

**TOWN OF HOOKSETT
NEW HAMPSHIRE**

**STANDARD SPECIFICATIONS
FOR CONSTRUCTION**

October, 2001

Approvals

This document was approved by the following departments:

<u>Governing Body</u>	<u>Specification</u>	<u>Date Approved</u>	<u>Approved by:</u>
Planning Board	ALL	_____	_____
			Director of Planning
Town Council	Road Fire Cistern Sprinklers Fire Alarm Specifications	_____	_____
			Chairman, Planning Board
Sewer Commission	Sewer Specifications	_____	_____
			Fire Chief
Central Hooksett Water Precinct	Water Main Specifications	_____	_____
			Chairman, Town Council
Hooksett Village Water Precinct	Water Main Specifications	_____	_____
			Superintendent
Manchester Water Works	Water Main Specifications	_____	_____
			Chairman

			Director

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Part I
General

PART I

GENERAL

A. GENERAL

1. Introduction

The specifications herein are compiled with the intent of providing "one stop shopping" for design and construction in the Town of Hooksett, NH. The specifications in this document include those for road, sewer, water, fire cistern, fire sprinkler and fire alarm construction in the Town. By reference, these specifications are considered part of the Subdivision Regulations of the Town of Hooksett. Questions should be directed as follows:

Questions regarding:

Road Construction:

Sewer Works:

Fire Cisterns/Sprinklers/Fire Alarms:

Water Works:

Direct questions to:

Town Highway Manager

Sewer Commission Superintendent

Hooksett Fire Dept.

See below

2. Water Service

Water service in the Town of Hooksett is provided by several entities including the Central Hooksett Water Precinct, the Hooksett Village Water Precinct, Manchester Water Works and Pennichuck Water Works. Specifications for each of these entities has been included in the appendices of this document. However, it is recommended that the appropriate entity be contacted to confirm that no revisions have been made by the governing body, subsequent to this document.

3. Other Ordinances

Other Ordinances which the developer should be aware of other ordinances including the following:

Town Ordinance #00-2 - Building Code Ordinance

Town Ordinance #00-6 - Establishing Regulations Regarding Fire Alarms

Town Ordinance #00-7 - Floodplain Development

Town Ordinance #00-10 - Knox Box Establishing Regulations Regarding Entry to Certain Buildings

Town Ordinance #00-11 - Minimum Road Construction Standards

Town Ordinance #00-13 - Roadway Excavation

Town Ordinance #00-27 - Residential and Business Burglary, Robbery and Panic Alarms

Town Ordinance #00-29 - Fire Lane Ordinance

4. Contacts

Town Contacts are as follows:

Hooksett Highway Department
210 West River Road (aka Rt 3A)
Hooksett, NH 03106
Phone: 668-8019
Fax: 668-6850

NHDOT, District 5 (for driveways
and utilities in State Highway ROW)
Phone: 485-9526

Hooksett Planning Department
Hooksett Municipal Building
16 Main Street
Hooksett, NH 03106
Phone: 268-0279
Fax: 485-4423

Hooksett Sewer Commission
1 Egawes Drive
Hooksett, NH 03106
Phone: 485-7000 or 485-4112
Fax: 485-4306

Hooksett Fire Department
15 Legends Dr.
Phone: 623-7272
Fax: 626-6742

Building/Zoning Code Enforcement Office
16 Main Street
Hooksett, NH 03106
Phone: 485-4117

Central Hooksett Water Precinct
Pat O'Brien, Superintendent
PO Box 16322
(Physical location: 32 Industrial Park
Drive)
Hooksett, NH 03106
Phone: 624-0608
Fax: 624-0814

Hooksett Village Water Precinct
Joseph L. Hebert, Superintendent
7 Riverside Drive
Hooksett, NH 03106
Phone: 485-3392

Manchester Water Works
281 Lincoln St.
Manchester, NH 03103
Phone: 624-6494

Pennichuck Water Works
4 Water Street
Nashua, NH 03601
Phone: 882-5191

5. Web Site

Additional Town information may be obtained from the Town web site located at www.hooksett.org.

6. As-Built Drawings

At the completion of the work, the Developer shall submit a set of working drawings (red-lines) and final As-Built drawings to all applicable departments. The As-Built drawings shall indicate any field adjustments, all buried structures, locations, invert, top of grade, centerline grade of streets at 50 ft stations to the nearest 0.1 ft, ditch grade lines to the nearest 0.01 ft at 50 ft stations, all utility locations and service ties. The As-Built drawings shall be submitted to the appropriate department (water, sewer, highway) on hard copy, 24" x 36" size, and electronically, on CD ROM, in AutoCad 2000 or most recent version. One copy of all As-Built drawings shall be submitted to the highway department for central filing.

Part B - General
FORMS

DEVELOPER PROCEDURE CHECKLIST

Important Phone Numbers

Building Department	485-4117	Central Water Precinct	624-0608
Planning Department	268-0279	Manchester Water Works	624-6494
Fire Department	623-7272	Highway Department	668-8019
Village Water Precinct	485-3392	Sewer Department	485-7000

Planning/Design Phase

- ___ 1. Consult with Building Department (*is the land is zoned for your use?*).
- ___ 2. Pick up pertinent regulations at the Building Department. These may include Zoning, Site Plan Review, Subdivision, Town Standards for Construction and other regulations.
- ___ 3. Preliminary consultation with the Planning Department.
- ___ 4. Consult with Town departments, as necessary, including Sewer Department, applicable Water Department, Fire Department, and Building Department.
- ___ 5. Develop conceptual design plans.
- ___ 6. Consult with the Building Department to determine if a technical review meeting (TRC) with all departments is necessary to discuss the conceptual design. The Building Department will schedule the TRC if determined necessary. Make required modifications resulting from the meeting.
- ___ 7. Develop final design plans and drainage report. Submit the application, fees and required number of plans and drainage studies to the Planning Department for completeness review. (*Completeness hearing scheduled by Planning Department*)(*The Planning Department will distribute the plans to the appropriate departments and consultants for review*).
- ___ 8. Attend completeness hearing with the Planning Board.
- ___ 9. The Department/Engineer will provide the Planning Department with an estimated cost for plan review (for road and fire cistern review). The Department/Engineer will provide the Developer with the cost for plan review for water and sewer review (where applicable). The Developer shall set up an escrow with each department for plan review.
- ___ 10. Respond to review comments and/or make modifications to the design drawings. Submit the required number of revised drawings, drainage studies and response to comments to the Planning Department for re-review.
- ___ 11. Get a final design plan approval from each department. This should be accomplished by written correspondence (letter, e-mail, fax) from the respective departments addressed to the Planning Department. The correspondence shall specifically identify the plans, date and revision number which has been reviewed and approved.
- ___ 12. When approvals from each department have been received, the applicant shall attend a public hearing to obtain Planning Board approval.

-
- ___ 13. The Developer shall submit 2 sets of final plans on Mylar, and paper prints, as required, to be signed by the planning board chairman.
- ___ 14. Signed plans will be recorded in the Merrimack County Registry of Deeds.

****NOTE: NO FIELD WORK MAY BE DONE ON THE SITE UNTIL SIGNED PLANS ARE ON FILE WITH THE PLANNING BOARD. ******

****NOTE: NO BUILDING PERMITS WILL BE ISSUED WITHOUT SIGNED PLANS ******

Construction Phase

- ___ 1. Check expiration date of Planning Board Approval.
- ___ 2. Submit bond estimate(s) to each respective departments (Highway, Water, Sewer as applicable) for approval.
- ___ 3. Submit bonds to the appropriate department (Highway, Water, Sewer, as applicable). Refer to Subdivision Regulations for additional bond requirements.
NOTE: IF PROPERTY OWNERSHIP CHANGES, NEW BONDS MUST BE SUBMITTED.
- ___ 4. Set up a separate escrow account with each respective department for construction observation and testing services.
- ___ 5. Submit a **Application for Start of Construction** form (or Building Permit, as applicable) to the Town Engineer (or Highway Manager, in absence of the Town Engineer).
- ___ 6. Request the Town conduct a pre-construction meeting with all involved departments (*meeting to be scheduled by the Town Engineer, or Highway Manager in absence of the Town Engineer*).
- ___ 7. Attend preconstruction meeting. The Developer shall submit a complete project schedule, identifying all inspections, for all departments at the preconstruction meeting. The Town Engineer will issue a **Notice to Proceed** with Construction.

**** NOTE: Developer is required to have a set of approved plans on the job site at all times. ******

**** NOTE: No Building Permit or Notice to Proceed will be issued without approved, signed plans. Each department must have a set of signed plans. *****

- ___ 8. Submit necessary **Intent to Clear** forms (State form) and **Intent to Excavate** forms (State form) to the highway manager for work involving state highways (*Pick up forms at Tax Office*).
- ___ 9. a. Layout roadway ROW and wetlands marking
b. Inspection
- ___ 10. a. Tree cutting, clearing, installation of erosion control measures - See Standard Specifications, Part II, B, 02110, 02210 and 02270.
b. Inspection

-
- _____ 11. a. Grubbing - See Standard Specifications Part II, B, 02110 and 02210.
Note: no earthwork after November 15 or before April 1.
b. Inspection.
 - _____ 12. a. Sub-grade, slope, underdrain construction - See Standard Specifications Part 02221, and 02225.
b. Inspection - Note: compaction testing is required for every 1,000 cy of fill placed.
 - _____ 13. a. Notify Town of Intent to begin utility construction.
b. Drainage, Sewer, Water, Buried Utility construction - See Standard Specifications Part II, B, 02710, 02710. See Water Department Regulations - Village, Central or Manchester Water (whichever water District project falls in), Appendices. See Sewer Department Regulations, Part IV. Consult respective Utility Companies.
c. Inspection. Note: Full time inspection is required, including trench backfilling.
 - _____ 14. a. Fire Cistern Construction - See Standard Specifications for Construction, Part V.
b. Inspections - Fire Cistern Construction Inspection Sheet.
 - _____ 15. a. Gravel Sub-base placement - See Standard Specification Part II, B, 02225.
b. Inspection - Note compaction testing is required every 200 lf of roadway.
 - _____ 16. Submit Building permit application (*get permit at the Building Department*).
NOTE: You can sell lots but you can not obtain a building permit, or commence building until gravel sub-base is complete and approved by the Town.
 - _____ 17. a. Crushed gravel base placement - See Standard Specifications Part II, B, 02225.
NOTE: All underground utilities must be installed and crushed gravel base must be down 30 days before base pavement is installed (cutoff for installation of crushed gravel base is October 15). During this 30 day period, sewer lines may be TV inspected, pressure tested, sewer manholes may be tested, drain lines tested, drain manholes tested and water lines tested and disinfected.
b. Inspection - Note: compaction testing is required every 200 lf of roadway.
 - _____ 18. a. Final grading of ditches, slopes, landscaping, erosion control, stormwater measures - See Standard Specifications Part II, B, 02270, 02931, 02932, 02950.
b. Inspection
 - _____ 19. a. Construction of driveways/curb cuts
b. Inspection
 - _____ 20. a. Binder course pavement - NOTE: PAVEMENT CANNOT BE PUT DOWN AFTER NOVEMBER 15 OR BEFORE APRIL 1. See Standard Specifications, Part II, B, 02510. Note: One winter must elapse after paving the binder course, prior to top course paving.
b. Inspection - Note: full time inspection is required during paving.
 - _____ 21. Install curbing
 - _____ 22. Set all permanent property and ROW bounds.

Substantial Completion Phase

- _____ 1. Submit As-Built drawings to the appropriate departments (water, sewer, highway) and one copy to the highway department for central filing.
- _____ 2. Set up inspection with each department for substantial completion sign-off (Highway, Sewer, Water, Fire & Utilities) on **Substantial Completion Certification** form. Base pavement and curbing must be in place to obtain substantial completion. **NOTE: No CO's will be issued prior to substantial completion sign-off from each department.**
- _____ 3. Submit sewer service permit, water service permit, gas and others. NOTE: Obtain permit application from each respective department. Follow each department's rules.
- _____ 4. Set up final inspection on house with Building Inspector. Submit application for Certificate of Occupancy (CO). NOTE: C. O.s will not be issued until sign-offs are obtained from all departments and all property bounds are set.

Completion Phase

- _____ 1.
 - a. Complete Final Paving. **Note: No paving after October 15 or before April 1. Base pavement must be down 1 winter prior to final paving.**
 - b. Inspection (Note: full time inspection is required during paving).
- _____ 2. Set up final inspection with each department (Highway, Sewer, Water, Fire & Utilities). Conduct inspection and obtain final inspection sign-off for road, drainage, water, sewer, fire, electric, phone, cable, etc for each.
- _____ 3. 90 days after final inspection of road and utilities, submit final as-built drawing to each respective department. Obtain final sign-off, via "Certificate of Final Completion of Work", from each department.
- _____ 4. One year following substantial completion, request bond reduction to 10% retainer.
- _____ 5. Return of excess Escrow by the Town.
- _____ 6. Submit final, signed, **Certificate of Final Completion of Work** from each department to the Town Engineer (or Highway Manager in the absence of the Town Engineer). The Town Engineer will file a **Recommendation for Roadway Acceptance** to the Town Council to accept the road.
- _____ 7. Two years after holding 10% bond retainer, bond will be returned if there are no outstanding issues.

TOWN OF HOOKSETT
APPLICATION FOR START OF CONSTRUCTION

Approved Name(s) of Road(s) or Drive(s)

Subdivision/Site Name: _____

Location: _____

Developer name, address & phone: _____

Contracted Road Builder name, address & phone: _____

Subcontractors name & phone: _____

Date of Application: _____

Developer's Authorized Agent name & phone: _____

Highway Department's Authorized Agent name & phone: _____

Sewer Department's Authorized Agent name & phone: _____

Water Service Company: _____

Water Department's Authorized Agent name & phone: _____

Fire Department's Authorized Agent name & phone: _____

DEVELOPER CERTIFICATION

I attest that I have read the Standard Specifications for the Town of Hooksett, and agree to perform all construction in accordance with said specifications. I agree to abide by all permanent Town Ordinances and to perform the work in accordance with all local, state and federal requirements. I agree that work will not be performed on weekends or holidays if the site is within 1,000 ft of residential dwellings, and working hours shall be limited to 7 am to 5 pm.

Developer (print name)

Developer (signature)

BOND AMOUNTS:

Highway Department \$ _____

Sewer Department \$ _____

Water Department \$ _____

**BOND RECEIVED (SIGNATURES
REQUIRED):**

Highway Manager

Sewer Commission Superintendent

Water Department Superintendent

ESCROW ACCOUNTS ESTABLISHED (SIGNATURES REQUIRED):

Highway Manager

Sewer Commission Superintendent

Water Department Superintendent

Fire Chief

Submit completed, authorized, form to the Town Engineer (or Highway Manager in absence of the Town Engineer). Do not proceed with construction without a Notice to Proceed.

TOWN OF HOOKSETT
NOTICE TO PROCEED

Approved Name(s) of Road(s) or Drive(s)

Subdivision/Site Name: _____

Location: _____

Developer name, address & phone: _____

Contracted Road Builder name, address & phone: _____

Subcontractors name & phone: _____

Date: _____

Approved signed plans: _____

Application for Start of Construction: _____

Preconstruction Conference: _____

You are hereby notified that work may commence on the above noted project, subject to the requirements and Standard Specifications of the Town of Hooksett.

Note the following important conditions:

- An approved set of plans, signed by the planning board, must be on site at all times work is in progress.
- If property ownership changes, new bonds must be submitted before any work may continue.
- No earthwork or paving shall be performed after November 15 or before April 1.
- Crushed gravel road base must be in place 30 days prior to paving.
- Base course paving must be in place one (1) winter before top course paving.
- Two (2) days' notice of all inspections is required.

Name - Town Engineer (or Highway Manager in absence)

Signature - Town Engineer (or Highway Manager in absence)

**TOWN OF HOOKSETT
RECOMMENDATION FOR ACCEPTANCE**

Approved Name(s) of Road(s) or Drive(s)

Subdivision name: _____

Location: _____

Developer name & address: _____

Contracted Road Builder name & address: _____

Contracted Water Main Builder name & address: _____

Contracted Sewer Builder name & address: _____

Said project has been satisfactorily completed in accordance with the minimum standards for road construction as adopted by the Town of Hooksett, New Hampshire. I recommend that the Town Council for the Town of Hooksett accept said road as a Public Way.

Signature - Town Engineer

Print Name - Town Engineer

Date

Attach signed Certificate of Final Completion from each Department

PART II
ROAD CONSTRUCTION

Part II

Road Construction

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PART II

ROAD CONSTRUCTION

A. GENERAL

1. Work in Existing Roads

- A. A **Roadway Excavation Permit** must be obtained from the Highway Department, and permit fee paid, a minimum of two (2) working days (48 hours) prior to the start of work.
- B. The following are prerequisite conditions to obtaining a **Roadway Excavation Permit**:
 - 1. Posting of the appropriate bonds,
 - 2. Written notice to, and consent of, authorities with underground structures/utilities in the vicinity of the work,
 - 3. Submittal of a suitable traffic maintenance plan,
 - 4. Arrangements for police traffic control or other traffic control and warning devices,
 - 5. Payment of the permit fee,
 - 6. Certificates of insurance and contact persons for ALL contractors working in the street ROW, and
 - 7. Inspection and testing fees for installation and restoration.

NOTE: NO TRENCHING IS ALLOWED IN EXISTING ROADWAYS AFTER OCTOBER 15 OR BEFORE APRIL 1.
- C. Refer also to Town Ordinance #00-13 - Roadway Excavation Ordinance.
- D. No excavation or other construction will be allowed in the Town Right-of-Way until a Roadway Excavation Permit has been issued.
- E. All driveways must be field inspected and approved by the Highway Department prior to issuance of a Certificate of Occupancy (CO).
- F. No excavation, open trenches or other construction are allowed in a Town Right-of-Way between 7:30 am and 5:00 pm, or dusk, whichever is earlier.

2. Road and Drainage Construction Procedures

- A. Prior to starting any construction, an **Application for Start of Construction** must be filed with the Town Engineer (or Highway Manager in absence of a Town Engineer).
- B. Prior to starting construction, subdivision design plans must be approved and signed by the Planning Board and filed with the Merrimack County Registry of Deeds. Bonds must be in place with all appropriate departments (Highway, Water, Sewer), and the appropriate escrow accounts established for construction observation and testing (Highway, Water, Sewer, Fire).
- C. Upon acceptance of the completed **Application for Start of Construction**, the Town Engineer (or Highway Manager in absence of a Town Engineer) will schedule a pre-construction meeting with all involved parties. At this meeting, the Developer will be required to submit a complete project schedule, identifying all inspections, for all departments (see inspection checklists for each department). At this meeting, the Town Engineer (or Highway Manager in absence of the Town Engineer, will issue a Notice to Proceed)

- D. Crushed gravel base must be placed 30 days prior to paving. No paving will be allowed after November 15 or before April 1. Final pavement placement will not be allowed until the binder coarse has been down for 1 winter.
- E. Construction shall not be permitted on weekends or holidays within 1,000 ft of residential dwellings. Construction hours shall be limited to 7 am to 5 pm within 1,000 ft of residential dwellings. Construction may be conducted between 6 am and dark in other areas. No equipment may be started or operated outside the designated construction hours. Blasting shall take place only from 7 am to dark.
- F. An approved set of plans, signed by the planning board, shall be on-site at all times.

3. Road and Drainage Inspection

- A. The Developer shall establish an escrow account with the Highway Department to cover the cost of construction inspection and testing services for the roadway and any fire cisterns. The Highway Department will notify the Developer of the estimated cost of these services. Should the cost of these services exceed the amount in the escrow account, no further inspections, sign-offs or approvals will be granted until the additional funds requested are deposited into the escrow account. Work performed without the required inspection will not be accepted by the Town.
- B. The Designated Representative of the Highway Department shall be notified at least two (2) working days prior to the requested time of inspection. The scheduled inspection time shall be confirmed by the inspector. The requirements of this notification are as follows:
 - 1. Two (2) working days do not include holidays and weekends.
 - 2. Inspectors will be available between 8:00 am and 3:00 pm Monday through Friday.
 - 3. No inspections will be made on weekends or holidays.
 - 4. Cancellation of scheduled inspection: In cases where the Designated Representative of the Highway Department is not notified that an inspector's services are not required by 12:00 pm (noon) the day prior to the requested inspection, a minimum charge of three (3) hours will be assessed to the requesting person or company.
- C. Inspections shall be made on the **Roadway Inspection Form**, located at the end of this section, and the **Fire Cistern Inspection Form**, located at the end of Section V. Inspections must be made at milestones identified on the **Roadway Inspection Form and the Fire Cistern Inspection Form**.
- D. Note that full time inspection is required whenever buried utilities are being installed or pavement is being placed. Compaction testing is required every 1,000 cy of general fill placed in the roadway ROW; for every 200 lf of roadway for placement of gravel sub-base and crushed gravel base.
- E. Upon completion of the work and signing of the **Certificate of Final Completion of Road Work** and the **Certificate of Final Completion of Fire Cistern Work**, any excess funds in the escrow account will be returned to the Developer.

4. Road, Drainage and Fire Cistern Estimates and Bonds

- A. A bond in the amount of the road construction project, made payable to the Town of Hooksett, will be required prior to commencing construction.
- B. The amount of the road, drainage and fire cistern portion of the bond shall be determined using stipulated prices identified in the **Subdivision Plan Improvements Bond Estimate Worksheet** included herein. Note that separate estimates are required for road/drainage work, water mains and sewers. The road/drainage estimate must be approved by the Designated Representative of the Highway Department prior to submission of the bond.
- C. A bond reduction to 10% will be issued one year after substantial completion.
- D. A 10% bond retainer will be held for two (2) years following the **Certificate of Final Completion of Work**. If there are no outstanding issues regarding the work, the bond retainer will be returned to the Developer at this time.

5. As-Built Drawings

- A. At the completion of the work, prior to obtaining substantial completion, the Developer shall submit a set of working drawings (red-lines) and As-Built drawings. The As-Built drawings shall indicated any field adjustments, all buried structures, utilities and services. The As-Built drawings shall be submitted to the appropriate department in hard copy, 24" x 36" size, and electronically in AutoCAD 2000 or most recent version. One copy of all As-Built drawings shall be submitted to the highway department for central filing.

TOWN OF HOOKSETT, NEW HAMPSHIRE

SUBDIVISION PLAN IMPROVEMENTS BOND ESTIMATE WORKSHEET

I hereby certify that, in addition to any work already completed, the following itemized statement and estimated unit costs will complete all improvements required by the Hooksett Subdivision/Site Plan Regulations for the following lot(s):

Map _____ Lot _____ Name of Project: _____ Revised Date: _____

ITEM	QUANTITY	MEASURE	UNIT PRICE	PRICE
1 Site Work				
a Clearing & Grubbing		Acre	\$6,250.00	
b Excavation		C.Y.	\$2.75	
c Grading		S.Y.	\$0.10	
d Erosion Control		L.F.	\$1.00	
e Other: Construction Entrance		L.S.	\$500.00	
f Ledge Excavation		C.Y.	\$20.00	
2 Paving				
a Bank Run Gravel		C.Y.	\$5.25	
b Crushed Gravel		C.Y.	\$9.75	
c Crushed Stone		C.Y.	\$9.75	
d 2" Paving, binder course		S.Y.	\$3.90	
e 1" Paving, finish course		S.Y.	\$1.75	
f Curbing:		L.F.	\$3.00	
g Striping		L.F.	\$1.00	
h Prep Work		L.F.	\$1.00	
i Tack Coat		S.Y.	\$0.75	
j Filter Fabric		S.Y.	\$0.50	
k Other: Sand		C.Y.	\$3.00	
l Retaining Wall		C.Y.	\$250.00	
3 Drainage Work				
a Pipe: Size Type				
36"		L.F.	\$40.00	
18"		L.F.	\$18.00	
15"		L.F.	\$16.00	
12"		L.F.	\$12.50	
6"		L.F.	\$10.00	
b Catch basins/Inlets		EA.	\$1,000.00	
c Outlet Control Structure		EA.	\$3,000.00	
d Retention/Detension Basins				
Excavation		C.Y.	\$10.00	
Loam & Seed		S.Y.	\$3.00	
Inlet/Outlet		EA.	\$2,000.00	
e End Section		EA.	\$325.00	
f Wingwall/Headwall		L.F.	\$150.00	
g Swales				
Excavation		L.F.	\$2.75	
Loam & Seed		S.Y.	\$3.00	
h Rip Rap/Filter Material		C.Y.	\$12.50	
i Other:		EA.		

ITEM	QUANTITY	MEASURE	UNIT PRICE	PRICE
4 On-site Improvements				
a Signs		EA.	\$150.00	
b Fencing/Guardrail		L.F.	\$15.00	
c Walkways		L.F.	\$20.00	
d Bumpers				
e Landscaping				
Loam & Seed		S.Y.	\$3.00	
Plant Material		L.S.	\$6,000.00	
f Other:				
Electrical Utilities		L.F. Rd	\$15.00	
g Gabion Wall		L.F.	\$65.00	
h Fire Cistern		Gal.	\$1.00	
i Gas Line		L.F.	\$15.00	
5 Off-site Right-of-Way Improvements				
a. Drainage:				
Excavation		C.Y.	\$10.00	
Loam & Seed		S.Y.	\$5.00	
Driveway Culverts:		L.F.	\$25.00	
b. On-site Septic		L.S.	\$15,000.00	
6 Miscellaneous				
a Bounds:				
No. Type - Granite (Row)		EA.	\$150.00	
b As-built plans		Sheets	\$500.00	
c Deeds or Agreements		L.S.	\$1,000.00	
d Other: Construction Monitoring		L.S.	\$13,000.00	
			SUBTOTAL	
8 Contingencies	(15% of Subtotal)		=	
			TOTAL	

Estimated by: _____

Concurrence by: _____

Signature: _____

Signature: _____

Title: _____

Title: _____

Date: _____

Date: _____

Tele. #: _____

Tele. #: _____

Date improvements to be completed by: _____
 (to be no later than one (1) year after signing of this form, unless approved by the Town)

Approved by: _____

Date: _____

Highway Manager

B. Specifications for Road Construction

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Description of Work.
- B. Work sequence.
- C. Use of premises.

1.02 DESCRIPTION OF WORK

- A. Work of this Specification comprises general construction including, but not limited to, excavation, backfilling, grading, seeding and paving; construction of storm drain systems and guard rails.

1.03 REFERENCES AND STANDARDS

- A. No work shall begin prior to approval of proposed plans by the Town of Hooksett Planning Board.
- B. The DEVELOPER is responsible for obtaining any approvals or permits from other federal, state or local authorities, as applicable.
- C. The State of New Hampshire Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, shall be used as the standard for any work not addressed in these specifications.

1.04 WORK SEQUENCE

- A. Coordinate Progress Schedule and performance with the Designated Representative for the TOWN OF HOOKSETT during construction.
- B. Do not close off usage of or access to existing facilities and roadways.
- C. Work within 1,000 ft of residential dwellings shall be limited to 7 a.m. - 5 p.m. No work shall be permitted on weekends or holidays.
- D. Work over 1,000 ft from residential dwellings may take place from 6 a.m. to 6 p.m.
- E. Blasting shall be allowed between the hours of 7a.m. and dark.
- F. Starting of construction shall be defined as starting of any equipment.

1.05 USE OF PREMISES

- A. DEVELOPER shall limit use of premises for work, for storage, and for access, to allow:
 - 1. Normal public use of public property, rights-of-way, etc.

2. Access to private property.
 - B. Coordinate use of premises under direction of the Designated Representative of the TOWN OF HOOKSETT.
 - C. Assume full responsibility for protection and safekeeping of products under this Project.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

- A. Throughout the construction of any roadway project in the TOWN OF HOOKSETT, the Highway Department has the authority to alter any aspect of the road construction which it deems necessary for the proper completion of that roadway.

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Clearing site of plant life and grass.
- B. Removing root systems of trees and shrubs in areas cleared.
- C. Pruning trees to remain where branches or roots will interfere with construction operations.
- D. Removing debris.

1.02 REGULATORY REQUIREMENTS

- A. Conform to applicable local, state and federal regulations for disposal of debris.
- B. Burning or disposing of debris on site is prohibited.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PROTECTION

- A. Protect plant growth and features remaining as final landscaping.
- B. Protect bench marks and existing work from damage or displacement.
- C. Maintain designated site access for vehicle and pedestrian traffic.
- D. Protect existing trees and other vegetation to remain in place against unnecessary cutting, breaking, skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line and excess foot or vehicular traffic, or parking of vehicles within drip line.

3.02 CLEARING AND GRUBBING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs within marked areas and where shown on Drawings. Grub out stumps and roots.
- C. Clear undergrowth and deadwood, without excavating topsoil and subsoil.
- D. Remove and dispose of all materials used for mulch and/or ground cover. Do not stockpile or reuse the material.

- E. Use only hand methods for grubbing inside drip lines of trees that remain in place.

3.03 PRUNING TREES

- A. Carefully and cleanly cut roots and branches of trees indicated to remain, where such roots and branches obstruct the construction.
- B. Prune trees in accordance with standard horticultural practice. Do not cut tree leaders.
- C. Repair, paint tree wounds in accordance with standard horticultural practice.

3.04 REMOVAL

- A. Remove debris from site.
- B. Dispose of debris in accordance with local, state and federal regulations.

END OF SECTION

SECTION 02160

EXCAVATION SUPPORT

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Designing, furnishing, installing, maintaining and removing excavation support systems for the following:
 - 1. Excavation.
 - 2. Trench excavation.

1.02 REFERENCE STANDARDS

- A. ASTM A328 - Steel Sheet Piling.
- B. NFPA - National Forest Products Association.

1.03 SYSTEM DESCRIPTION

- A. The construction of the excavation support systems shall include soldier piles, lagging, trench boxes, wood sheeting and steel sheeting, including bracing members such as walers, struts, shores and tieback anchors and all other system members.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Wood: Tongue and groove; #3 common Douglas Fir or Hemlock; or Utility Grade Southern Pine; NFPA grading.
- B. Steel: ASTM A328.
- C. Trench Boxes: Fabricated steel.

PART 3 EXECUTION

3.01 EXECUTION

- A. The CONTRACTOR shall be totally responsible for the means and methods of excavation and for the design and construction of the excavation support systems.
- B. The support system shall be designed to support the maximum loads that will occur during construction.

- C. Excavation support systems shall be constructed so as to be able to support all vertical and lateral loads and other surcharge loads imposed on the system during construction including earth pressures, utility loads and other surcharges and construction loads in order to provide safe construction of the permanent structures and prevent movement and/or damage to adjacent soil, buildings, structures and utilities.
- D. Do not brace to concrete unless authorized by the Designated Representative of the Town of Hooksett, and then only if concrete has reached its design strength as determined by compressive test of representative concrete cylinders which have been cured on site for a period of at least 14 days.
- E. Do not embed any part or portion of excavation support system in the Work. Do not construct sleeves or openings in the structures to permit bracing through the structures unless authorized by the Designated Representative of the Town of Hooksett.
- F. The Developer shall not perform excavations in unstable earth. Stabilize all earth materials behind support walls before excavation is allowed to proceed.
- G. The Developer shall monitor all excavations and provide a means of determining movement of adjacent soil, buildings, structures and utilities.
- H. Where movement or damage is observed, the Developer shall immediately cease excavation operations and correct such deficiency in the excavation support system that allowed for movement or damage and repair all damage.
- I. The Developer shall be responsible for, and shall repair all damage resulting from his excavations.
- J. During construction, the Developer shall be responsible for meeting all requirements and standards of OSHA (Occupational Safety and Health Administration).

3.02 SHEETING LEFT-IN-PLACE

- A. Cut off all sheeting left-in-place at least three feet below the ground surface, whether such sheeting is ordered left in place by the Designated Representative of the Town of Hooksett or is left in place for the convenience of the Developer/Contractor.

END OF SECTION

SECTION 02210

SITE PREPARATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Remove topsoil and stockpile suitable material for later reuse. Remove excess or unsuitable topsoil from site.
- B. Excavate subsoil and stockpile suitable material for later reuse. Remove excess or unsuitable topsoil from site.
- C. Grade and rough contour site.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known below grade utilities. Stake and flag locations.
- C. Identify and flag above grade utilities.
- D. Upon discovery of utility or concealed conditions which affect the conduct of the work of this section, notify the TOWN OF HOOKSETT.
- E. Protect trees, shrubs, lawns, and other features remaining as portion of final landscaping.
- F. Protect bench marks, existing structures, fences, roads, sidewalks and paving and curbs.
- G. Protect above or below grade utilities which are to remain.

3.02 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded and stockpile on site. Remove excess topsoil not being reused from site.

All stockpiled loam shall be hay mulched to reduce erosion.

3.03 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be re-landscaped or re-graded and stockpile on site and remove excess subsoil not being reused from site.

- B. When excavation through roots is necessary, perform work by hand and cut roots with a sharp axe.

3.04 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus one (1) inch.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 GENERAL

1.01 SYSTEM PERFORMANCE REQUIREMENTS

- A. Dewatering shall include all necessary control and disposal of groundwater on a continual basis during construction.
- B. Dewatering shall include the lowering of the groundwater table to relieve any hydrostatic head that could cause a decrease in the stability of the excavated subgrade. It shall also include the intercepting of seepage which could otherwise emerge from the slope or sides of excavations which could cause a decrease in the stability of the excavated subgrade or the slopes or sides of the excavations.
- C. Dewatering shall be performed during construction to temporarily protect against the following:
 - 1. The loss of any material beneath the excavated subgrade or from the slopes or sides of the excavations or the movement of any fine particle materials from the soil.
 - 2. Any increased vertical or lateral loads on the excavation support systems.
 - 3. Any disturbance, rupture, instability, boiling or heaving of the bottom of excavated subgrade during:
 - a. Excavation.
 - b. Placement of foundation or bedding materials.
 - c. Construction of slabs, footings, pipes, conduits, under-drains and any other structures.
 - d. Backfilling operations.

1.02 ADDITIONAL PROVISIONS

- A. Provide, operate and maintain any dewatering system required to lower and control groundwater levels and groundwater hydrostatic pressure during the construction of the Work as required by these specifications. The Developer shall assume full responsibility and expense for the adequacy of the dewatering system with no additional time for performance.
- B. Remove and dispose of water resulting from activities described in paragraph 1.02 A. Provide siltation settling basins for all discharges from dewatering systems. Submit plan of settling basins and discharge facilities for review by the Town prior to dewatering system installation.
- C. Remove dewatering systems and equipment when no longer required.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 EXECUTION

- A. The dewatering system shall be capable of developing an excavated subgrade relieved of any hydrostatic pressure that could cause a decrease in the stability of the excavated subgrade and which will provide the necessary groundwater control for the proper performance required for completion of the Work.
- B. The dewatering system shall not cause damage to newly constructed or existing properties, buildings, utilities and other work due to the loss of support from incompletely drained soils or from removal of soil particles resulting from the dewatering system operation.
- C. Dewatering facilities shall be located where they will not cause interference with work performed by others.
- D. If the dewatering system utilized by the Developer causes or threatens to cause damage to new or existing facilities, the dewatering system shall be modified. The Developer shall be responsible for, and shall repair all damage caused by the dewatering system operation.
- E. Dispose of subsurface water collected in a manner which conforms to all applicable local and state ordinances, statutes and laws.
- F. Maintain continual and complete effectiveness of the dewatering system operation to provide a firm, stable, excavated subgrade at all times as required for proper performance of the Work.
- G. Provide dewatering necessary to maintain the groundwater table a minimum of two (2) feet below the bottom of excavated subgrade at all times.

3.02 JOB CONDITIONS

- A. Erosion Control: Provide adequate protection from erosion from any of the dewatering operations utilized during the course of the construction. Any damage, disruption or interference to newly constructed work or existing properties, buildings, structures, utilities and/or other work resulting directly or indirectly from dewatering operations conducted by the Developer shall be remedied.
- B. Treatment of Dewatering Operations Discharges: Provide such additional treatment devices as may be required. This may include the construction of sumps and/or settling basins, stone rip-rap, silt fences or other requirements. The treatment devices shall be later removed and/or filled in with acceptable backfill material, and restored to original conditions once they are no longer needed.

END OF SECTION

SECTION 02221

LEDGE AND BOULDER EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Conducting preconstruction survey.
- B. Excavating and disposing of ledge.
- C. Excavating and disposing of boulders.
- D. Backfilling of ledge and boulder excavation.

1.02 DEFINITIONS

- A. Ledge shall mean:
 - 1. solid igneous, sedimentary, metamorphic, conglomerate boulder which requires for its removal drilling and blasting, wedging, sledging or barring; or,
 - 2. single pieces of solid rubble masonry and Portland cement concrete two (2) cubic yard in volume or larger.

1.03 SUBMITTALS

- A. Submit plans of the preconstruction survey at the preconstruction conference.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PRECONSTRUCTION SURVEY

- A. At the preconstruction conference, the DEVELOPER shall submit plans of the pre-blast survey to the Designated Representative of the TOWN OF HOOKSETT. This information should be complete and of sufficient detail to inform the Designated Representative of the TOWN OF HOOKSETT of the extent and detail to be achieved throughout the Work. During the course of the survey the DEVELOPER shall keep the Designated Representative of the TOWN OF HOOKSETT informed of the progress of the Work and shall notify them of any modifications to the initial plan.
- B. The pre-blast survey shall include examinations of the interior and exterior of any buildings and of public and private water supply systems which could be affected by construction and/or blasting operations. Photographs and detailed measurements of such properties and buildings shall be included. Tests shall be performed on public and private water supply systems indicating quality and quantity of those systems where warranted. In some areas, buildings and water supply systems might not necessarily be in the proximity of the Work, but unstable ground could be altered by construction and/or blasting operations. The survey

should include borings in such expected areas and appropriate rock soundness or other tests to eliminate damage from blasting in areas of unknown subsurface conditions. Seismographic monitoring shall be utilized in all areas. The results of seismographic monitoring shall be maintained for five (5) years.

- C. The DEVELOPER shall obtain sufficient information to conduct blasting and drilling operations without damage to person and property throughout the entirety of the Work and take special care and be fully aware of subsurface conditions in sensitive areas.
- D. The DEVELOPER shall submit a written report to the TOWN OF HOOKSETT which summarizes structures and utilities surveyed, recommended blasting procedures, and any other pertinent information related to safe blasting operations and protection of the public, property and utilities.
- E. Copies of all preconstruction survey information shall be maintained on file with the preconstruction survey consultant for two (2) years following construction or longer if required by law. All information will be made available to interested parties in the event of a blasting damage claim.

3.02 LIMITS OF LEDGE AND BOULDER EXCAVATION

- A. Ledge excavation shall be performed, unless otherwise directed, so that no projection shall come within vertical planes twelve (12) inches outside of the structure being built, or as shown on the Drawings. In trenches, the rock shall be removed to the limits shown on the typical trench section. Where excavation is carried beyond the above defined limits, the additional space shall be refilled with concrete for structures bearing otherwise on rock, or backfill material, as specified in Section 02225.
- B. If ledge below limits of excavation is shattered by blasting caused by holes drilled too deep, or too heavy charges of explosives, or any other circumstance due to blasting, and if such shattered ledge does not provide suitable foundation, the ledge shall be removed and the excavation refilled with backfill material, as specified in Section 02225, at the expense of the DEVELOPER.

3.03 NOTIFICATION

- A. When ledge or boulders are encountered, the material shall be uncovered and the designated representative of the TOWN OF HOOKSETT notified.

3.04 BLASTING

- A. Conduct all blasting operations in full compliance with all state and federal laws and local ordinances. Take all possible care to avoid injury to persons and damage to property. The ledge is to be well covered and sufficient warning given to all persons in the vicinity of the Work before blasting. Care shall be taken to avoid damage to utilities or other structures above and below ground.
- B. No blasting will be permitted under or adjacent to any street, road, or highway unless permission has been received in writing from the authority having jurisdiction.
- C. Conform to all municipal, state, federal and other ordinances and codes relating to the transportation, storage and handling 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.

- D. Seismographic monitoring of all blasts shall be mandatory.

3.05 DISPOSAL AND REMOVAL OF LEDGE AND BOULDERS

- A. Ledge and boulders removed shall be considered unsuitable material for trench backfill and shall be removed and properly disposed of off-site.

3.06 BACKFILLING LEDGE AND BOULDER EXCAVATIONS

- A. Ledge and boulders shall be replaced with backfill material as specified in Section 02225 - EXCAVATION, BACKFILLING AND COMPACTING.

END OF SECTION

SECTION 02225

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Excavating topsoil and stockpiling topsoil for later use.
- B. Saw cutting pavement and excavating pavement.
- C. Excavating subsoil and stockpiling subsoil for later use.
- D. Excavating unsuitable material.
- E. Replacing ledge and boulder excavation and excavated unsuitable material with select fill material or common fill material.
- F. Placing select fill materials below utilities, tankage and concrete structures.
- G. Backfilling excavations with common fill materials.
- H. Placing common fill materials for bringing site to subgrade.
- I. Complying with compaction requirements.
- J. Removing and disposal of excess topsoil and subsoil, excavated unsuitable material, and excavated pavement, rock, boulders, solid rubble masonry and Portland cement concrete off site.
- K. Grading and rough contouring the site to the cut limits required for construction.
- L. Removing unsuitable material from excavated material and making the excavated material suitable for reuse.

1.02 REFERENCE STANDARDS

- A. ASTM C33 - Concrete Aggregates.
- B. ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.
- C. ASTM D75 - Sampling Aggregates.
- D. ASTM D1557 - Tests for Moisture - Density Relations of Soils and Soil- Aggregate Mixtures, Using 10-lb Rammer and 18-inch Drop: (Modified Proctor).
- E. ASTM D2922 - Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- F. State of New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction (latest edition).

1.03 SAMPLES

- A. Samples shall be obtained in accordance with ASTM D75.
- B. Submit, 75-lb samples of each type of materials to be tested to the Designated Representative of the TOWN OF HOOKSETT.

1.04 TESTING

- A. Tests and analysis of fill materials will be performed in accordance with the methods in ASTM C136.
- B. The DEVELOPER is responsible for payment of costs resulting from retesting of any soils.

1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record location of utilities remaining, rerouted utilities, and new utilities by horizontal dimensions, elevations or inverts, and slope gradient.
- B. Provide records of utility locations to the Designated Representative of The TOWN OF HOOKSETT prior to acceptance of the roadway.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

- A. Topsoil: Friable, fertile, natural, free-draining loam typical of the locality; free of subsoil, roots, grass, sticks, weeds, clay, sod lumps, debris and stones larger than one (1) inch in maximum dimension. Soil shall not be excessively acid or alkaline, nor contain toxic material harmful to plant growth.
- B. Unsuitable Material: Cut or broken pavement, debris, concrete or other rubble, organic materials; muck, peat, silty soils or clayey soil; rock over six (6) inches in maximum dimension; or any material which in the opinion of the Designated Representative of the TOWN OF HOOKSETT will not provide sufficient support or maintain the completed construction in a stable condition.

2.02 COMMON FILL MATERIALS

- A. Subsoil (suitable for reuse): Material excavated on site which is friable, natural soil composed of gravel, sand, or silty or clayey gravel and sand; free from debris, concrete or other rubble, organic matter, muck, peat, excavated rock and boulders over 6 inches in maximum dimension.
- B. Additional Fill: Imported material which is friable, natural soil composed of gravel, sand, or silty or clayey gravel and sand; free from debris, concrete or other rubble, organic matter, muck, peat, excavated rock and boulders over 6 inches in maximum dimension.

2.03 SELECT FILL MATERIALS

- A. Bank Run Gravel: Material excavated from a suitable gravel bank and consisting of stones, rock fragments and fine durable particles resulting from natural disintegration of rock; meeting

the following limits, as noted in NHDOT standard specification Section 304, when tested in accordance with ASTM C136:

Sieve <u>Designation</u>	Percentage by Weight Passing Square Mesh Sieve <u>TOTAL SAMPLE</u>
(Maximum size - 6 inches)	
3-1/2-inch	95 - 100
No. 4	25 - 70
No. 200 (based on fraction passing the No. 4 sieve)	0 - 12

- B. Sand: Clean mineral aggregate with the following particle size limits when tested in accordance with ASTM C136:

Sieve <u>Designation</u>	Percentage by Weight Passing Square Mesh Sieve <u>TOTAL SAMPLE</u>
No. 4	100
No. 100	0 - 30
No. 200	0 - 12

- C. Crushed Gravel (structural fill): Clean, hard crushed gravel; free from silt, topsoil, clay, and organic matter; uniformly graded from coarse to fine within the following limits, as noted in NHDOT standard specification Section 304, when tested in accordance with ASTM C136:

Sieve <u>Designation</u>	Percentage by Weight Passing Square Mesh Sieve <u>TOTAL SAMPLE</u>
3-inch	100
2-inch	95 - 100
1-inch	55 - 85
No. 4	27 - 52
No. 200	0 - 12

- D. Crushed Stone: Clean mineral aggregate meeting the following limits when tested in accordance with ASTM C136:

Sieve <u>Designation</u>	Percentage by Weight Passing Square Mesh Sieve <u>TOTAL SAMPLE</u>
3/4-inch	100
No. 4	0 - 5

- E. Stone for Stone Fill: Hard, blasted angular rock other than serpentine rock containing the fibrous variety chrysotile (asbestos); reasonably well graded from smallest to maximum size stone so as to form a compact mass when in place: note NHDOT standard specification Section 585.

- Class A - Approximately 50 percent of the mass having a minimum volume of 12 cubic feet, approximately 30 percent of the mass ranging from 12 and 3 cubic feet, approximately 10 percent of the mass ranging from 3 and 1 cubic feet, and the remainder of the mass composed of spalls.

2. Class B - Approximately 50 percent of the mass having a minimum volume of 3 cubic feet, approximately 40 percent of the mass ranging from 1 and 3 cubic feet, and the remainder of the mass composed of spalls.
3. Class C - Shall conform to the following gradation:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieve TOTAL SAMPLE</u>
12-inch	100
4-inch	50 - 90
1-1/2-inch	0 - 30
3/4-inch	0 - 10

4. Class D - Shall conform to the following gradation:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieve TOTAL SAMPLE</u>
2-inch	100
1-1/2-inch	95 - 100
3/4-inch	35 - 70
3/8-inch	10 - 30
No. 4	0 - 5

2.04 FILTER FABRIC

- A. Filter fabric shall be Mirafi 140N. Substitution of a product equal or better quality, detail, function and performance may be proposed for substitution.

PART 3 EXECUTION

3.01 PREPARATION

- A. It is the responsibility of the DEVELOPER to verify all existing utilities within the project area.
- B. Identify required lines, levels, contours, and datum.
- C. Identify known underground utilities. Stake and flag locations.
- D. Identify and flag surface and aerial utilities.
- E. Notify utility companies to locate and temporarily support, remove, and/or relocate utilities.
- F. Notify DIG-SAFE (1-800-225-4977).

3.02 PROTECTION

- A. Protect trees, shrubs, lawns, and other features remaining as a portion of final landscaping.
- B. Protect bench marks, existing structures, fences, stone walls, sidewalks, paving, and curbs from equipment and vehicular traffic.

- C. Protect above and below grade utilities and structures which are to remain.
- D. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- E. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- F. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

3.03 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, landscaped, or graded, and stockpile. Remove excess topsoil not being reused from site. Topsoil suitable for reuse shall be in conformance with paragraph 2.01 A. Stockpiled topsoil shall be protected from erosion.

3.04 PAVEMENT EXCAVATION

- A. All pavement shall be cut with saws or acceptable power tools prior to removal.
- B. Excavate pavement within the limits shown on the Drawings.
- C. Keep excavated pavement separate from topsoil and subsoil stockpiles.
- D. Remove and dispose of pavement excavated from site.

3.05 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be landscaped or graded to the limits shown on the Drawings.
- B. Excavate subsoil required for structures, utilities or yard piping and other work to the limits necessary or as shown on the Drawings.
- C. Stockpile excavated material to be reused and remove and dispose of unsuitable subsoil and excess subsoil not being reused, off site. Subsoil suitable for reuse shall be in conformance with paragraph 2.02 A. Stockpiled subsoil shall be protected from erosion.
- D. Remove all muck, peat and other unsuitable material within trench limits or where structures are to be located. Excavated unsuitable material shall be replaced with backfill material as specified.
- E. Notify the Designated Representative of The TOWN OF HOOKSETT of unexpected subsurface conditions, discovery of unknown utilities or concealed conditions, and discontinue affected work in area until notified to resume work.
- F. Slope sides of excavation to satisfy OSHA requirements.
- G. Excavations shall not interfere with normal 45 degree bearing influence of any foundation.
- H. Grade top perimeter of excavations to prevent surface water run-off into excavation.
- I. When excavation through roots is necessary, cleanly cut roots.

- J. Maintain bottom of all excavations stable, dry and free of water on a continual basis.
- K. Remove boulders greater than six (6) inches in maximum dimension from sub-soil.

3.06 BACKFILLING PREPARATION

- A. Brace walls and slabs of structures to support surcharge forces and construction loads to be imposed by backfilling operations.
- B. Remove all water, snow, ice and debris from excavations and trenches before placing pipe bedding, foundation material under tankage or concrete structures or backfilling.
- C. Compact subgrade surfaces disturbed by construction operations to density requirements for backfill material. Do not place bedding, foundation material or backfill on porous, unstable or unsuitable subgrade.

3.07 BEDDING AND BACKFILLING

- A. Bedding and backfilling materials shall not contain frozen materials, ice or snow.
- B. Crushed stone shall be used beneath pipe where rock, boulders, or unsuitable bearing materials have been removed.
- C. Install pipe on shaped, undisturbed subgrade or on bedding material in accordance with paragraph 3.12 SCHEDULE OF BEDDING, BACKFILL AND COMPACTION.
- D. Support pipe during placement and compaction of bedding material.
- E. Filter fabric shall be placed to completely enclose crushed stone used for bedding material or for replacement material where rock, boulders or unsuitable material have been removed in pipe trenches unless authorized otherwise by the Designate Representative of the TOWN OF HOOKSETT. Under structures, where crushed stone is used, the filter fabric shall enclose the material on the sides and bottom, and on top, extend 2 feet under all edges of the proposed structure.
- F. Place and compact bedding for utilities and yard piping in accordance with the specifications and typical trench details shown on the Drawings.
- G. Backfill excavations and trenches to depths, contours and elevations required.
- H. Each layer of backfill shall be compacted to the specified density the same day it is placed.
- I. Maintain optimum moisture content of backfill materials to attain required compaction density.
- J. Fill that is too wet for proper compaction shall be disced, harrowed or otherwise dried to a proper moisture content for compacting to the required density. If the fill material cannot be dried within 48 hours of placement, it shall be removed and replaced with drier fill. This applies to both subsoil (suitable for reuse) and all imported select and/or common fills.
- K. Fill that is too dry for proper compaction shall be watered uniformly over the surface of the loose layer. Sufficient water shall be added to allow compaction to the required density.

- L. Employ placement and compaction methods that will not disturb or damage Work or existing structures or utilities. Disturbed or damaged Work, structures or utilities shall be repaired.
- M. Do not backfill against unsupported foundation walls or before required concrete strength has been achieved. Backfill simultaneously on each side of unsupported foundation walls.
- N. Grade backfill to provide a smooth surface which will readily shed water and provide positive drainage. Areas to receive compacted fill shall be graded to prevent ponding of surface water runoff.

3.08 BACKFILLING TOLERANCES

- A. Top Surface of Backfilling or Subgrade: Plus or minus one inch.

3.09 COMPACTION

- A. The maximum density at optimum moisture content for bedding and backfill materials shall be determined in accordance with ASTM D1557 (Modified Proctor).
- B. All bedding and backfill materials shall be compacted to the density shown in paragraph 3.12 SCHEDULE OF BEDDING, BACKFILL AND COMPACTION.
- C. Testing density of soil in place (compaction) will be performed in accordance with ASTM D1556, ASTM D2167, or ASTM D2922. If tests indicate compacted bedding and/or backfill does not meet specified requirements, remove, replace and retest.

3.10 GRADING

- A. Grading Areas to be Loamed and Seeded:
 - 1. Perform all rough grading required to attain the elevations indicated on the Drawings or as required.
 - 2. Grade to elevations shown on the Drawings or as required for landscaping. Remove all material, including rock and boulders to a point at least 4 inches below the finished grade of landscaped areas to be loamed and seeded.
 - 3. Remove all ruts and other uneven surfaces by surface grading.
- B. Grading Areas to be Paved or Surfaced:
 - 1. Perform all rough grading, including shaping, sloping, and any work necessary to prepare the subgrades of all roadways, walks and parking areas. Subgrade shall be brought to the bottom elevation of the base course under paved or surfaced areas.
 - 2. Accomplish all grading within the slope and grade lines as indicated on the Drawings or as necessary to accomplish the Work, unless otherwise authorized in writing by the Designated Representative of the TOWN OF HOOKSETT. The roadway shall be graded to full cross section width at subgrade before placing any type of subbase or pavement except that partial width construction may be permissible where necessary for the maintenance of traffic.
- C. Slope grade away from structure minimum 2 inches in 10 feet, unless noted otherwise.

- D. Make gradual changes in grade. Slopes shall transition gradually into level areas.
- E. Grade all areas completely and remove and dispose of all excess excavated, bedding and backfill materials from site.
- F. Backfill to original grade or as indicated herein or on the Drawings. Deviations and settlement shall be corrected.

3.11 FIELD QUALITY CONTROL

- A. All subgrades must be inspected and accepted by the Designated Representative of the TOWN OF HOOKSETT prior to proceeding with Work. Sufficient time must be allowed for the Designated Representative of the TOWN OF HOOKSETT to observe and to have any necessary tests performed on the subgrade.

3.12 SCHEDULE OF BEDDING, BACKFILL AND COMPACTION

- A. The following schedule identifies location; bedding and/or backfill materials to be used (identified from upper to lower fill type); loose thicknesses of each fill lift; and, compaction expressed as a percentage of maximum density and optimum moisture determined in accordance with ASTM D1557 (Modified Proctor).

<u>Location</u>	<u>Material/Thickness</u>	<u>Lifts (Loose) Compaction</u>
• Disturbed, Excavated Subgrade	Natural Subgrade/Existing.	Existing/95 percent or equal to average density of undisturbed material.
• Beneath Structures	Crushed Stone/12" min. w/filter fabric.	12" lifts/95 percent.
• Beneath Structures from which Rock, Boulders or Unsuitable Material has been Removed	Crushed Stone/12" min. w/filter fabric. Structural Fill/as req'd. to 12" below structure.	12" lifts/95 percent. 12" lifts/95 percent.
• Slabs-on-Grade	Crushed Gravel/4" min. on natural subgrade or structural fill. Structural Fill/as req'd.	4" min./95 percent. 12" lifts/95 percent.
• Around Structures	Common Fill/as req'd.	12" lifts to top of fill/95 percent.
• Around Structures with Foundation Perimeter Drainage	Structural Fill/as req'd.	12" lifts to top of fill/95 percent.

- Underground Tanks Structural fill to top of fill. 12" lifts/95 percent.
 Structural Fill/to 2' above tank 12" lifts/95 percent.
 top. 12" lifts/95 percent.

Pipe Bedding

- DI Water Pipe, DI Sewage Force Main, Copper Tubing and PVC Water Pipe Sand/6" min. below pipe to springline of pipe. Existing 95 percent or equal to average density of undisturbed material.
- DI Gravity Sewer, PVC Gravity Sewer and PVC Sewage Force Main, High Density SPE Storm Drain Crushed stone/6" min. below pipe to springline of pipe. 6" lifts/95 percent
- RCP Storm Drain Crushed Stone/6" min. below pipe to springline of pipe. Existing 95 percent or equal to average density of undisturbed material.
- All Pipe in Area of Rock Excavation Crushed Stone/6" min. below pipe to springline of pipe. 6" lifts/95 percent.
- All Pipe in Area of Unsuitable Material Excavation Crushed Stone/As req'd, 6" min. from excavation limits below pipe to springline of pipe. 6" lifts/95 percent.

Pipe Blanket

- DI & PVC Water Pipe, DI & PVC Gravity Sewer, DI & PVC, Sewage Force Main, Copper Tubing, and SPE Storm Drain Sand/from springline of pipe to 12" above pipe. 6" lifts/95 percent.
- RCP Storm Drain, PVC Storm Drain Crushed Stone/from springline of pipe to 12" above pipe. 6" lifts/95 percent.

Backfill

- Under Grassed Areas Common Fill/From subgrade or 12" above pipe to 4" below finished grade. 15" lifts/90 percent.
- Under Landscaped Areas Common Fill/From subgrade or 12" above pipe to 12" below finished grade. 15" lifts/90 percent.
- Under Paved Areas Common Fill/From subgrade or 12" above pipe to underside of subbase for paved areas 6" lifts/95 percent.

- Under Paved Areas Blasted Ledge/Rockfill to 5'-0"
from finish grade. 2'-0" lifts/mechanical
consolidation

Subbase

- Bituminous Bank Run Gravel 12" min.
Pavement Subbase Crushed Gravel 6" min. 6" lifts/95 percent.

END OF SECTION

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Planning and executing measures to prevent and control soil erosion.
- B. Furnishing, installing and maintaining erosion control materials.

1.02 REFERENCE STANDARDS

- A. Soil Conservation Service (SCS) Manual for New Hampshire Sediment and Erosion Control.

1.03 PROJECT CONDITIONS

- A. Schedule temporary seeding, mulching and other erosion control measures to take place as soon as possible.
- B. When temporary seeding cannot be accomplished to have established or visible growth by October 15, the disturbed areas shall be covered with six (6) inches of mulch for the winter.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Hay Bales: Securely tied baled hay at least fourteen (14) inches by eighteen (18) inches by thirty (30) inches long.
- B. Mulch Material: Select mulch material for erosion control that will best meet the site conditions from the following:
 - 1. Hay or Straw - Shall be dry, free of mold and weed seeds.
 - 2. Wood Chips - Shall be dry, free of soil and other foreign material.
- C. Mulch Anchoring: When mulch must be held in place, one of the following mulch anchoring materials shall be used:
 - 1. Mulch Netting (paper, twine, plastic, or plastic and wood fiber).
- D. Fertilizer: Complete fertilizer 10-20-20 (standard product).
- E. Lime: Ground limestone containing not less than ninety-five percent (95%) total carbonates (calcium or magnesium).
- F. Temporary Seed Mixture: When it is impractical to establish permanent protective vegetation on disturbed earth by October 15, use "Conservation Mix" or the following seed mixture:

<u>Kind of Seed</u>	<u>lbs per Acre</u>
Switchgrass (Blackwell or Shelter)	4.0
Big bluestem (Niagara or Kaw)	4.0
Little bluestem (Camper or Blaze)	2.0
Sand lovegrass (NE-27 or Blaze)	1.5
Birdsfoot trefoil (Viking)	2.0

- G. Inoculum specific to Birdsfoot trefoil must be used with this mixture. If seeding by hand, a sticking agent such as milk or cola shall be used to stick inoculum to the seed. If seeding with hydroseeder, use four (4) times the recommended amount of inoculum.

PART 3 EXECUTION

3.01 GENERAL CONSTRUCTION SEQUENCE TO MINIMIZE EROSION

- A. Erect hay bale dikes and/or silt fences as shown on Drawings and as may be required in the field to protect property, waterways, wells and springs.
- B. Commence excavation. Stockpile soil so that erosion is minimized. Extra precautions shall be taken when soil is saturated.
- C. Control surface water and erosion.
- D. Dewater all trenches to 2 feet below invert of pipe. Filter discharge using hay bales, silt fence, settling basin or natural vegetated buffer as site conditions require and as approved by the designated representative of the Town of Hooksett.
- E. Backfill excavation to grade. Grade site so that soil erosion caused by runoff will be minimized.
- F. Seed and mulch exposed ground.

3.02 SEEDING AND MULCHING

- A. All areas which will remain open shall be seeded and mulched within five (5) days graded.
- B. Soil samples may be sent to the Soil Conservation Service for analysis to determine the proper seed mixture and fertilizer requirements.
- C. The following procedures shall be followed for temporary seeding:
 - 1. Apply lime at a rate of seventy-five (75) to one hundred (100) pounds per one thousand (1000) square feet. Incorporate into top two (2) inches of soil.
 - 2. Apply fertilizer at a rate of thirty (30) pounds per one thousand (1000) square feet. Mix thoroughly into the top two (2) inches of soil.
 - 3. Apply seed mixture at a rate of two (2) pounds per one thousand (1000) square feet evenly in two (2) intersecting directions. Rake lightly.

4. Apply mulch material within twenty-four (24) hours after seeding in accordance with the following:
 - a. Hay or Straw: Application rate - seventy-five (75) to one hundred (100) pounds per one thousand (1000) square feet. Spread by hand or with machine. Anchor on slopes and where subject to blowing or slipping.
 - b. Wood Chips: Application rate - two (2) to six (6) inches deep. Use for tree and shrub planting.
5. Anchor mulch on all slopes exceeding five percent (5%) and other areas as required using one (1) of the following method:
 - a. Mulch Netting: Spread over loose mulch and pin to the soil in accordance with the manufacturer's instructions.

3.03 HAY BALE DIKES

- A. Embed hay bales into soil and anchor in place with stakes as required to control soil erosion. Butt hay bales together tightly.
- B. Hay bales shall be replaced when they become clogged with soil particles or as directed by the Designated Representative of the TOWN OF HOOKSETT.

3.04 DAMAGE AND REPAIR

- A. Repair all damages caused by soil erosion or construction equipment at or before the end of each working day.

END OF SECTION

SECTION 02507

ROADWAY STABILIZATION FABRIC

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnishing roadway stabilization fabric.
- B. Installation

1.02 SUBMITTALS

- A. Submit shop drawings and product data to designated representative of the Town of Hooksett.

1.03 ACCEPTABLE MANUFACTURERS

- A. Mirafi

1.04 MANUFACTURER'S WARRANTY

- A. The manufacturer shall warrant the stabilization fabric against manufacturing defects and material degradation in the outdoor exposure for a period of 2 years from the date of installation. The manufacturer shall replace any material which fails from the above causes within the warranty period. The manufacturer shall furnish the Town of Hooksett with a written warranty covering the requirements of this paragraph.

1.05 DEVELOPER'S GUARANTEE

- A. The Developer shall guarantee the stabilization fabric against defects in installation and workmanship for the period of 2 years commencing with the date of final acceptance. The guarantee shall include the services of qualified service technicians and all materials required for the repairs at no expense to the Town of Hooksett.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Properties
 - 1. The stabilization fabric shall be manufactured from new, first quality material of the type specified in this document.
 - 2. The stabilization fabric shall meet all requirements for the specified end use.
- B. The stabilization fabric shall demonstrate the following minimum properties (these properties are based on Mirafi 600x):

<u>Property</u>	<u>Test</u>	<u>Value</u>
Grab Tensile Strength	ASTM D1682	300 lbs
Grab Tensile Elongation	ASTM D1682	35% (max)
Modulus (at 10% elongation)	ASTM D1682	140 lbs
Trapezoid Tear Strength	ASTM D1117	120 lbs
Mullen Burst Strength	ASTM D3786	600 psi
Puncture Resistance	ASTM D3787	130 psi
Abrasion Resistance	ASTM D3884	100 lbs
Coeff. Of Permeability, K	CFMC-GET-2	0.01 cm/sec
Water Flow Rate	CFMC - GET -2	50 gpm/sq ft
Apparent Opening Size (AOS)	COE-CW-02215	#20-#45 Sieve size

PART 3 EXECUTION

3.01 STORAGE

- A. Storage of the stabilization fabric shall be the responsibility of the Developer. The manufacturer shall make recommendations as the storage procedure for the stabilization fabric. The recommended storage procedures shall note any deviations from the following specifications.

3.02 HANDLING AND PLACEMENT

- A. Installation shall be in accordance with the manufacturer's requirements.
- B. The stabilization fabric shall be handled in such a manner as to ensure no damage.
- C. On slopes, stabilization fabric shall be secured by means approved by the manufacturer and the Designated Representative of the Town of Hooksett, and rolled down the slope so as to preclude folds and wrinkles.
- D. Fabric shall be installed over the full width of the roadway where indicated.
- E. In presence of wind, stabilization fabric shall be weighted with sandbags or the equivalent to provide wind protection.
- F. The stabilization fabric shall be cut using a cutter approved by the Designated Representative of the Town of Hooksett. Care shall be taken during cutting to protect other material from damage.
- G. A minimum overlap of 2 feet shall be required between different pieces of stabilization fabric.

END OF SECTION

SECTION 02510

BITUMINOUS CONCRETE PAVING

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Bituminous concrete paving and associated preparatory work.
- B. Gravel subbase.
- C. Final grading of subbase.
- D. Installation of subbase, binder course and wearing course.

1.02 REFERENCE STANDARDS

- A. ASTM D1557 - Tests for Moisture - Density Relations of Soils and Soil - Aggregate Mixtures, Using 10-lb Rammer and 18-Inch Drop; Modified Proctor.
- B. ASTM D2922 - Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. State of New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction (latest edition).

1.03 SUBMITTALS

- A. Submit job mix data as required by NHDOT Standard Specification Division 300 and Division 400.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Bankrun Gravel and Crushed Gravel: See Section 02225 - EXCAVATING, BACKFILLING AND COMPACTING.
- B. Bituminous binder course shall be Type B (3/4 inch) per NHDOT Specification Section 401; Sub-Section 2 - Materials.
- C. Bituminous wearing course shall be Type F (3/8 inch) per NHDOT Specification Section 401; Sub-Section 2 - Materials.
- D. Temporary Bituminous Trench Pavement shall be Type B (3/4 inch) per NHDOT Specification Section 401; Sub-Section 2 - Materials.
- E. Bituminous Overlay shall be Type F (3/8 inch) per NHDOT Specification Section 401; Sub-Section 2 - Materials.
- F. Emulsified Asphalt: NHDOT Section 410.

PART 3 EXECUTION

3.01 GENERAL

- A. Bituminous concrete material shall be placed in accordance with NHDOT requirements and as specified herein. If there is a discrepancy between the requirements, the more stringent requirement shall govern. The specific gravity of the compacted bituminous pavement shall not be less than 97 percent of the specific gravity of the corresponding daily job sample except as follows:
 - 1. Pavement placed directly on gravel base - 95 percent.
 - 2. Overlay paving less than 1-1/4 inch in compacted thickness - 95 percent.
- B. Areas to receive bituminous paving shall be as shown on the drawings, and all other areas damaged during construction. The edge of the existing pavement, at the limits of the paving, shall be saw cut and cold planed. All existing damaged by construction shall be removed.
- C. Bituminous concrete paving mixture shall be placed only when the proper density can be obtained. Precautions shall be taken at all times to compact the mixture while the mixture is in the proper temperature range. The mixture shall not be placed on any wet surface or when weather conditions prevent its proper handling or finishing.
- D. The number of paving courses and the thickness of each course shall conform to the Drawings or to the dimensions stated in this Section.
- E. One (1) winter shall elapse prior to placing the wearing coarse on all roadways.
- F. No binder pavement shall be placed after November 15 or prior to April 1. No wearing pavement shall be placed after October 15 or prior to April 1.

3.02 COMPACTION TESTING

- A. Compaction testing will be performed in accordance with ASTM D1556, ASTM D1557, ASTM D2167 or ASTM D2922.

3.03 EQUIPMENT

- A. Paver: Shall be a self-contained, self-propelled paver capable of spreading the required thickness and width of pavement. Short bodied pavers and hot boxes shall not be allowed.
- B. Roller: Eight (8) to twelve (12) ton self-propelled tandem drum roller.

3.04 EXECUTION

- A. All humps in the pavement from blasting operations or caused by the equipment shall be removed before paving. All loose pieces of pavement on the edge of the trench shall be removed and the edges saw cut and cold planed before paving.
- B. Edges of pavement removed during trenching or other excavations shall be saw cut and cold planed to provide one (1) foot minimum overlap of the final patch on undisturbed material. The disturbed areas shall receive crushed gravel base course to the depth equal to the existing depth or the depth shown on the plan, whichever is greater.

- C. During trenching, all remaining asphalt surfaces that are less than four (4) feet wide after the pavement has been cut back a minimum of one (1) foot shall be removed and replaced with new pavement.
- D. Weather Limitations: Mixtures shall be placed only when the underlying surface is dry, frost free and the surface temperature is above forty (40) degrees F and rising for courses greater than one and one fourth (1-1/4) inches in compacted depth and above fifty (50) degrees F and rising for courses less than one and one fourth (1-1/4) inches in compacted depth, or as determined by the Designated Representative of the TOWN OF HOOKSETT.
- E. Clean edges of existing pavement and coat with emulsified asphalt prior to placement of the new pavement in accordance with NHDOT Specification Section 401.
- F. The temperature of the bituminous pavement shall be a minimum of two hundred and seventy-five (275) and a maximum of three hundred and fifty (350) degrees F when it is placed.
- G. Placing of any course shall be as nearly continuous as possible, keeping the number of transverse joints at a minimum. Stopping of the paver shall only be done in emergencies. If the Designated Representative of the TOWN OF HOOKSETT determines that the paving operations result in excessive stopping of the paver, he may suspend all paving operations until the DEVELOPER makes arrangements to synchronize the rate of paving with the rate of delivery of material.
- H. All surfaces and trenches eight (8) feet wide and greater shall use a approved self-propelled paver to apply the mix. Trenches less than eight (8) feet wide may use the hand method to apply mix.
- I. Any displacement occurring as a result of reversing the direction of a roller, or from other causes, shall be corrected at once by the use of lutes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.
- J. All courses shall be rolled until all roller marks are eliminated.
- K. All joints between existing and new pavement shall receive a bead of emulsified asphalt and a sand over, after the new pavement has been placed, to ensure proper adhesion.
- L. Reset valve boxes, catch basins, and manhole castings as required.
- M. Unless otherwise authorized by Designated Representative of the TOWN OF HOOKSETT , the final wearing course shall not be placed until after guard rail posts have been set and general cleanup has been completed.
- M. Bituminous wearing and binder courses shall be constructed in full compliance with the latest edition of NHDOT Standard Specifications for Road and Bridge Construction; Section 401 - Pavements; Sub-Section 3 - Construction Requirements.
- N. The minimum thickness of permanent pavement shall be 1-1/2 inches of binder and one (1) inch of wearing unless specified otherwise.

3.05 TEMPORARY TRENCH PATCH

- A. Temporary trench patch shall be placed upon a properly installed subbase, on the day that the existing pavement is removed.
- B. The minimum thickness of temporary pavement shall be one and a half (1-1/2) inches.
- C. The DEVELOPER shall maintain and/or repair the trench as often as necessary including placement of additional asphalt to fill any areas that have settled so that the surface is flush with the existing pavement surface. Work shall be performed by the direction of the Designated Representative of the TOWN OF HOOKSETT.
- D. Temporary pavement shall be placed in accordance to the specifications stated herein.
- E. Temporary pavement shall remain in the trench for a minimum of thirty (30) days and a maximum of forty-five (45) days.

3.06 PERMANENT TRENCH PATCH

- A. The DEVELOPER shall remove temporary trench patch, regrade subbase and install permanent trench patch as specified upon authorization by the Designated Representative of the TOWN OF HOOKSETT.
- B. Permanent trench patch shall be a minimum of 1-1/2 inches of binder course mix and a minimum of 1 inch of top course mix in two separate and compacted layers for a minimum total of 2-1/2 inches or as shown on the Drawings.
- C. The DEVELOPER shall then sweep the entire roadway surface just prior to placing the wearing course if the Designated Representative of the TOWN OF HOOKSETT thinks there is excess sand and/or debris on the road.
- D. The DEVELOPER shall maintain permanent pavement under this Contract during the contract guarantee period and shall promptly refill and repave areas which have settled or are otherwise unsatisfactory for traffic.
- E. All pavement patches shall have infrared treatment thirty (30) days after placement of the trench patch.

3.07 REPLACEMENT

- A. If any imperfect places are found in any course, the DEVELOPER shall remove the unsatisfactory material and replace it with satisfactory material after coating the exposed edges with suitable emulsified asphalt.
- B. If any high areas are found after placement of the base course the DEVELOPER shall cut out the areas and refill them with approved material before the final wearing course is placed to the approval of the Designated Representative of the TOWN OF HOOKSETT.
- C. If any low areas are found after placement of the base course the DEVELOPER shall shim the areas before the final wearing course is placed to the approval of the Designated Representative of the TOWN OF HOOKSETT.

3.08 CLEANUP

- A. Any bituminous material remaining on exposed surfaces of curbs, sidewalks, or other masonry structures shall be removed.
- B. All material left from the truck cleanup area shall be removed.

3.09 OVERLAY AND NEW BITUMINOUS PAVEMENT FOR ROADS

- A. Roadway centerline offset stakes shall be set one foot from the edge of the roadway shoulder at 50-foot intervals so that the centerline can be replaced in its original location.
- B. The DEVELOPER shall cold plane a joint in the existing pavement, on all street tie-in, to accept the new overlay material. The joint shall be 1" deep at the edge and slope up to the existing pavement surface at a point 5' away from the joint edge. Place a two (2) foot wide strip of emulsified asphalt along the joint.
- C. For new road construction or complete width road reconstruction, the binder course shall be placed prior to raising or adjusting manhole covers, catch basin grates and valve boxes. The binder course shall be 1½" thickness of ¾" binder (NHDOT Section 401 Type B).
- D. The DEVELOPER shall raise all manhole covers, catch basin grates, and valve boxes prior to the overlay or wearing course. The final elevation of these fixtures shall be flush with final grade to one quarter (¼) inch below the final pavement elevation.
- E. The DEVELOPER shall then sweep the entire roadway surface just prior to placing the overlay or wearing course.
- F. Place the bituminous overlay to the limits shown on the plan.
- G. The overlay shall be placed the full width of the roadway.

3.10 APPROVALS

- A. All work shall be performed to the satisfaction of the Designated Representative of the TOWN OF HOOKSETT.

END OF SECTION

SECTION 02710

SUBSURFACE DRAINAGE SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnishing pipe, cleanouts, fabric, coarse filter aggregate, wall drain, and other material required for the installation of subsurface drainage system(s).
- B. Installation of subsurface drainage systems.

1.02 REFERENCE STANDARDS

- A. ASTM D3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- B. ASTM F667 - Smooth-Wall Corrugated Polyethylene (SPE) Plastic Underdrain Systems.

1.03 PIPE PROTECTION

- A. Pipe and fittings stored on the site shall be stored in the protective unit packages provided by the manufacturer. If packages need to be opened, the pipe shall be stored on a flat surface and not in direct contact with the ground. Do not stack higher than four feet. Keep inside of pipe and fittings free from dirt and debris. Care shall be exercised to avoid compression damage or deformation to the pipe.
- B. All pipe and fittings that are stored shall be covered to provide protection from the sunlight.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Specifications are based on materials produced by the following manufacturers:
 - 1. ADS pipe - Advanced Drainage System, Inc. or approved equal.
 - 2. Filter fabric - Mirafi, Inc. or approved equal.

2.02 PIPE MATERIAL

- A. Subsurface drainage pipe shall consist of perforated and solid wall pipe in the sizes indicated on the Drawings. Drainage pipe shall be Smooth Wall Corrugated Polyethylene (SPE) and shall meet the requirements of ASTM F667. Perforations shall be in two rows, one row on each side, 60° above bottom centerline of the pipe. Joints shall be single rubber gasket bell and spigot type in accordance with ASTM D3212.
- B. Fittings shall be suitable for use with the specified strength pipe and shall not deflect more than the pipe when loaded and bedded in the same manner.
- C. Couplings shall be flexible, non-hardening PVC sleeves with double stainless steel bands including stainless steel hardware.

2.03 FABRIC

- A. Fabric required as part of the subsurface drainage system shall be Mirafi 140N.

2.04 COARSE FILTER AGGREGATE

- A. Coarse filter aggregate shall be clean, well graded natural gravel or crushed stone; free from shale, clay, organic materials and debris; graded within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
1-1/2 inch	100
1 inch	90 - 100
3/4 inch	45 - 100
5/8 inch	30 - 85
1/2 inch	13 - 55
3/8 inch	0 - 30
1/4 inch	0 - 15
No. 4	0

PART 3 EXECUTION

3.01 INSTALLATION

- A. Subsurface drainage systems shall be installed at the locations and depths shown on the Drawings. Pipe shall be in sound, undamaged condition and shall be installed in compliance with the manufacturer's recommendations.
- B. Subsurface drainage systems shall be installed to insure that groundwater flowing in the permeable material around the pipes is intercepted and carried to the drain system unimpeded.
- C. Perforated pipe shall be installed with perforations on the lower side of the pipe, symmetrical about the vertical axis.
- D. Filter fabric shall be installed as shown on the Drawings and in accordance with the manufacturer's recommendations. Overlaps of filter fabric shall be a minimum of 18 inches.
- E. Provide for temporary diversion of water to permit the installation of pipe in a reasonably dry trench.
- F. Lay pipe and fittings in accordance with the manufacturer's recommendations and these specifications.
- G. Excavation and backfill shall be in accordance with Section 02225 - Excavation, Backfilling and Compacting.

END OF SECTION

SECTION 02720

STORM DRAINS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnishing pipe for storm drains.
- B. Installing and/or removing and replacing storm drains as shown on the drawings.

1.02 REFERENCE STANDARDS

- A. AASHTO M170 - Reinforced Concrete Pipe.
- B. ASTM D3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- C. ASTM F405 - Standard Specifications for Corrugated Polyethylene pipe and fittings. ASTM F667 Standard Specifications for large diameter Corrugated Polyethylene pipe and fittings.

1.03 SUBMITTALS

- A. Submit manufacturer's certifications and shop drawings to the Designated Representative of the TOWN OF HOOKSETT.

1.04 QUALITY CONTROL

- A. The quality of all materials, the process of manufacture and the finished pipe shall be subject to inspection by the Designated Representative of the TOWN OF HOOKSETT. Such inspection may be made at the place of manufacture, and or on the work site after delivery. Pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though sample pipe may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All pipe which have been damaged after delivery will be rejected, or if already installed, shall be repaired or removed and replaced by the DEVELOPER, as directed by the Designated Representative of the TOWN OF HOOKSETT.
- B. All sections shall be inspected for general appearance, dimensions, soundness, etc. The surface shall be dense, close-textured and free of blisters, cracks, roughness and exposure of reinforcement.
- C. Imperfections may be repaired, subject to the approval of the Designated Representative of the TOWN OF HOOKSETT, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7 days and 5,000 psi at the end of 28 days when tested in 2 inch cubes stored in the standard manner.
- D. Pipe shall not be shipped or subjected to interior or exterior loadings until five (5) days after fabrication and/or repair and the concrete has attained a compressive strength of 3000 psi.

- E. Exercise care in unloading pipe from delivery trucks. Do not drop concrete pipe from trucks. Use an attached loading/unloading device or proper equipment. Defective pipe which cannot be repaired to the satisfaction of the Designated Representative of the TOWN OF HOOKSETT shall be promptly removed from the project and replaced with new pipe.

PART 2 PRODUCTS

2.01 GENERAL

- A. All products included in this section shall conform to the requirements of the standard specifications referenced herein.
- B. Pipe size and material shall be as shown on the Drawings.

2.02 MATERIALS

- A. Reinforced Concrete Pipe (RCP): Pipe and fittings shall conform to AASHTO M170, Class IV, Wall B. Cement shall be Type II.
- B. Smooth Interior Corrugated Polyethylene Pipe (SPE): Pipe and fittings shall conform to ASTM F405 or ASTM F667, AASHTO M252 and M294. HDPE pipe adaptors must be used for transition to drainage structures.
- C. Each length of pipe shall be marked or tagged with the nominal diameter, gauge or class, the name of the manufacturer or his trademark, and in the case of reinforced concrete pipe, the date of manufacture.
- D. Backfill material shall be as specified in Section 02225.
 - 1. The pipe material to be used shall be determined after a site visit by the DEVELOPER, the Design Engineer, and the TOWN OF HOOKSETT HIGHWAY DEPARTMENT. If in the opinion of the Highway Department, perforated S.P.E. pipe is required, the DEVELOPER shall use said pipe.

PART 3 EXECUTION

3.01 HANDLING PIPE

- A. Exercise care in moving pipe to its final position. Use slings, straps and/or other devices to support pipe when it is lifted. Transporting pipe from storage areas shall be restricted to operations which will not cause damage to the pipe. Pipe shall not be dropped into the trench.
- B. All pipe shall be examined before laying and no pipe shall be installed which is found to be defective. Defective pipe which cannot be repaired to the satisfaction of the Designated Representative of the TOWN OF HOOKSETT shall be promptly removed from the project and replaced with new pipe.

3.02 CONTROL OF ALIGNMENT AND GRADE

- A. Easement and property and other control lines necessary for locating the Work as well as elevations and bench marks used in the design of the Work are shown on the Drawings. The DEVELOPER shall use this information to set line and use a laser, level, or transit to set grade.
- B. The DEVELOPER shall use laser equipment to assist in setting the pipe provided he must demonstrate satisfactory skill in its use.
- C. The use of string levels, hand levels, carpenter's levels or other similar devices for transferring grade or setting pipe will not be permitted.
- D. During construction provide the Designated Representative for the TOWN OF HOOKSETT , at his request, all reasonable and necessary materials, opportunities, and assistance for setting stakes and making measurements, including the furnishing of one or two rodmen as needed at intermittent times.
- E. The DEVELOPER shall not proceed until he has made timely request of the Designated Representative of the TOWN OF HOOKSETT for, and has received from him, such controls and instructions as may be necessary as Work progresses. The Work shall be done in strict conformity with such controls and instructions.
- F. The DEVELOPER shall carefully preserve bench marks, reference points and stakes, and in case of willful, careless, or accidental destruction by his own men, he will be responsible for the resulting cost to re-establish such destroyed control data and shall be responsible for any mistakes or delay that may be caused by the loss or disturbance of such control data.
- G. Maintain the proper alignment in laying pipe.

3.03 EXCAVATING TRENCH AND INSTALLING PIPE

- A. Pipe shall be laid in dry trench conditions. Provide for temporary diversion of water.
- B. Excavate a trench to required depth sufficiently wide to allow for jointing of the pipe and compaction of the material under and around the pipe. Excavation shall conform to Section 02225. If ledge rock, rocky soil, hard pan or other unyielding foundation material is encountered at the normal grade of the pipe bed, excavate to 6 inches below invert grade and one foot on each side of the interior face of the pipe wall and refill with compacted crushed stone. Blocking is not permitted.
- C. Compact disturbed trench bottom and shape to fit pipe for a depth of not less than 10 percent of the total diameter of the pipe. The pipe shall rest firmly on the shaped bottom for the entire length of pipe barrels. Excavate troughs to accommodate bells or couplings to provide ample space for jointing pipe.
- D. Begin laying pipe at outlet and make sure that the lower segment of the pipe is in contact with the shaped trench bottom throughout its full length. Each pipe section shall be placed into position on the pipe bed in such a manner and by such means required to avoid injury to persons, any property or the pipe.
- E. Fill handling hole in concrete pipes with a precast plug, seal and cover with mastic or mortar.
- F. Allow time for inspection and approval before any backfill is placed. Relay any pipe out of alignment and remove any damaged pipe.

- G. After placing pipe on shaped trench bottom, backfill material shall be placed and compacted to the spring line (horizontal center line) of the pipe in continuous layers not exceeding 6 inches loose depth. Additional backfill material shall then be placed from the spring line to 12 inches above the crown of the pipe. This material shall be placed and compacted in continuous layers not exceeding 6 inches loose depth.
- H. After placement of the material around and over the pipe, alignment and grade of the pipe shall be checked. If the pipe has been properly installed, the DEVELOPER may refill or backfill the remainder of the trench in conformance with Section 02225, and details shown on the Drawings.
- I. At the end of each day's work or at other intervals, the Designated Representative of the TOWN OF HOOKSETT, with the DEVELOPER, may inspect the pipe installation. Unsatisfactory work shall be dug up and reinstalled to meet the requirements of the Contract Documents.

3.04 JOINTING PIPE

- A. Reinforced concrete pipe: For reinforced concrete pipe use bell and spigot or tongue and groove type. When storm sewer is an extension of existing concrete pipe, use joint type to match. Ends of pipe are to be pushed home and the inner surfaces to be flush and even. Joints shall be made with oil resistant compression rings of an elastomeric material conforming to ASTM C443. Manufacturer's installation instructions shall be followed.
- B. Smooth Interior Corrugated Polyethylene Pipe (SPE): Pipe joints, fitting joints and double-bell couplers shall be furnished with rubber gasketed connections.

END OF SECTION

SECTION 02850

STEEL BEAM GUARDRAIL

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnishing single-face beam guardrail, composed of steel rail elements mounted on pressure treated wood posts.
- B. Guardrail is required on all slopes greater than 3:1 and as ordered by the Hooksett Highway Department.
- C. Installation.

1.02 REFERENCE STANDARDS

- A. AASHTO M180 - Corrugated Sheet Steel Beams for Highway Guardrail.
- B. ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips.
- C. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- E. ASTM A606 - Steel Sheet and Strip, Hot-Rolled and Cold-Rolled, High Strength, Low-Alloy, with Improved Atmospheric Corrosion Resistance.
- F. State of New Hampshire Department of Transportation (NHDOT) Standard Specifications for Road and Bridge Construction (latest edition).

PART 2 PRODUCTS

2.01 MATERIALS

- A. Wood posts and offset blocks shall be red pine, pitch pine, Norway pine, or southern yellow pine, or other approved wood, straight, sound and cut from live timber. Posts and offset blocks shall be sawn to the nominal dimensions shown on the Drawings. All wood posts and offset blocks shall be treated with preservative, full length in accordance with the NHDOT, Section 606.
- B. Standard steel beam guardrail, terminal sections, bolts, nuts and other fixtures shall conform to the requirements of AASHTO M180, Class A and shall be zinc coated (galvanized) after fabrication with Type II coating. In addition the guardrail elements shall be fabricated from steel sheet conforming to the requirements of ASTM A606, Type 4 (corrosion resistant). The effective length of beam shall be 12 feet, 6 inches.

Steel beams shall be shop punched to allow for 6 foot - 3 inch post spacing. Where the rail is on a curve having a radius of 150-feet or less, the rail shall be shop curved. The plates at the splice shall make contact throughout the area of the splice. Guardrail parts furnished under

this specification shall be interchangeable with similar parts, regardless of the source of manufacture.

- C. Terminal end section must be NHDOT-approved flared energy-absorbing terminal (Fleat-350) assembly.
- D. A 12-inch square adhesive reflective strip shall be placed at the end of all terminal sections.
- E. Provide plastic reflective devices on the guardrail center beam at 12'-6" o.c.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Posts: Post spacing shall be 6-foot - 3-inch on center. Posts shall be set plumb to full depth indicated, and accurately aligned and spaced as indicated on the Drawings. Any space around the posts shall be backfilled with suitable material in 6-inch layers and thoroughly compacted.
- B. Rail elements: The rail elements and terminal pieces shall be erected to the required grade, and the top of the rail shall be in a straight line or shall have a smooth continuous curve parallel to the road and/or curb. All bolts, except adjustment bolts, shall be drawn tight. Bolts shall be of sufficient length to extend beyond the nuts. No punching, drilling, reaming, cutting or welding of rail elements or terminal pieces will be permitted in the field except where specifically approved, in writing, by the Designated Representative of the TOWN OF HOOKSETT.

3.02 FIELD PAINTING

- A. Galvanized surfaces and fittings that have been abraded so that base metal has been exposed and threaded portions of all fittings and fasteners and the cut end of all bolts shall be cleaned and painted with 2 coats of field galvanizing coating.
- B. All posts shall have beveled top and shall be framed before being treated with preservatives.

END OF SECTION

SECTION 02931

RESTORATION OF GROWTH - CLASS A (LAWN)

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Finishing, loaming, grading, fertilizing, seeding and maintaining all seeded areas as shown on the Drawings and/or specified herein, and any other areas disturbed by the DEVELOPER'S operations.
 - 1. Class A growth restoration shall apply to all lawn or park type areas disturbed during construction.
 - 2. Restore growth in all areas to a condition at least fully equal to that prevailing prior to the construction.

1.02 QUALITY ASSURANCE

- A. Employ trained personnel experienced in this type of work.

1.03 PRODUCT DELIVERY AND STORAGE

- A. Fertilizer shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis, and stored so that, when used, it shall be dry and free flowing.
- B. Lime shall be delivered and maintained in a dry, free flowing condition until used.
- C. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis and stored in a dry, protected place.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil shall be friable, fertile, natural free-draining loam, typical of the locality; free of subsoil, roots, grass, sticks, weeds, clay, sod lumps, debris and stones larger than 1-inch in maximum dimension. Soil shall not be excessively acid or alkaline, nor contain toxic material harmful to plant growth.
- B. Fertilizer shall be a complete commercial fertilizer, 10-20-20 grade.
- C. Lime shall be ground limestone containing not less than 95% calcium and magnesium carbonates.
- D. Seed shall be from the same or previous year's crop and shall have not more than 1% weed content. Seed shall also meet the following requirements:
 - 1. Grass seed of the specified mixtures shall be furnished in fully labeled, standard, sealed containers.

2. Percentage and germination of each seed type in the mixture, purity and weed seed content of the mixture shall be clearly stated on the label.
3. The weight of pure live seed (PLS) is computed by the labeled purity percent times the labeled germination percent times the weight.
4. To illustrate the method of computing to PLS from the tag basis, the following example is given:

Required: 20 lbs PLS of a particular variety.
Stock Available: 99.41% pure and 92% germination.

$$\frac{20 \text{ lbs}}{(0.9941 \times 0.92)} = 21.87 \text{ lbs to be obtained}$$

- E. Class A shall normally be used on loam areas. This seed shall conform to the following and shall be furnished on a pure live seed (PLS) basis.

CLASS A

<u>Kind of seed</u>	<u>PLS per Acre, lbs</u>
Red Fescue (creeping)	21
Kentucky Bluegrass	21
Redtop	21
Perennial Ryegrass (Manhattan)	<u>21</u>
TOTAL	84

- F. Hay mulch shall consist of mowed and properly cured grass or legume mowings, reasonably free from swamp grass, weeds, twigs, debris or other deleterious material. It shall be free from rot or mold.
- G. Mulch Anchoring: When mulch must be held in place, one of the following mulch anchoring materials shall be used:
 1. Mulch Netting (paper, twine, plastic, or plastic and wood fiber).

PART 3 EXECUTION

3.01 GENERAL

- A. Rake the subgrade of all areas to be loamed for seed or ground cover and remove all rubbish, sticks, roots, and stones larger than 1 inch in maximum dimension. Spread and lightly compact the loam to finished grade as shown on the Drawings. When finished grades are not indicated, they shall be uniform between the points for which finished grades are given, or from such points to existing grades, except that the top and bottom of slopes shall be rounded. Compacted loam shall not be less than the depth specified. No loam shall be spread in water or while frozen or muddy.
- B. After the loam is placed and before it is raked to true lines and rolled, spread lime evenly over loam surface and thoroughly incorporate into the loam by heavy raking to at least one-half the depth of the loam.

- C. Uniformly spread fertilizer and immediately mix with the upper 2 inches of loam.
- D. Immediately following this preparation, uniformly apply the seed evenly in two (2) intersecting directions and lightly rake the seed into the surface. Lightly roll the surface and water with a fine spray.
- E. Seed shall be sown in a favorable season, as approved by the Designated Representative of the TOWN OF HOOKSETT, typically between September 15 and October 15 and between April 15 and June 1. Seeding shall not be done during windy weather when ground is frozen, excessively wet or otherwise unillable.
- F. Promptly thereafter or within 24 hours after the seeding operation, lightly and uniformly mulch the area with hay. Spread hay by hand or with machine.
- G. Anchor mulch on all slopes exceeding 5% and other areas as required using one of the following methods:

Mulch Netting: Spread over loose mulch and pin to the soil in accordance with the manufacturer's instructions.
- H. Protect against washouts by an approved method. Any washout which occurs shall be regraded and reseeded.

3.02 APPLICATION RATES

- A. Place loam to a minimum depth of 4 inches, or as shown on the drawings.
- B. Apply lime at the rate of 75 to 100 lbs per 1,000 square feet.
- C. Apply fertilizer at the rate of 30 lbs per 1,000 square feet.
- D. Apply seed at a rate of at least 84 lbs per acre or 2 lbs per 1,000 square feet.
- E. Apply mulch at the rate of 90 lbs per 1,000 square feet.

3.03 MAINTENANCE

- A. Keep all seeded areas watered and in good condition, reseeding if and when necessary until a good, healthy, uniform growth is established over the entire area seeded. Maintain these areas in an approved condition until final acceptance of growth by the Designated Representative of the TOWN OF HOOKSETT. The maintenance shall include repairs for damage caused by erosion.

END OF SECTION

SECTION 02932

RESTORATION OF GROWTH - CLASS B (FIELD)

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Finishing, furnishing and placing humus, grading, fertilizing, seeding and maintaining all seeded areas within limits shown on the Drawings and/or specified herein and any other areas disturbed by the DEVELOPER'S operations.
 - 1. Class B restoration shall apply to slope or field type areas disturbed during construction.
 - 2. Restore growth in all areas to a condition at least fully equal to that prevailing prior to the construction.

1.02 QUALITY ASSURANCE

- A. Employ trained personnel experienced in this type of work.

1.03 PRODUCT DELIVERY AND STORAGE

- A. Fertilizer shall be delivered to the site in the original unopened containers, each showing the manufacturer's guaranteed analysis and stored so that when used it shall be dry and free flowing.
- B. Lime shall be delivered and maintained in a dry, free flowing condition until used.
- C. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis and stored in a dry, protected place.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Humus shall be the surface layer of natural workable soil containing organic matter, or material of a nature capable of sustaining the growth of vegetation, with no admixture of refuse or material toxic to plant growth. It shall be relatively free from stones, lumps, sterile soil, stumps or similar objects larger than two (2) inches in maximum dimension, roots and brush. Ordinary sods of herbaceous growth such as grass and non-noxious weeds may be permitted.
- B. Fertilizer shall be a complete commercial fertilizer, 10-10-10 grade.
- C. Lime shall be ground limestone containing not less than ninety-five percent (95%) calcium and magnesium carbonates.

- D. Seed shall be from the same or previous year's crop and shall have not more than one percent (1%) weed content. Seed shall also meet the following requirements:
1. Grass seed of the specified mixtures shall be furnished in fully labeled, standard, sealed containers.
 2. Percentage and germination of each seed type in the mixture, purity and weed seed content of the mixture shall be clearly stated on the label.
 3. The weight of pure live seed (PLS) is computed by the labeled purity percent times the labeled germination percent times the weight.
 4. To illustrate the method of computing to PLS from the tag basis, the following example is given:

Required: Twenty (20) pounds PLS of a particular variety.
 Stock Available: 99.41% pure and 92% germination.

$$\frac{20 \text{ lbs}}{(0.9941)(0.92)} = 21.87 \text{ lbs to be obtained}$$

- E. This seed mixture shall be placed on all pasture areas. This seed shall conform to the table below unless amended by the TOWN OF HOOKSETT to suit special local conditions encountered. This seed shall be furnished on a PLS basis.

PASTURE RESTORATION

<u>Kind of Seed</u>	<u>PLS per Acre, lbs</u>
Bluegrass	23.6
Timothy	14.0
Ladino Clover	2.4
Redtop	<u>15.0</u>
TOTAL	55.0

- F. Class B shall normally be used for all slope work. This seed shall conform to the table below unless the change is approved by the Designated Representative of the TOWN OF HOOKSETT PLANNING BOARD to suit special local conditions encountered. This seed shall be furnished on a PLS basis.

CLASS B

<u>Kind of Seed</u>	<u>PLS per Acre, lbs</u>
Tall Fescue (Alta or K-31)	20
Perennial Ryegrass (Manhattan)	15
Red Fescue (Creeping)	5
Red Clover	5
Birdsfoot Trefoil (Empire variety preferred)	<u>5</u>
TOTAL	50

SECTION 02950
TREES AND SHRUBS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnishing trees and shrubs.
- B. Installation.
- C. Maintenance service.
- D. Warranty.

1.02 REFERENCE STANDARDS

- A. American Joint Committee on Horticultural Standards: Standardized Plant Names.
- B. American Association of Nurserymen.
- C. ANSI 260.1 - USA Standards for Nursery Stock.

1.03 QUALITY ASSURANCE

- A. Perform work with personnel experienced in the work required of this Section under direction of a skilled foreman.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Move plant materials with solid root balls wrapped in burlap.
- B. Deliver plant materials immediately prior to placement. Keep plant materials moist.
- C. Reject plants when root ball of earth surrounding roots has been cracked or broken preparatory to or during process of planting.
- D. Reject plants when burlap, staves, and ropes required in connection with transplanting have been displaced prior to acceptance.
- E. Plants shall be dug with root balls having minimum sizes as specified in ANSI 260.1.
- F. Plants shall be dug, transported and handled with the utmost care to insure against injury and to provide adequate protection against wind and sun. Plants shall be securely covered with tarpaulin, canvas or other cover to minimize wind whipping and drying. The plant shall be kept moist at all times until planted. Under no circumstances shall balled plants be dropped to the ground. A suitable method of handling shall be employed to preclude cracked or mushroomed root balls at the point of delivery. All plant material shall be protected from freezing at all times prior to transplanting.
- G. All plants shall have securely attached durable legible labels stating in weather resistant ink the correct botanical plant name.

- H. All plants shall be subject to inspection by the Designated Representative of the Town of HOOKSETT during digging operations and after replanting. No plants shall be planted before inspection and approval by the Designated Representative of the TOWN OF HOOKSETT. Any plants damaged by the Developer's operations shall be removed from the site immediately and replaced with acceptable plants without additional compensation.

1.05 WARRANTY

- A. Provide one year warranty from date of final acceptance.
- B. During the warranty period replace plant materials found dead, or not in a healthy growing condition. Replacement plant materials shall be of same species, with the warranty commencing on date of replacement.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Plants shall be of species and sizes called for on the Drawings and shall conform to all applicable provisions of the Horticultural Standards published by the American Association of Nurserymen. All plants shall have well developed and vigorous branch and root systems and shall be healthy and free of injury or any form of damage. All plant material will be subject to inspection and approval by the Designated Representative of the TOWN OF HOOKSETT.
- B. Planting Soil: Topsoil specified in Section 02931 mixed five (5) parts topsoil, one (1) part peat moss. Add fertilizer as required.
- C. Peat Moss: Horticultural grade Class A decomposed plant material, elastic and homogeneous. Free of decomposed colloidal residue, wood, sulphur, and iron; pH value of 5.9 to 7.0, 60% organic matter by weight, moisture content not exceeding 15% and water absorption capacity of not less than 300% by weight on oven dry basis.
- D. Mulching Material: Red bark chip mulch shall consist of softwood bark platelets, 1/8 inch to ¼ inch nominal thickness, with 50 percent having an area of not less than one square inch nor more than two square inches. All bark chip mulch shall be reasonably free from leaves, twigs, shavings, wood or other deleterious material.
- E. Fertilizer shall be 5-10-10 delivered in standard manufacturer's bags, showing the weight, chemical analysis of the contents and the name of the manufacturer. At least 50% of the nitrogen in the fertilizer shall be from natural organic sources. Fertilizer shall be carefully stored and shall be dry and free-flowing at the time of application.
- F. Bonemeal shall be commercial steamed bonemeal, finely ground with a minimum of 2.0% nitrogen and a minimum of 20% phosphoric acid, delivered in standard packages of the manufacturer, showing weight, analysis and name of manufacturer.
- G. Tree wrap shall be burlap or special crepe weatherproof tree wrapping tape in 2 to 8 inch width rolls.
- H. Antidesiccant emulsion for tree spraying shall be antitransparent wax or similar concentrate specifically manufactured for horticultural use. It shall be delivered in manufacturer's original containers and mixed and applied according to manufacturer's label directions.
- I. Support Stakes: Shall be wood.

- G. Red clover and bird's-foot trefoil seed shall include not more than twenty-five percent (25%) hard seed. If necessary, to meet this requirement, extra seed shall be supplied.
- H. Inoculum specific to red clover and Birdsfoot trefoil must be used with this mixture. The inoculum shall be a pure culture of nitrogen-fixing bacteria selected for maximum vitality and the ability to transform nitrogen from the air into soluble nitrates and to deposit them in the soil. The inoculum shall not be used later than the date indicated on the container or later than specified. The inoculum shall be subject to approval. If seeding by hand, a sticking agent such as milk or cola shall be used to stick inoculum to the seed. If seeding with hydroseeder, use four (4) times the recommended amount of inoculum.
- I. Hay mulch shall consist of mowed and properly cured grass or legume mowings, reasonably free from swamp grass, weeds, twigs, debris or other deleterious material. It shall be free from rot or mold.
- J. Mulch Anchoring: When mulch must be held in place, one of the following mulch anchoring materials shall be used:
 - 1. Mulch Netting (paper, twine, plastic, or plastic and wood fiber).

PART 3 EXECUTION

3.01 GENERAL

- A. Rake the subgrade of all areas to receive humus and remove all rubbish, sticks, roots and stones larger than two (2) inches in maximum dimension. Spread and lightly compact the humus to finished grade as shown on the Drawings. When finished grades are not indicated, they shall be uniform between the points for which finished grades are given, or from such points to existing grades, except that the top and bottom of slopes shall be rounded. Compacted humus shall not be less than the depth specified. No humus shall be spread in water or while frozen or muddy.
- B. After the humus is placed and before it is raked to true lines and rolled, spread lime evenly and thoroughly incorporate into the humus by heavy raking to at least one-half the depth of the humus.
- C. Uniformly spread fertilizer and immediately mix with the upper two (2) inches of humus.
- D. Immediately follow this preparation, uniformly apply the seed evenly in two (2) intersecting directions and lightly rake the seed into the surface. Lightly roll the surface and water with a fine spray.
- E. Seed shall be shown in a favorable season as approved by the Designated Representative of the TOWN OF HOOKSETT, typically between September 15 and October 15 and between April 15 and June 1. Seeding shall not be done during windy weather or when the ground is frozen, excessively wet or otherwise untillable.
- F. Promptly thereafter or within twenty-four (24) hours after the seeding operation, lightly and uniformly mulch the area with hay. Spread hay by hand or with machine.
- G. Anchor mulch on all slopes exceeding five percent (5%) and other areas as required using one of the following methods:
 - 1. Mulch Netting: Spread over loose mulch and pin to the soil in accordance with the manufacturer's instructions.

- H. Protect against washouts by an approved method. Any washout which occurs shall be regraded and reseeded.

3.02 APPLICATION RATES

- A. Spread humus over properly prepared areas to give a covering which will be a minimum of four (4) inches.
- B. Apply lime at the rate of fifty (50) pounds per one thousand (1000) square feet.
- C. Apply fertilizer at the rate of twenty-five (25) pounds per one thousand (1000) square feet.
- D. Apply seed at a rate of at least fifty (50) pounds (PLS) per acre or 1.2 pounds (PLS) per one thousand (1000) square feet.
- E. Apply mulch at the rate of ninety (90) pounds per one thousand (1000) square feet.

3.03 MAINTENANCE

- A. Keep all seeded areas watered and in good condition, reseeded if and when necessary until a good, healthy, uniform growth is established over the entire area seeded. Maintain these areas in an approved condition until final acceptance of growth by the Designated Representative of the TOWN OF HOOKSETT. The maintenance shall include repairs for damage caused by erosion.

END OF SECTION

- J. Cables, Wire, Eye Bolts, and Turnbuckles: Shall be noncorrosive and of sufficient strength to withstand wind pressure.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify topsoil is ready to receive the work of this Section.
- B. Prepare topsoil to receive plant materials.

3.02 INSTALLATION

- A. Place plant materials for review and final orientation by the Designated Representative of the TOWN OF HOOKSETT prior to installation.
- B. Excavations for all plant material shall allow a minimum of 1 foot clearance around the sides of the root ball and 6 inches below the root ball to receive the backfill material.
- C. All plants shall stand plumb and after settlement shall be at the same ground level at which they were growing before digging. Burlap and twine shall be cut away from the upper half of all root balls and the remaining burlap adjusted to prevent the formation of air pockets. Exposed and curled roots shall be spread in a natural position.
- D. Backfill around plant balls shall be planting soil as specified. The plant ball shall be placed on a compacted planting base of the prepared planting soil with a minimum depth of 6 inches. Bonemeal as specified shall be mixed in the compacted base soil mixture at the rate of one cup per diameter inch for trees and one-half cup per shrub. Planting soil shall be backfilled in 6-inch layers, firmly tamping and watering each layer. Excess topsoil shall be used to form a berm approximately 4 inches high around the pit planting area to provide a saucer for watering.
- E. Fertilizer as specified shall be evenly distributed on the surface of the backfilled saucer area at the rate of one (1) pound per tree before mulching.
- F. Pruning shall be done with sharp tools which make a clean cut. Care shall be taken to preserve the natural appearance of the plant. Pruning shall consist of removal of selected small branches rather than a general cutting back of all branches. The pruning shall be limited to removal of damaged branches and cutting back of longer lateral branches. The central leader shall not be cut under any circumstances.
- G. Mulching material as specified shall be applied to all plants over the entire backfilled saucer area to a depth of 4 inches. A slight saucer shall be maintained around each plant for watering.
- H. All stems and leaves of plant materials shall be uniformly covered with an antidesiccant emulsion, using an approved low pressure power sprayer to apply an adequate film over trunks, branches, twigs and/or foliage. The spray material shall not be applied at temperatures below 32 degrees F. and shall be protected from freezing at all times.
- I. All plants shall be carefully and thoroughly watered during planting and as often as necessary thereafter to provide the best growing conditions until acceptance of the Work.

3.03 PLANT SUPPORT AND WRAPPING

- A. All stakes or guying shall be done immediately after planting and stakes and wire maintained. Plants shall stand plumb after staking.
- B. Brace plants upright in position by guy wires with turnbuckles or stakes according to the following schedule:

<u>Tree Caliper</u>	<u>Tree Support Method</u>
1 inch	1 stake with one tie
1 - 2 inches	2 stakes with two ties
2 - 4 inches	3 guy wires
over 4 inches	4 guy wires

- C. Promptly after planting and inspection, the trunks of all deciduous trees are to be spirally wrapped starting at the base with burlap or approved tree wrap. The wrap shall overlap half the width of the tape and be securely tied around the tree stem at two foot intervals. The wrapping shall cover the entire surface of the trunk to a height of 6 feet or the first main branches.

3.04 MAINTENANCE SERVICE

- A. Begin maintenance of plant materials immediately after planting and continue until termination of warranty period.
- B. Maintenance shall include measures necessary to establish and maintain plants in a vigorous and healthy growing condition. Include the following:
 - 1. Cultivating and weeding plant beds and tree pits. When herbicides are used for weed control, apply in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.
 - 2. Watering sufficient to saturate root system.
 - 3. Pruning, including removal of dead or broken branches, and treatment of pruning wounds.
 - 4. Disease and insect control.
 - 5. Maintaining wrappings, guys, turnbuckles, and stakes. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.

END OF SECTION

SECTION 03310

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnishing all labor, materials, equipment and incidentals required for all cast-in-place concrete, including reinforcing steel, forms, water stops and miscellaneous related items such as sleeves, reglets, anchor bolts, inserts and embedded items specified under other Sections.

1.02 REFERENCE STANDARDS

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 305 - Recommended Practice for Hot Weather Concreting.
- C. ACI 306 - Recommended Practice for Cold Weather Concreting.
- D. ACI 315 - Details and Detailing of Concrete Reinforcement.
- E. ACI 347 - Recommended Practice for Concrete Formwork.
- F. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- G. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- H. ASTM C33 - Concrete Aggregates.
- I. ASTM C94 - Ready-Mixed Concrete.
- J. ASTM C150 - Portland Cement.

1.03 SUBMITTALS

- A. Shop Drawings: Submit two (2) sets of completely detailed working drawings and schedules of all reinforcing required.

1.04 QUALITY ASSURANCE

- A. Concrete work shall conform to all requirements of ACI 301 and ACI 347, except as modified herein.
- B. Protection: Store concrete reinforcement in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond breaking coatings.

1.05 SCHEDULING

- A. Formwork and steel reinforcing installation shall be completed at least 24 hours in advance of placing concrete.
- B. Notify Town of Hooksett representative upon completion of formwork and completion of steel reinforcing installation.

- C. Notify Town of Hooksett Representative at least 24 hours in advance of placing concrete.

PART 2 PRODUCTS

2.01 CEMENT

- A. Cement: ASTM C150, Portland Type I; Type II if concrete will be in contact with wastewater.

2.02 AGGREGATES

- A. Fine Aggregate: ASTM C33.
- B. Coarse Aggregate: ASTM C33, 3/4 inch maximum size.

2.03 ADMIXTURES

- A. Air Entraining: "Darex AEA" by W.R. Grace, or equal.
- B. Water Reducing: "WRDA with Hycol" by W.R. Grace, or equal.
- C. No other admixtures are permitted without prior acceptance by the ENGINEER.

2.04 CONCRETE

- A. The proportions of ingredients shall be selected in accordance with ACI 301 Section 3.8.
- B. Concrete shall be 4,000 psi, except where noted otherwise.
- C. All concrete shall have a slump between 3 & 5 inches and an air entrained content between 4 & 6 percent.

2.05 REINFORCING

- A. Reinforcing Steel: ASTM A615, Grade 60 deformed bars; stirrups and ties Grade 40.
- B. Welded Wire Fabric: ASTM A185.
- C. Fabricate reinforcing steel in conformance with ACI 315.

2.06 FORMS AND ACCESSORIES

- A. Lumber: All form lumber shall be in accordance with ACI 347.
- B. Form Ties: Removable metal of fixed length; cone type, 1-1/4 inch maximum diameter; 1 inch break back dimension; and waterproofing washer. Wire ties and wood spreaders not permitted.
- C. Form Release Agent: Colorless material which will not stain concrete nor absorb moisture nor impair natural bonding or color characteristics of coating intended for use on concrete.
- D. Dovetail Anchor Slots: Galvanized steel; easily removed foam filler; bent tab anchors; securable to concrete formwork.

- E. Waterstop: Waterstop shall be extruded polyvinyl chloride or cold joint waterstop (volclay) as shown on the Drawings.

PART 3 EXECUTION

3.01 GENERAL

- A. Design, and construct formwork, falsework, shoring, and bracing to meet all loads during placement and curing, so that cast-in-place concrete conforms to required finishes, shapes, lines, and dimensions.
- B. Provide for inserts, openings, sleeves, offsets, recesses, anchorage, blocking, and other penetrations and embedments.
- C. Embedded Items: Set required steel frames, angles, bolts, inserts, and other items required to be anchored in the concrete before the concrete is placed.
- D. Form Release Agent: Do not apply form release agent where concrete surfaces are scheduled to receive special finishes which may be affected by agent. Soak contact surfaces of untreated forms with clean water and keep surfaces wet prior to placing concrete. Apply form release agent in accordance with manufacturer's instructions.

3.02 REINFORCING

- A. Fabrication:
 - 1. Fabricate all reinforcement in strict accordance with the reviewed and accepted shop drawings.
 - 2. Do not use bars with kinks or bends not shown on the Drawings or on the reviewed and accepted shop drawings.
 - 3. Do not bend or straighten steel in a manner that will damage the material.
- B. Placement:
 - 1. Accurately place all concrete reinforcement, positively securing and supporting by concrete bricks, metal chairs or spacers, or by metal hangers.
 - 2. Splicing:
 - a. Place bars with minimum 30 bar diameter overlap at splices.
 - b. Lapped ends of bars may be placed in contact and securely wired or may be separated 1-1/2 inches minimum to permit the embedment of the entire surface of each bar in concrete.
 - c. Stagger the splices of adjacent bars.
 - d. Splice wire fabric at least 1-1/2 meshes wide.
- C. Dowels: Place all required steel dowels and securely anchor them into position.

- D. Obstructions: If conduits, piping, inserts, sleeves, or any other items interfere with placing reinforcement as indicated on the Drawings or as otherwise required, immediately consult the Design Engineer for proper placement before placing concrete.
- E. Steel reinforcement shall be free from rust scale, loose mill scale, oil, paint, and all other coatings which will destroy or reduce bond between steel and concrete.

3.03 INSPECTION

- A. Verify that all formwork, reinforcing and work of other trades are complete and ready for placement of concrete.
- B. Notify ENGINEER at least 48 hours before placing concrete. Do not proceed without notifying ENGINEER.

3.04 CONCRETE MIXING AND PLACEMENT

- A. All cast-in-place concrete shall be transit-mix concrete in accordance with ASTM C94.
- B. Retampering of concrete is not permitted.
- C. Weather Conditions: Do not place concrete when weather conditions are not suitable for the proper placing, finishing or curing of the concrete. Unless otherwise accepted by ENGINEER, place concrete only during dry weather. In the event of sudden rainstorms, cover exposed, freshly placed concrete and protect from damage. When cold or hot weather concreting is authorized by ENGINEER, comply with ACI 305 and ACI 306.
- D. Cold Weather Concrete: Concrete shall not be placed on the ground where the temperature is below 35 degrees F or in forms where the form, reinforcing steel, adjacent concrete, etc. are below 35 degrees F. Concrete shall be covered and heated immediately after placement and only allowed to be covered to place the finish.
- E. When Type II cement is used, elapsed time between initial contact of the cement with water and the completed discharge of the batch at the Project site shall not exceed 1-1/2 hours or 300 revolutions of the drum, whichever comes first. Reduce the above limits when conditions result in quick-stiffening of the concrete, or when directed by Town of Hooksett Representative.
- F. Conveying and Placing Concrete: Convey concrete to the forms as rapidly as practicable, utilizing methods which will not cause segregation or loss of ingredients. Free fall from mixer or truck to conveyance shall not exceed 3 feet. When placing concrete in final position, the free fall shall not exceed 5 feet. Place concrete in horizontal layers approximately 2 feet thick and avoid the formation of cold joints and poorly bonded sections between layers. The horizontal distribution of concrete by spading or vibration is prohibited.
- G. Vibration: Unless otherwise specified or directed by the Town of Hooksett Representative, vibrate all reinforced concrete. Use only approved mechanical vibrators operated by experienced operators. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine. Vibrate concrete sufficiently to produce satisfactory consolidation without causing segregation. Do not use vibrators to transport concrete in the forms or insert them into lower layers of concrete that have begun to set.

3.05 CONCRETE TESTING

- A. CONTRACTOR shall prepare, cure and have tested by an independent laboratory, one (1) set of four (4) test cylinders for each concrete placement in accordance with Chapter 16 of ACI 301.
- B. CONTRACTOR shall pay for all concrete testing including all supplemental testing required if the cylinders break at lower than the required strength.
- C. A minimum of one slump test shall be performed for each batch of concrete and when additional water is added.

3.06 CURING

- A. Concrete shall be water cured, or cured using curing compounds or waterproof paper and sheeting, or other acceptable methods. Minimum curing period shall be 7 days.

3.07 REMOVAL OF FORMS

- A. Forms shall be removed in accordance with ACI 347 only after concrete has attained sufficient strength to support its own weight, construction live loads placed thereon, and lateral loads, all without excessive deflection or damage to the structure.
- B. CONTRACTOR shall be fully responsible for the proper removal of forms, installing all shoring and reshoring, and removal of shores and reshores. The CONTRACTOR shall, at no additional cost to OWNER, replace any work damaged due to improper or early removal of forms, shores and reshores.
- C. Remove metal spreader ties on exposed concrete by removing or snapping off inside the wall surface and pointing up and rubbing the resulting pockets to match the surrounding areas.

3.08 FINISHING CONCRETE

- A. Provide finishes in accordance with ACI 301 as follows:
 - 1. Rough Form Finish: Concrete surfaces below grade and other surfaces not exposed to view after construction, shall have fins and rough edges removed. All tie holes and defects shall be patched in accordance with paragraph 3.11 - PATCHING CONCRETE. All channels and other surfaces used to convey liquids shall be provided with a smooth form finish, whether or not it may be exposed to view.
 - 2. Grout Cleaned Finish: Thoroughly wet and brush on a cement grout composed of 1 part cement to 2 parts fine sand, mixed with water to the consistency of heavy cream. Cement shall be light colored to produce a finish matching the color of the concrete. Thoroughly rub grout over the entire area with clean burlap or a sponge rubber float to fill pits and voids completely. While the grout is still plastic, rub the surfaces with a dry mix of the grout until no materials remain on the surface, except within pits and voids. The grouting operation for an area shall be completed the day it is started.
 - 3. Surfaces to Receive Epoxy Coatings: Remove oil and grease, and any curing compounds and other materials which are incompatible with or may adversely affect the bonding of the epoxy coatings. Prepare the concrete surfaces as specified for smooth form finish. Refer to Division 9 for additional surface preparation requirements.
 - 4. Floated Finish: Concrete floor slabs.

3.09 PROTECTION

- A. Protect concrete from damage due to sun, rain, flowing water, frost, weather and mechanical injury.
- B. Maintain concrete temperature at a minimum of 50°F. for not less than 3 days and do not expose concrete to a temperature below 40°F. for a minimum of 7 days after placement.
- C. Do not subject concrete walls to lateral pressures until the supporting members are placed and cured for a minimum of 14 days with the concrete attaining a minimum of 75 percent of the required 28 day compressive strength. CONTRACTOR shall be responsible for damage to, or misalignment of, walls resulting from earth backfilling, trapped water or other causes.

END OF SECTION

SECTION 03481

PRECAST CONCRETE CATCH BASINS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnishing precast concrete catch basins and appurtenant materials.
- B. Installation.

1.02 REFERENCE STANDARDS

- A. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
- B. AASHTO - Standard Specifications for Highway Bridges.
- C. New Hampshire Standard Specifications for Road and Bridge Construction.

PART 2 PRODUCTS

2.01 MATERIALS AND DESIGN

- A. Catch basins shall:
 - 1. Conform to ASTM C478 and as shown on the Drawings.
 - 2. Be constructed of minimum 4,000 psi reinforced concrete using Type II cement.
 - 3. Have a minimum 8-inch thick base, minimum 5-inch thick walls and shall be capable of withstanding H-20 wheel loadings.
 - 4. Be cured five (5) days before shipping.
 - 5. Have a minimum 3-foot deep sump.
 - 6. Maintain 6 inches of monolithic structure between all joints and structure openings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation shall be performed in accordance with Section 02225.
- B. Backfilling and compaction shall be performed in accordance with Section 02225 and as shown on the Drawings.
- C. The base on which the precast concrete catch basin is set shall be dry, firm and level.
- D. Catch basin sections shall be set vertical with sections in true alignment within $\frac{1}{4}$ inch maximum tolerance.

- E. Holes in the concrete sections and around pipe entrances shall be plugged with a nonshrinking grout.
- F. Inlet frames shall be brought to grade using brick type S.S., grade N and mortar.

END OF SECTION

SECTION 05540

CASTINGS

PART 1 GENERAL

1.01 WORK INCLUDED

- A. Furnishing catch basin frames and grates, drain and miscellaneous manhole frames and covers.
- B. Installation.

1.02 REFERENCE STANDARDS

- A. ASTM A48 - Grey Iron Castings.

1.03 QUALITY CONTROL INSPECTION

- A. All castings shall be subject to a hammer inspection by the Designated Representative of the TOWN OF HOOKSETT. Castings rejected upon delivery to the site shall be marked as such and removed from the site. All castings damaged after delivery or after installation shall be removed and replaced as directed by the Designated Representative of the TOWN OF HOOKSETT.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manhole Frames and Covers: Neenah Foundry Co., Catalog No. R-1743.
- B. Waterproof Manhole Frames and Covers: Neenah Foundry Co., Catalog No. R-1916.
- C. Catch Basin Frames and Grates: E.L. LeBaron Foundry Co., Neenah Foundry Co., Catalog R-3570, or approved equal.
- D. In areas with roadway slopes of 6% or greater, the catch basin frames and grates shall be Neenah Foundry Co., Type R-3210L
- E. Substitutions: Products of equal or better quality, detail, function, and performance may be proposed for substitution.

2.02 GENERAL

- A. The castings shall be of good quality, even-grained cast iron, free from scale and defects of any nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined at the foundry, before shipment to prevent rocking of covers in any orientation.
- B. All castings shall be thoroughly cleaned and subject to a careful hammer inspection.
- C. Castings shall be Class 30 minimum, conforming to the ASTM A48.
- D. Before being shipped from the foundry, castings shall be sandblasted.

- E. All castings shall be heavy duty suitable for H-20 loadings.
- F. All manhole covers for installation on drain manholes shall have the word "DRAIN" cast into a diamond design on the top surface.

2.03 MANHOLE FRAMES AND COVERS

- A. Manhole frames and covers shall provide 30-inch diameter clear opening.

2.04 CATCH BASIN FRAMES AND GATES

- A. Catch basin frames and grates shall have 24-inch-square grates with 2 inch square openings suitable for H-20 loadings.
- B. In non-residential green areas, the DEVELOPER may propose the use of type "C" inlet catch basins.

PART 3 EXECUTION

3.01 SETTING FRAMES, COVERS AND GRATES

- A. Frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the Drawings. Frames shall be adjusted to grade with a precast concrete grade ring or a maximum of 3 courses of mortared red, type SS, sewer brick. Exterior of sewer brick shall be plastered with mortar. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
- B. Manhole covers and grates shall be left in place in the frames upon completion of other work at the manholes or catch basins.

END OF SECTION

C. Road Construction Forms

TOWN OF HOOKSETT
ROAD INSPECTION CHECKLIST

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____ Location: _____

Developer: _____

Contracted Road builder: _____

INSPECTION CHECKLIST

Inspection No. 1: Review of design engineer's layout of roadway R.O.W. and wetlands marking.

Proceed
Do Not Proceed

Remarks:

Date: _____
Inspector's Signature

Inspection No. 2: Inspection of clearing, grubbing, and erosion control measures.

Proceed
Do Not Proceed

Remarks:

Date: _____
Inspector's Signature

Inspection No. 3: Inspection of fill placement. In-place compaction testing of fill is required every 1,000 c.y. or as directed by the inspector.

Proceed
Do Not Proceed

Remarks:

Date: _____
Inspector's Signature

Inspection No. 4: Inspection of drainage piping and buried utilities. Full-time inspection is required, including the trench backfilling.

Proceed
Do Not Proceed

Remarks:

Date: _____
Inspector's Signature

Inspection No. 5 Inspection of subgrade and slope work.

Proceed
Do Not Proceed

Remarks:

Date: _____
Inspector's Signature

Inspection No. 6: Inspection of gravel grade, Compaction testing of the gravel course is required every 200 l.f. of roadway.

Proceed
Do Not Proceed

Remarks:

Date: _____
Inspector's Signature

Inspection No. 7: Inspection of crushed gravel grade, Compaction testing of the crushed gravel course is required every 200 l.f. of roadway.

Proceed
Do Not Proceed

Remarks:

Date: _____
Inspector's Signature

Inspection No. 8: Inspection of final ditch work, slope work, landscaping, and erosion control measures.

Proceed
Do Not Proceed

Remarks:

Date: _____

Inspector's Signature

Inspection No. 9: Inspection of headwall and/or remaining wall construction.

Proceed
Do Not Proceed

Remarks:

Date: _____

Inspector's Signature

Inspection No. 10: Inspection of all driveways.

Proceed
Do Not Proceed

Remarks:

Date: _____

Inspector's Signature

Inspection No. 11: Inspection of binder course paving. Full-time inspection will be performed during paving.

Proceed
Do Not Proceed

Remarks:

Date: _____

Inspector's Signature

NOTE: One winter must elapse after paving the binder course.

TOWN OF HOOKSETT

CERTIFICATE OF SUBSTANTIAL COMPLETION OF ROAD WORK

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____ Location: _____

Developer: _____

Contracted Road builder: _____

Start of Construction: _____ Agreement Date: _____

Substantial Completion Date: _____

CERTIFICATION OF DEVELOPER

I hereby certify that the Work as identified on the As-Built Drawings of the above-noted project dated _____ conforms to the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

DEVELOPER

Signature

Title

CERTIFICATION OF DEPARTMENT

I have reviewed the DEVELOPER's Final As-Built Drawings dated _____ and hereby certify that to the best of my knowledge, the Work we witnessed being accomplished on the above-noted project has been completed in accordance with the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

Highway Manager, or designated representative

Signature

Title

TOWN OF HOOKSETT
CERTIFICATE OF FINAL COMPLETION OF ROAD WORK

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____ Location: _____

Developer: _____

Contracted Road builder: _____

Start of Construction: _____ Agreement Date: _____

Final Completion Date: _____

FINAL CERTIFICATION OF DEVELOPER

I hereby certify that the Work as identified on the As-Built Drawings of the above-noted project dated _____ conforms to the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

DEVELOPER

Signature

Title

FINAL CERTIFICATION OF DEPARTMENT

I have reviewed the DEVELOPER's Final As-Built Drawings dated _____ and hereby certify that to the best of my knowledge, the Work we witnessed being accomplished on the above-noted project has been completed in accordance with the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

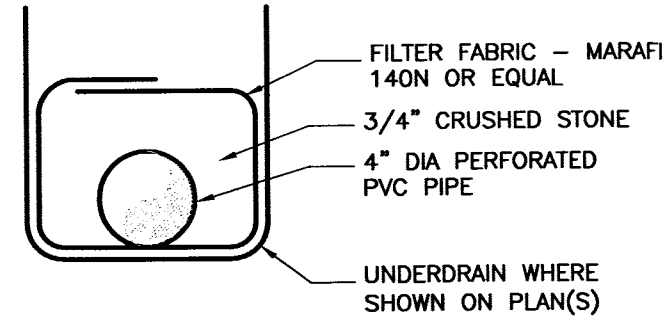
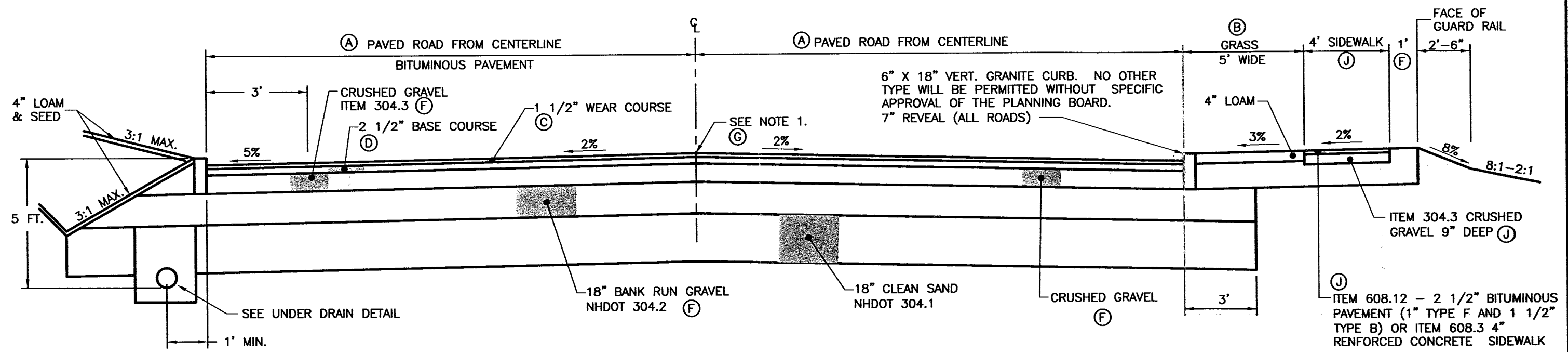
Highway Manager, or designated representative

Signature

Title

D. Typical Road Construction Details

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UNDERDRAIN DETAIL
NO SCALE

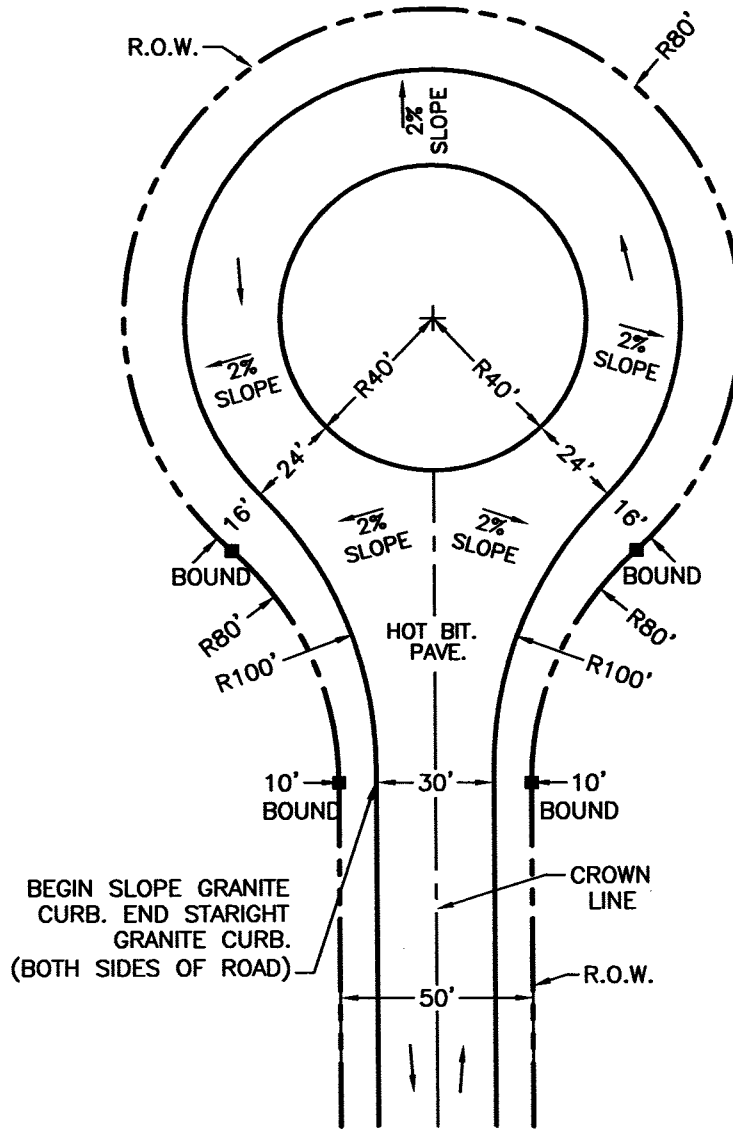
1. REFER TO SUBDIVISION REGULATIONS FOR TABLE OF GEOMETRIC STANDARDS FOR DIMENSIONS DESIGNATED BY LETTER (A).
2. THE WIDTH & DEPTH OF THE DITCH MUST BE ADEQUATE TO CONTROL RUNOFF. DRAINAGE CALCULATIONS MUST BE SUBMITTED.
3. CONSTRUCT MATTING FOR EROSION CONTROL ON ALL DITCHES UP TO 5% SLOPE. DITCHES STEEPER THAN 5% MUST BE PROTECTED BY USING A STONE LINED SWALE OR OTHER ENGINEERED METHOD. CALCULATIONS MUST BE SUBMITTED.
4. SIDEWALKS: CONSTRUCT AS A GRASS PANEL EXCEPT AT THOSE LOCATIONS WHERE AN ASPHALT OR CONCRETE SIDEWALK IS ORDERED.
5. 5 FT. GRASS PANEL IS OPTIONAL WHEN STRAIGHT GRANITE CURB IS USED. ALL CURB TO MEET NHDOT REQUIREMENTS.
6. ITEM NUMBERS REFER TO NHDOT STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION.

DRAWN BY:	DKP
CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	
CAD FILE:	H-01

TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS
**TYPICAL CLOSED DRAINAGE
ROADWAY CROSS-SECTION**

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	H-01 A

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NOTES:

1. CURBING ON INSIDE AND OUTSIDE OF CUL-DE-SAC SHALL BE VERTICAL GRANITE CURB.
2. BOUNDS SHALL BE CONSTRUCTED AT EACH PROPERTY LINE INTERSECTION WITH THE R.O.W.
3. THE AREA INSIDE THE ISLAND SHALL BE CLEARED OF BRUSH LEAVING TREES 3' OR LARGER.
4. THE AREA INSIDE THE ISLAND SHALL BE GRADED TO DRAIN TO THE INSIDE AND A PROPER OUTLET PIPE PROVIDED.
5. THE CUL-DE-SAC MAY BE CONSTRUCTED LARGER THAN SHOWN HERE WITH THE APPROVAL OF THE PLANNING BOARD. THE PAVEMENT WIDTHS SHOWN SHALL NOT BE REDUCED.

PLAN VIEW

SCALE: 1" = 50'

DIMENSIONS ARE TO FACE OF CURB

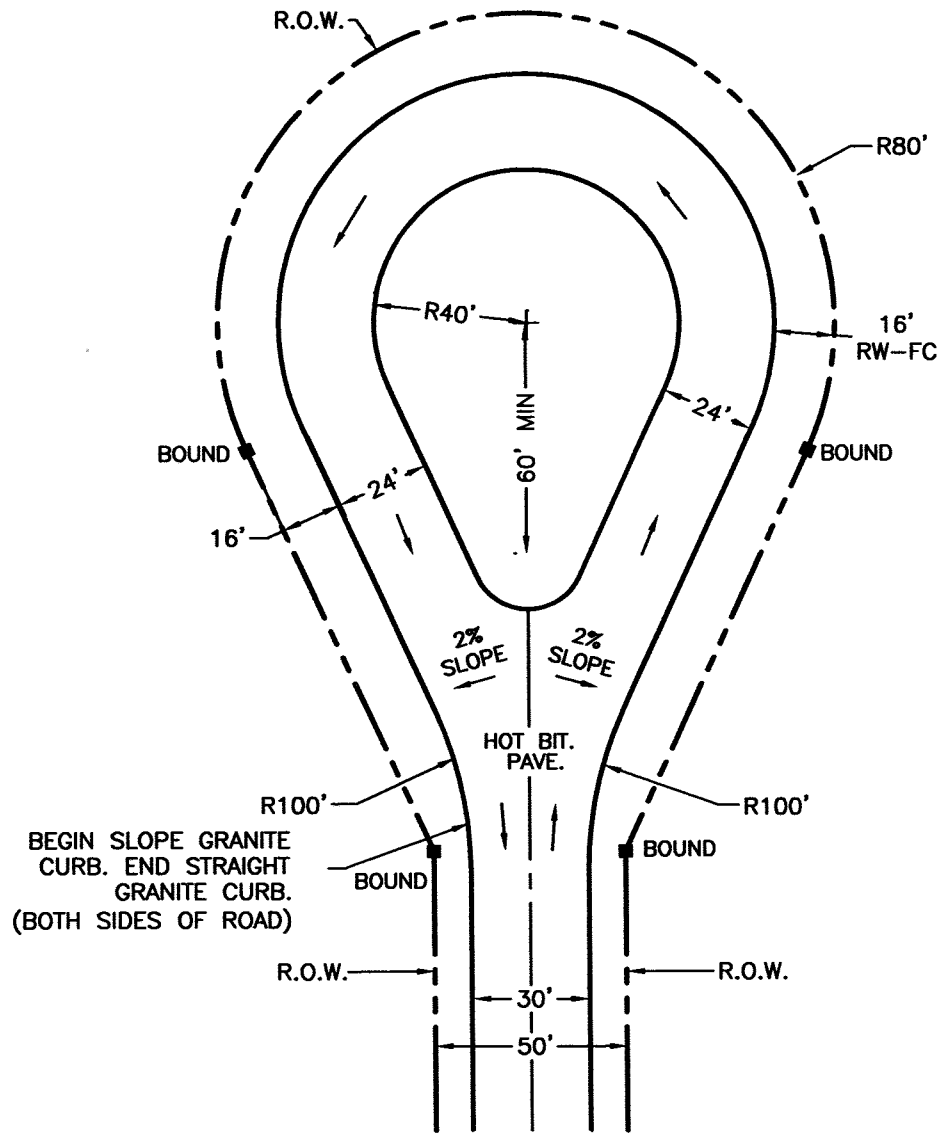
DRAWN BY:	DKP
CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	1:1
CAD FILE:	H-06

TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS

**CIRCULAR CUL-DE-SAC
DETAIL**

REV. DATE:	
REV. DATE:	
SCALE:	AS SHOWN
DATE:	JULY, 2001
FIGURE:	H-05 A

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NOTES:

1. CURBING ON INSIDE AND OUTSIDE OF CUL-DE-SAC SHALL BE VERTICAL GRANITE CURB.
2. BOUNDS SHALL BE CONSTRUCTED AT EACH PROPERTY LINE INTERSECTION WITH THE ROW.
3. THE AREA INSIDE THE ISLAND SHALL BE CLEARED OF BRUSH LEAVING TREES 3' OR LARGER.
4. THE AREA INSIDE THE ISLAND SHALL BE GRADED TO DRAIN TO THE INSIDE AND A PROPER OUTLET PIPE PROVIDED.
5. THE CUL-DE-SAC MAY BE CONSTRUCTED LARGER THAN SHOWN HERE WITH THE APPROVAL OF THE PLANNING BOARD. THE PAVEMENT WIDTHS SHOWN SHALL NOT BE REDUCED.

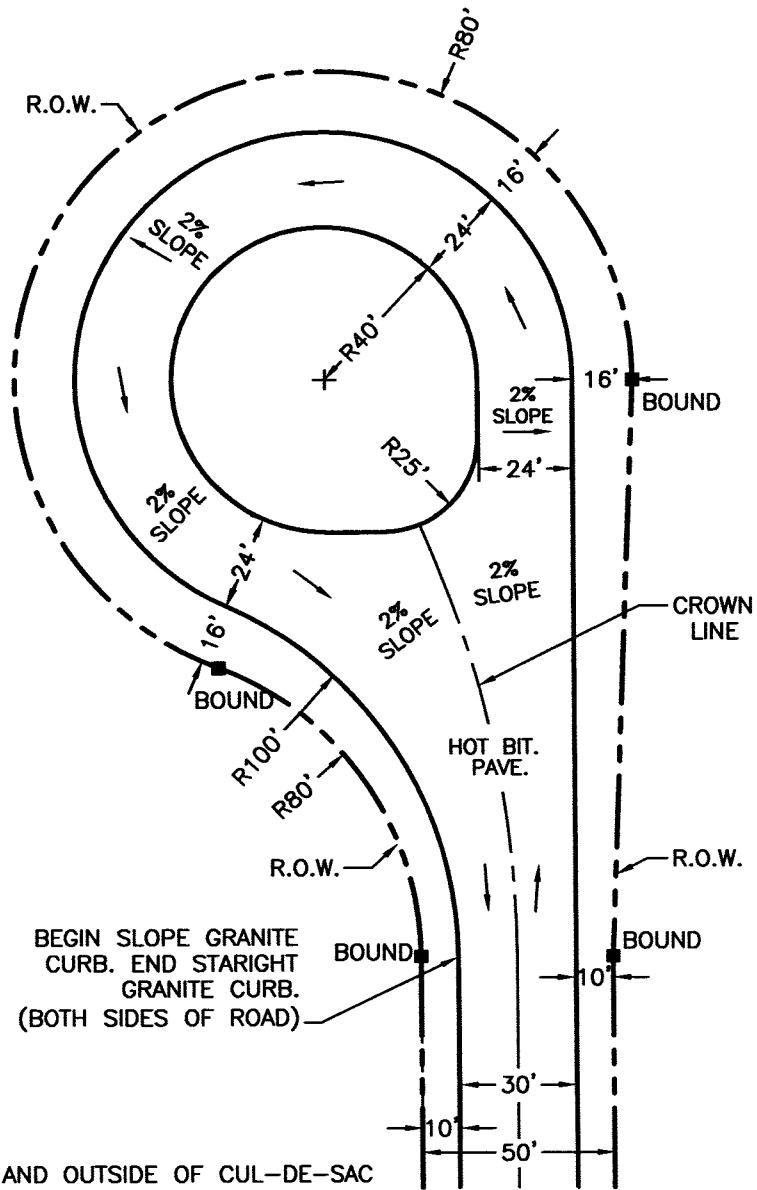
PLAN VIEW

SCALE: 1" = 50'

DIMENSIONS ARE TO FACE OF CURB

DRAWN BY: DKP	TOWN OF HOOKSETT, NEW HAMPSHIRE DESIGN SPECIFICATIONS TEARDROP CUL-DE-SAC DETAIL	REV. DATE:
CHECKED BY:		REV. DATE:
APPROVED BY:		SCALE: AS SHOWN
PLOT SCALE: 1:1		DATE: JULY, 2001
CAD FILE: H-04		FIGURE: H-03 A

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NOTES:

1. CURBING ON INSIDE AND OUTSIDE OF CUL-DE-SAC SHALL BE VERTICAL GRANITE CURB.
2. BOUNDS SHALL BE CONSTRUCTED AT EACH PROPERTY LINE INTERSECTION WITH THE R.O.W.
3. THE AREA INSIDE THE ISLAND SHALL BE CLEARED OF BRUSH LEAVING TREES 3' OR LARGER.
4. THE AREA INSIDE THE ISLAND SHALL BE GRADED TO DRAIN TO THE INSIDE AND A PROPER OUTLET PIPE PROVIDED.
5. THE CUL-DE-SAC MAY BE CONSTRUCTED LARGER THAN SHOWN HERE WITH THE APPROVAL OF THE PLANNING BOARD. THE PAVEMENT WIDTHS SHOWN SHALL NOT BE REDUCED.

PLAN VIEW

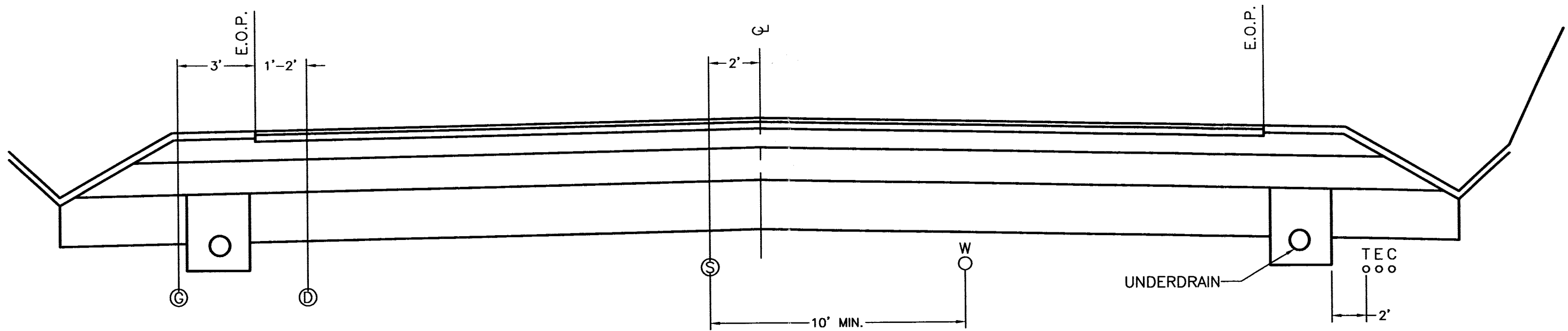
SCALE: 1" = 50'
 DIMENSIONS ARE TO FACE OF CURB

DRAWN BY:	DKP
CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	1:1
CAD FILE:	H-05

TOWN OF HOOKSETT, NEW HAMPSHIRE
 DESIGN SPECIFICATIONS

**OFFSET CUL-DE-SAC
 DETAIL**

REV. DATE:	
REV. DATE:	
SCALE:	AS SHOWN
DATE:	JULY, 2001
FIGURE:	H-04 A



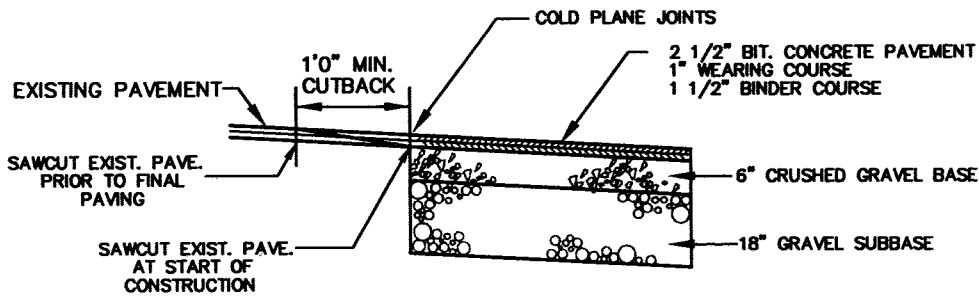
LEGEND

- EOP = EDGE OF PAVEMENT
- G = GAS
- D = DRAIN
- S = SEWER
- W = WATER
- T = TELEPHONE
- E = ELECTRIC
- C = CABLE

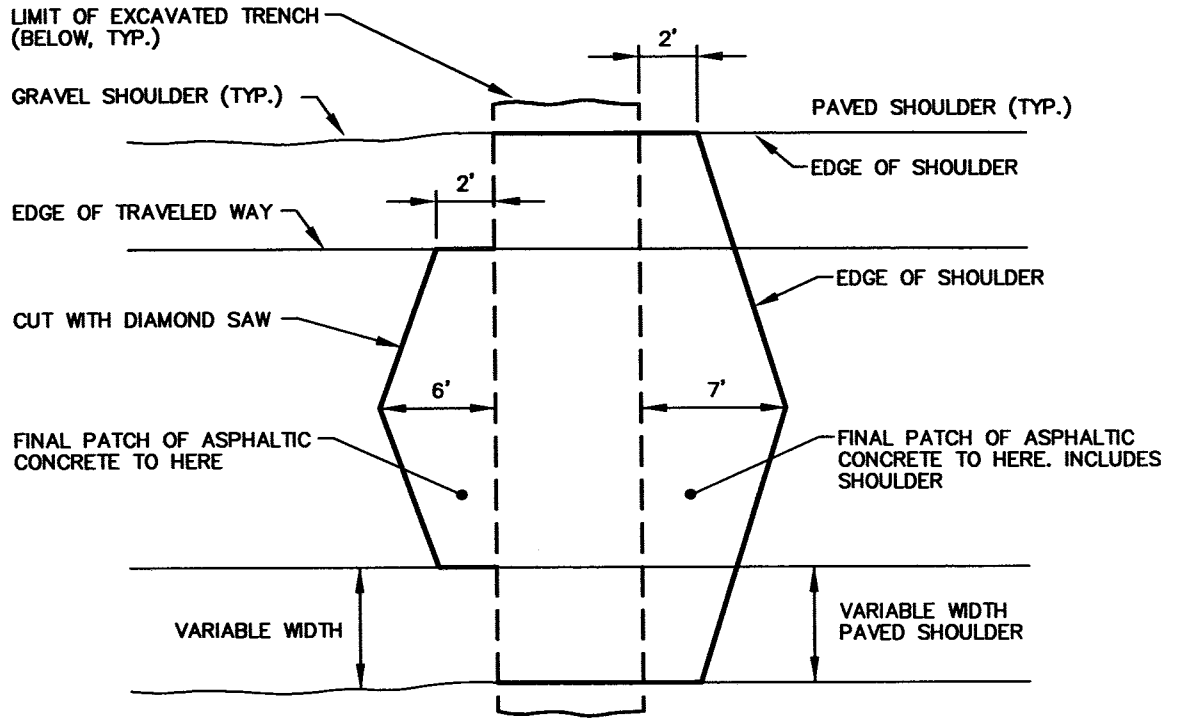
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CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	
CAD FILE:	H-02

TOWN OF HOOKSETT, NEW HAMPSHIRE
 DESIGN SPECIFICATIONS
**TYPICAL UTILITY LOCATION
 SECTION**

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	G-04 A



PAVEMENT SAWCUT DETAIL



PLAN

TYPICAL PATCH DETAIL

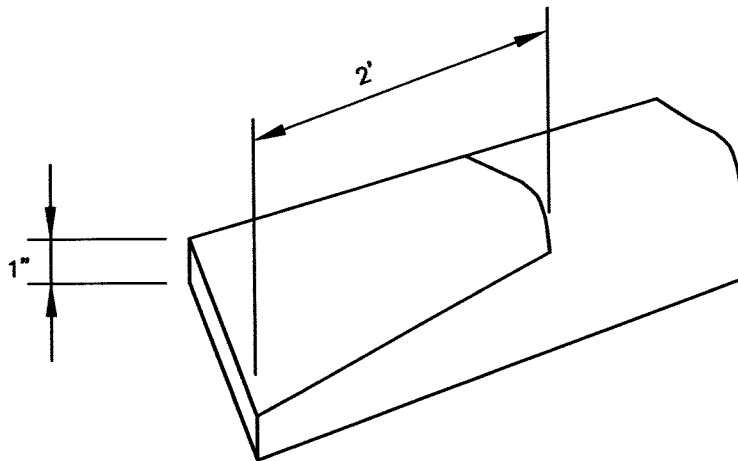
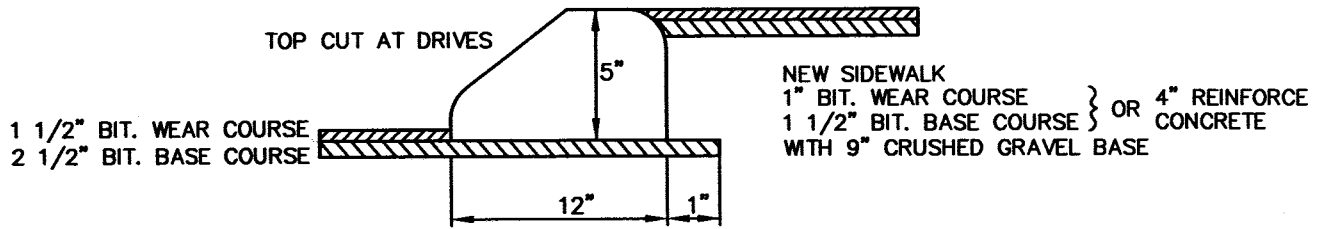
NOTES

1. TYPICAL TRENCH OPENING IN PAVEMENT AND A METHOD APPROVED FOR PATCHING.

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DRAWN BY:	DKP	TOWN OF HOOKSETT, NEW HAMPSHIRE DESIGN SPECIFICATIONS PAVEMENT SAWCUT DETAIL AND TYPICAL PATCH DETAIL	REV. DATE:	
CHECKED BY:			REV. DATE:	
APPROVED BY:			SCALE:	NTS
PLOT SCALE:	1:1		DATE:	JULY, 2001
CAD FILE:	G-02		FIGURE:	G-02 A

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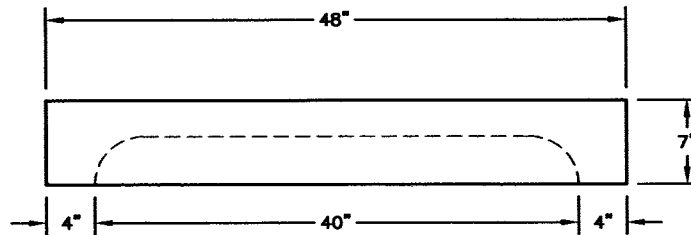
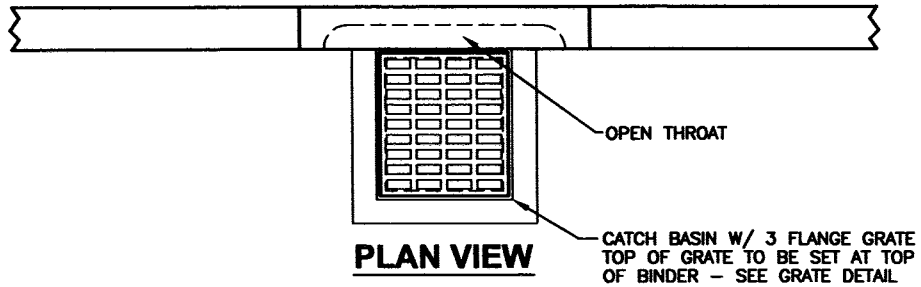


NOTE:

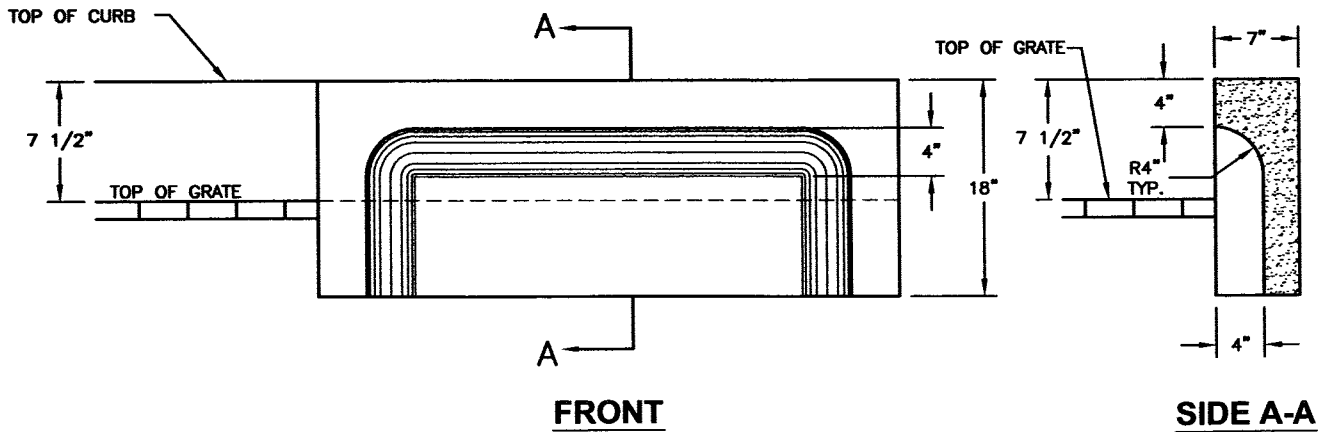
BITUMINOUS BERM MAY BE USED IN ACCORDANCE WITH THE SITE PLAN REGULATIONS OR AS TEMPORARY CURB IN ACCORDANCE WITH THE SUBDIVISION REGULATIONS.

DRAWN BY: DKP	TOWN OF HOOKSETT, NEW HAMPSHIRE DESIGN SPECIFICATIONS TYPICAL BITUMINOUS CONCRETE BERM DETAILS	REV. DATE:
CHECKED BY:		REV. DATE:
APPROVED BY:		SCALE: NTS
PLOT SCALE:		DATE: JULY, 2001
CAD FILE: D-05		FIGURE: D-05 A

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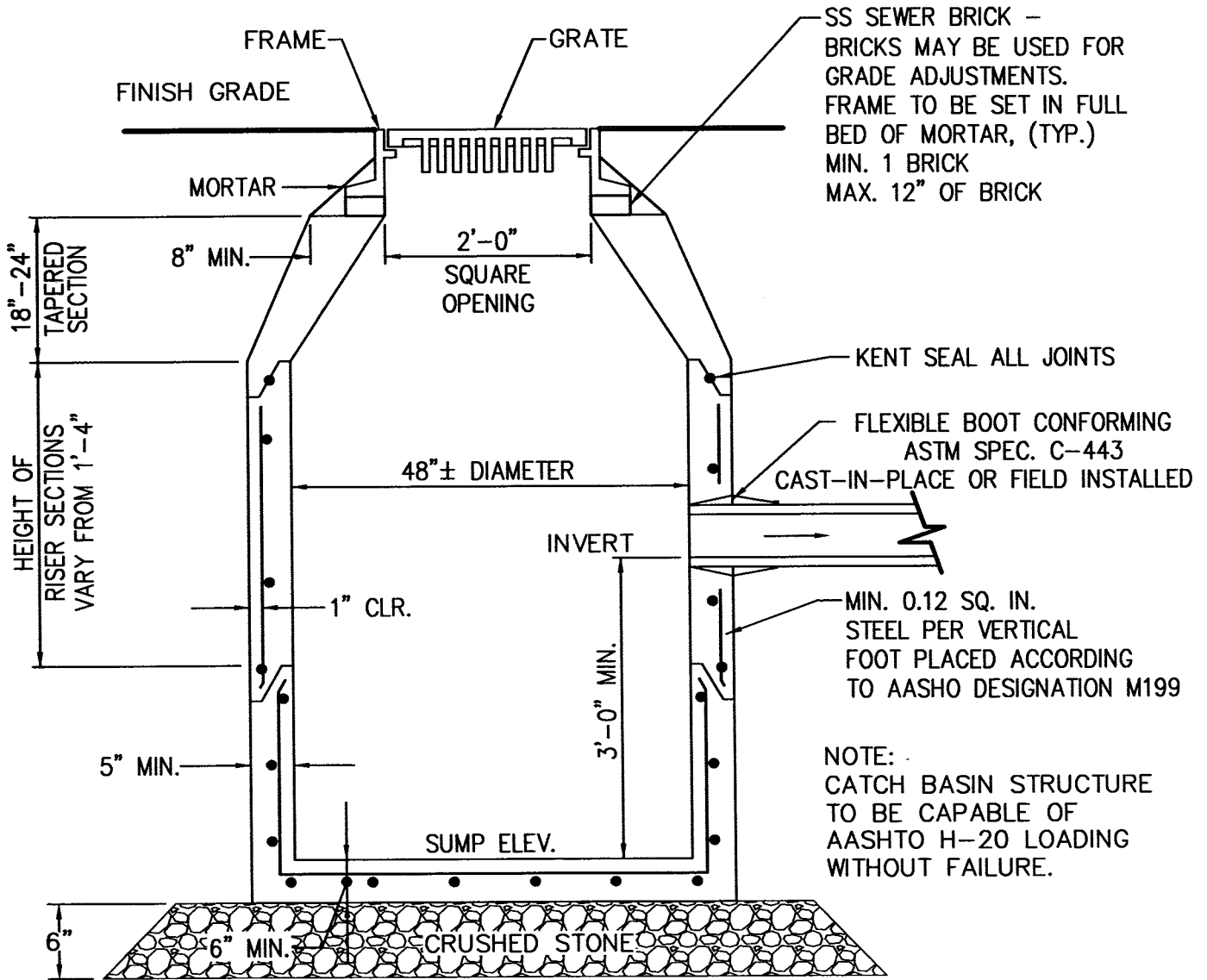


GRANITE CURB INLET - PLAN VIEW



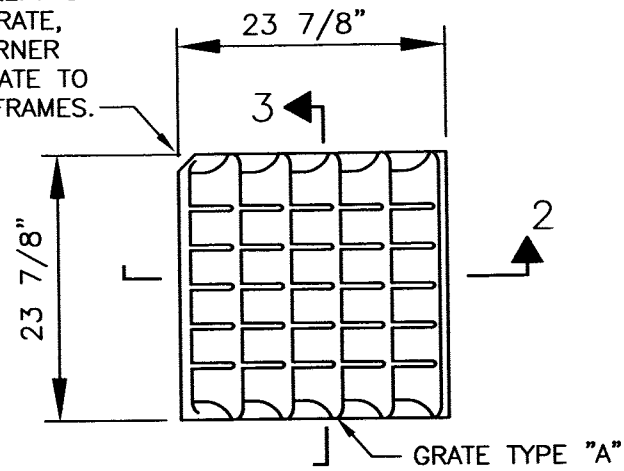
DRAWN BY:	DKP	TOWN OF HOOKSETT, NEW HAMPSHIRE DESIGN SPECIFICATIONS	REV. DATE:	
CHECKED BY:			REV. DATE:	
APPROVED BY:			SCALE:	NTS
PLOT SCALE:	1:1		DATE:	JULY, 2001
CAD FILE:	D-01		FIGURE:	D-01 A
GRANITE CURB INLET DETAILS				

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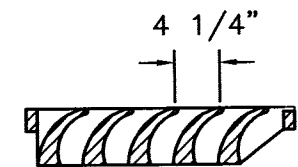
DRAWN BY:	DKP	TOWN OF HOOKSETT, NEW HAMPSHIRE DESIGN SPECIFICATIONS PRECAST CONCRETE CATCH BASIN	REV. DATE:	
CHECKED BY:			REV. DATE:	
APPROVED BY:			SCALE:	NTS
PLOT SCALE:			DATE:	JULY, 2001
CAD FILE:	D-07		FIGURE:	D-07 A

THIS CORNER LEFT OFF
FOR "RIGHT" GRATE,
DIAG. OPP. CORNER
FOR "LEFT" GRATE TO
FIT IN KEYED FRAMES.

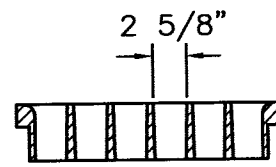


PLAN

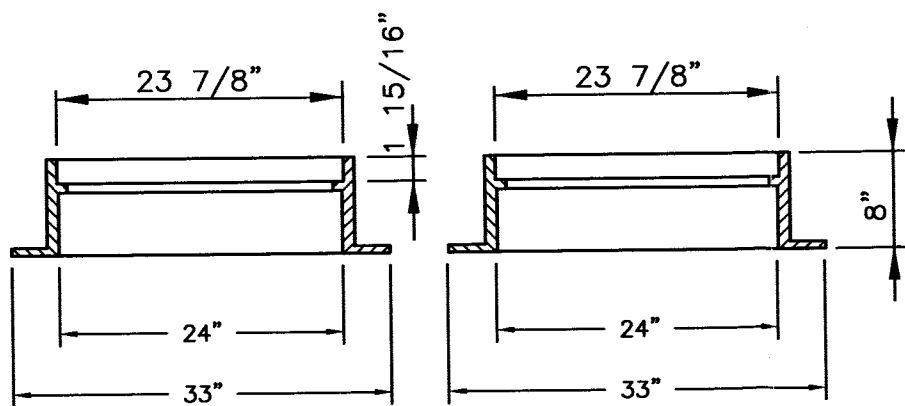
GRATE TYPE "A"



GRATE SECTION 2



GRATE SECTION 3

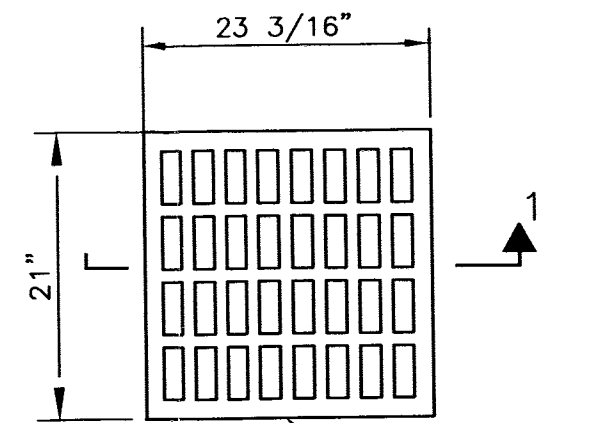


FRAME SECTIONS

TYPE A FRAME AND GRATE

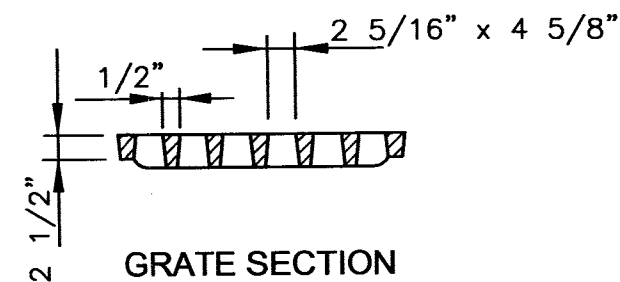
(NEENAH R-3588-L)

NOT TO SCALE

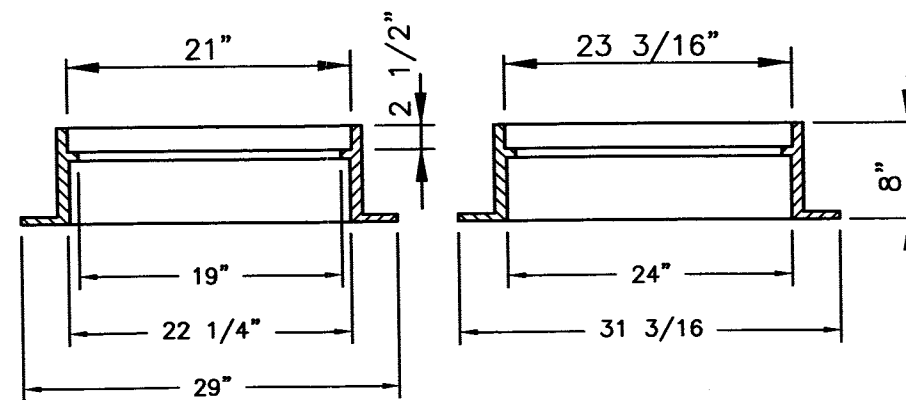


PLAN

GRATE TYPE "B"



GRATE SECTION



FRAME SECTIONS

TYPE B FRAME AND GRATE

(NEENAH R-3570)

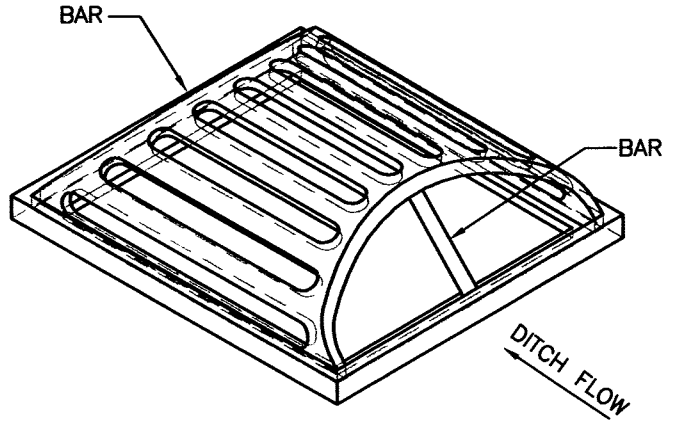
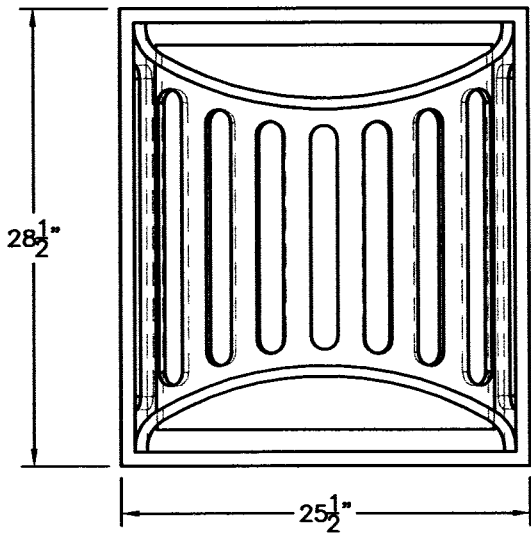
NOT TO SCALE

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CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	
CAD FILE:	D-08

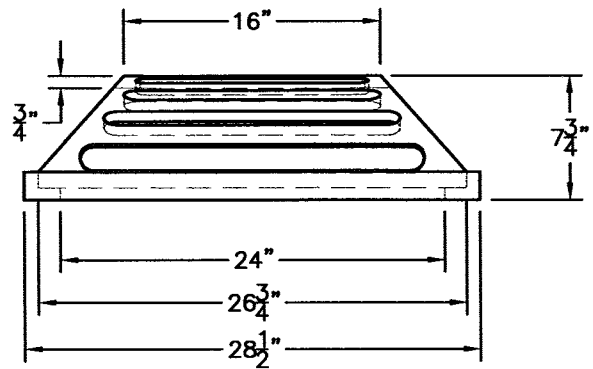
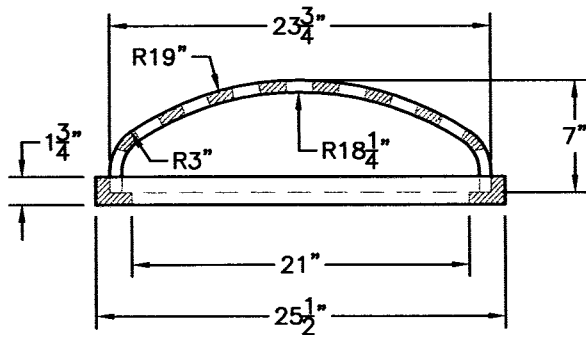
TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS
CATCH BASIN DETAILS

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	D-08 A

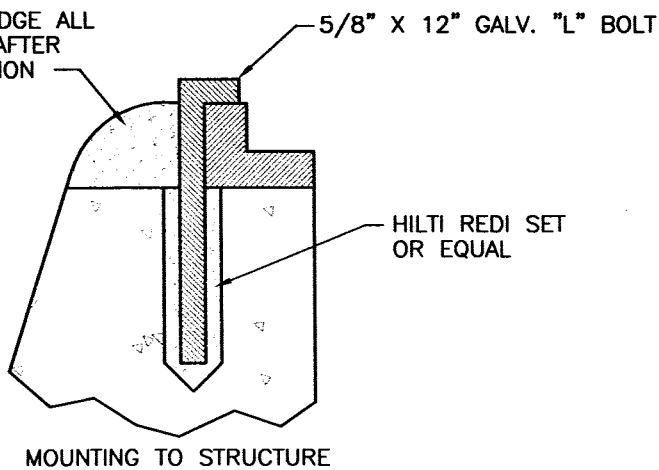
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NEENAH R-4343 DITCH GRATE WITH FRAME OR EQUAL



GROUT RIDGE ALL AROUND AFTER INSTALLATION

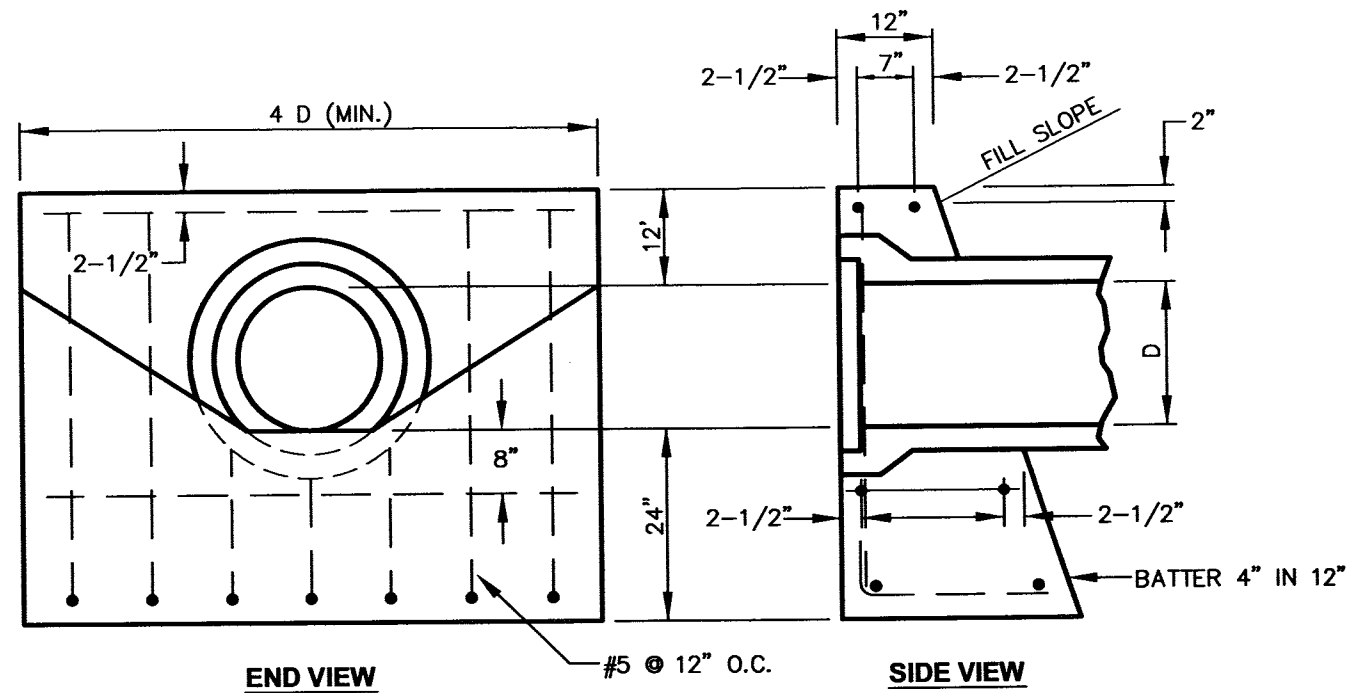


NOTE:
DETAIL FOR BAR MOUNTING TO BE FURNISHED PRIOR TO CONSTRUCTION.

DRAWN BY:	DKP
CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	1:1
CAD FILE:	D-03

TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS
**DITCH GRATE WITH FRAME
DETAIL**

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	D-03 A



END VIEW

SIDE VIEW

#5 @ 12" O.C.

QUANTITY SCHEDULE FOR REINFORCED CONCRETE HEADWALL, CLASS B

PIPE DIAMETER	12"	15"	18"	24"	30"	36"	42"	48"	54"	60"
CONCRETE QUANTITY	1.0	1.3	1.8	2.7	3.5	4.9	6.4	8.0	10.0	12.3

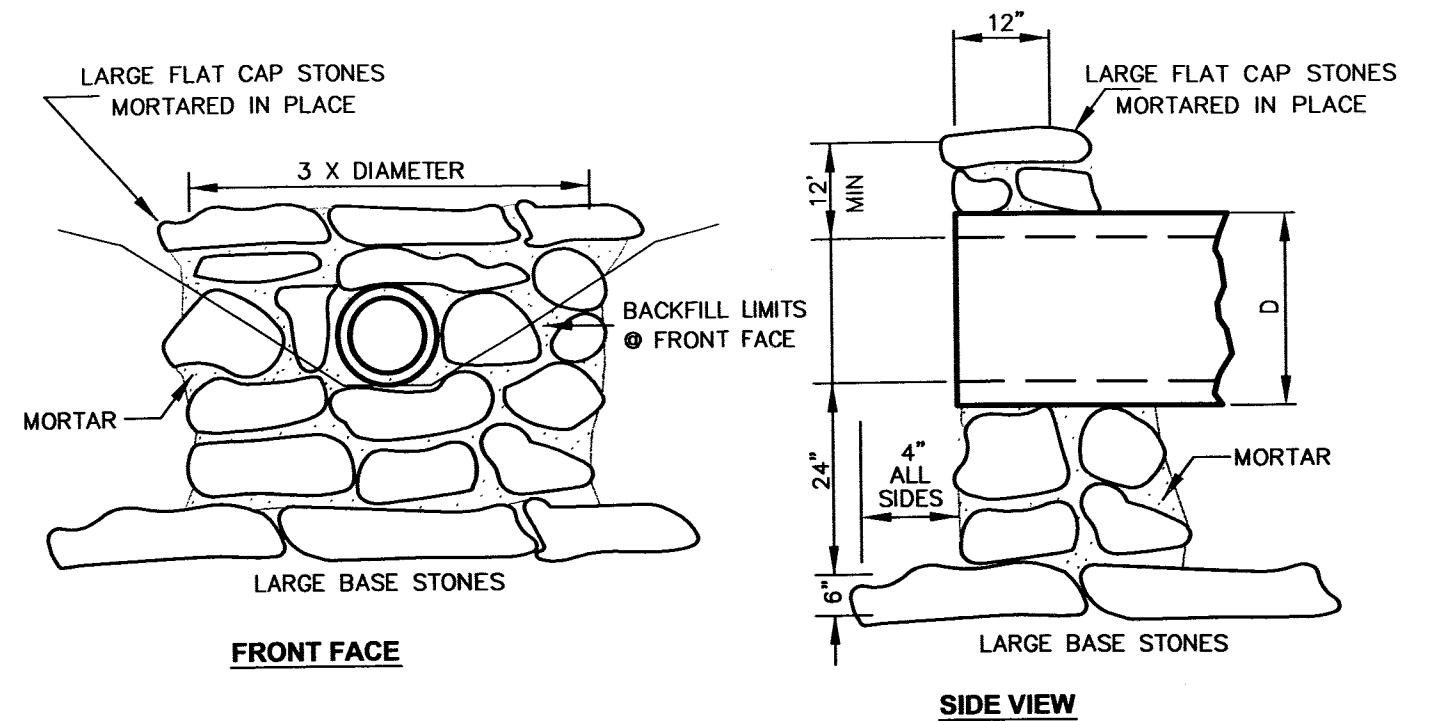
STEEL SCHEDULE FOR REINFORCED CONCRETE HEADWALL

PIPE DIAMETER	12"	15"	18"	24"	30"	36"	42"	48"	54"	60"
NUMBER	4	4	4	4	4	4	4	4	4	4
LENGTH OF BARS	3'-0"	3'-0"	3'-0"	3'-0"	4'-0"	4'-0"	5'-0"	5'-0"	6'-0"	6'-0"

ALL REINFORCING STEEL TO BE #5 DEFORMED BARS.
 CONCRETE QUANTITIES EXCLUDE PIPE DIAMETERS FOR 30" AND OVER.
 SAME DEDUCTION MADE FOR CONCRETE PIPE AS IS MADE FOR METAL PIPE.

REINFORCED CONCRETE HEADWALL DETAIL

NOT TO SCALE



FRONT FACE

SIDE VIEW

STONE & MORTAR HEADWALL DETAIL

NOT TO SCALE

NOTE:

THE PLANNING BOARD RESERVES THE RIGHT TO REQUIRE THAT THE DEVELOPER PROVIDE CAST-IN-PLACE CONCRETE HEADWALLS WITH STONE FACING IF THE CAST-IN-PLACE TYPE IS TO BE USED.

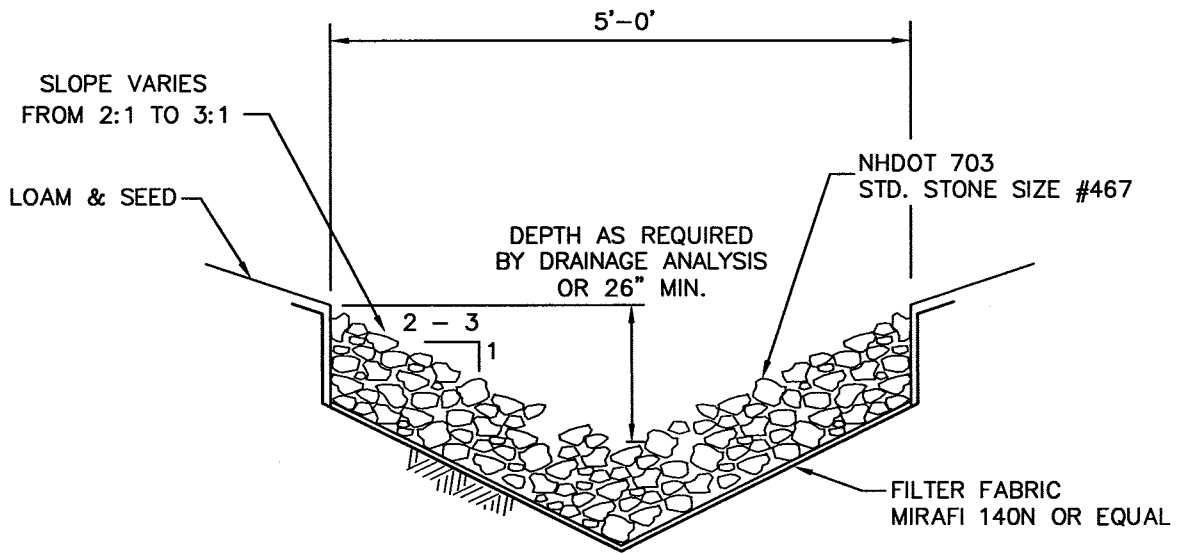
DRAWN BY:	DKP
CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	
CAD FILE:	D-04

TOWN OF HOOKSETT, NEW HAMPSHIRE
 DESIGN SPECIFICATIONS
**STORM DRAIN HEADWALL
 DETAILS**

REV. DATE:	
REV. DATE:	
SCALE:	NO SCALE
DATE:	JULY, 2001
FIGURE:	D-04 A

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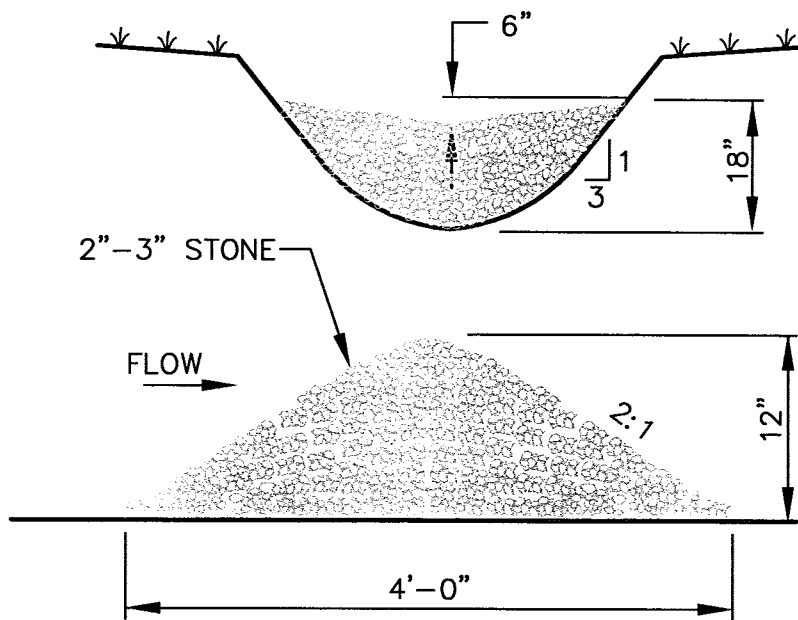
STONE LINED SWALES ARE TO BE
CONSTRUCTED ON ALL SLOPES OF
5% OR GREATER.

DRAWN BY:	DKP
CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	
CAD FILE:	D-06

TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS

**TYPICAL STONE
LINED SWALE**

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	D-06 A



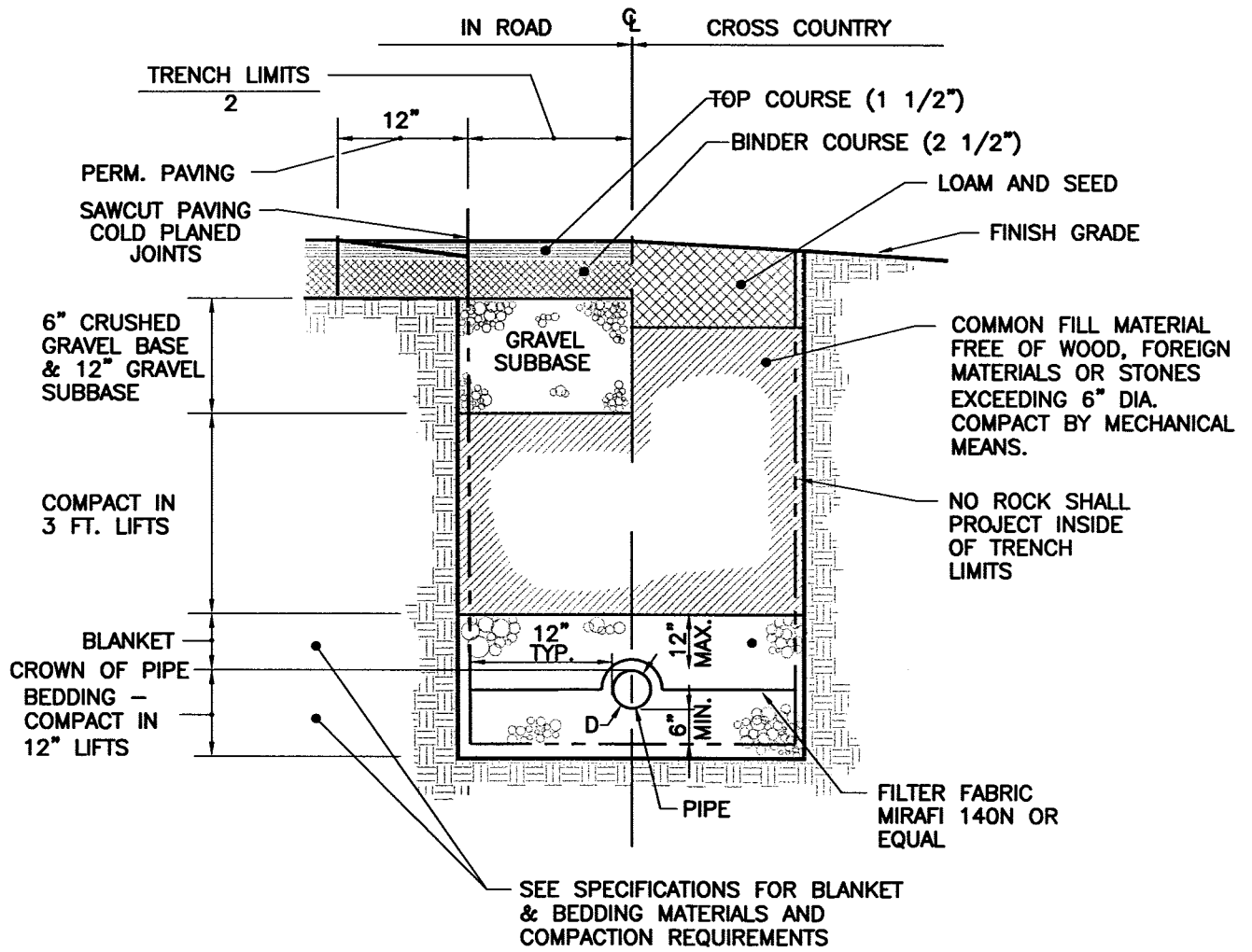
DRAWN BY:	DKP
CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	
CAD FILE:	D-07

TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS

TYPICAL STONE
CHECK DAM

REV. DATE:	
REV. DATE:	
SCALE:	NO SCALE
DATE:	JULY, 2001
FIGURE:	D-09 A

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DRAWN BY:	DKP
CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	1:1
CAD FILE:	G-01

TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS

TYPICAL TRENCH DETAIL
FOR DRAINAGE PIPES

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	G-01 A

Part III
Water Works Construction

PART III

WATER WORKS CONSTRUCTION

A. GENERAL

1. Water Service Companies

Water service in the Town of Hooksett is provided by several entities including the Central Hooksett Water Precinct, the Hooksett Village Water Precinct, Manchester Water Works and Pennichuck Water Works. Contacts for each of these entities are as follows:

Central Hooksett Water Precinct
Pat O'Brien, Superintendent
PO Box 16322
(Physical location: 32 Industrial Park Drive)
Hooksett, NH 03106
phone 624-0608
fax 624-0814

Hooksett Village Water Precinct
Joseph L. Hebert, Superintendent
7 Riverside Drive
Hooksett, NH 03106
485-3392

Manchester Water Works
281 Lincoln St.
Manchester, NH 03103
624-6494

Pennichuck Water Works
4 Water Street
Nashua, NH 03601
882-5191

2. Water Works Construction Procedures

- A. The Developer must determine which service area the parcel(s) in question are, and follow the procedural requirements of the appropriate governing body. The appendices of these specifications should be referenced for the following:

Central Hooksett Water Precinct
Design and Construction Requirements for Water Works Appendix A

Hooksett Village Water Precinct
Design and Construction Requirements for Water Works Appendix B

Manchester Water Works
Design and Construction Standards for Water Works Appendix C

- B. Prior to starting any construction, an **Application for Start of Construction** must be filed with the Town Engineer (or Highway Manager in absence of a Town Engineer).
- C. Prior to starting construction, subdivision design plans must be approved and signed by the Planning Board and filed with the Merrimack County Registry of Deeds. Bonds

must be in place with all appropriate departments (Highway, Water, Sewer), and the appropriate escrow accounts established for construction observation and testing (Highway, Water, Sewer, Fire).

- C. Upon acceptance of the completed **Application for Start of Construction**, the Town Engineer (or Highway Manager in absence of a Town Engineer) will schedule a pre-construction meeting with all involved parties. At this meeting, the Developer will be required to submit a complete project schedule, identifying all inspections, for all departments (see inspection checklists for each department). At this meeting, the Town Engineer (or Highway Manager in absence of the Town Engineer, will issue a Notice to Proceed).
- D. For work in existing roadways, refer to Part II, Road Construction.

3. Water Works Inspection

- A. The Designated Representative of the respective Water Company/Department shall be notified at least two (2) working days prior to the requested start time of inspection. The scheduled inspection time shall be confirmed by the inspector. The requirements of this notification are as follows:
 - 1. Two (2) working days do not include holidays and weekends.
 - 2. Inspectors will be available between 8:00 am and 3:00 pm Monday through Friday.
 - 3. No inspections will be made on weekends or holidays.
 - 4. Cancellation of scheduled inspection: In cases where the Designated Representative of the Water Company/Department is not notified that an inspector's services are not required by 12:00 pm (noon) the day prior to the requested inspection, a minimum charge of three (3) hours may be assessed to the requesting person or company.
 - 5. **Hooksett Village Water Precinct:**

Application for water service must be submitted prior to performing the work. The permit cost will cover one service inspection. A fee of \$20 will be assessed for each residence, or \$100 for each commercial/industrial building, for inspection of the service. If an inspector must return because the requesting person or company was not ready, or the work does not pass inspection, a charge of \$50.00 will be assessed for each additional inspection. The inspection will not be performed, nor approval granted, until the necessary fee has been received by the Water Department.
 - 6. **Central Hooksett Water Precinct:**

The Applicant must complete a **service card**, available at the Precinct offices.
- B. Note that full time construction inspection is required for trenching, installation, backfilling and testing of water utilities.

4. Water Works Bonds

- A. A bond in the amount of the water main portion of the project, made payable to the governing body, will be required prior to commencing construction.
- B. The amount of the water main bond shall be determined by in accordance with the appropriate water company/department regulations (refer to appendices). The water main estimate must be approved by the governing body prior to submission of the bond.
- C. **Hooksett Village Water Precinct:**

The full amount of the bond will be held for one (1) year following Substantial Completion.
- D. **Central Hooksett Water Precinct:**

The full amount of the bond will be held for two (2) years following substantial completion.
- E. A 10% bond retainer will be held for two (2) years following the **Certificate of Substantial Completion of Work**. If there are no outstanding issues regarding the work, the bond retainer will be returned to the Developer at this time.

5. As-Built Drawings

- A. At the completion of the work, the Developer shall submit a set of working drawings (red-lines) and as-built drawings to the appropriate Water Company/Department. The as-built drawings shall indicate any field adjustments, all buried structures, utilities and services. The as-built drawings shall be submitted to the appropriate department in hard copy, 24" x 36" size, and electronically in AutoCad 2000 or most recent version. One copy of all as-built drawings shall be submitted to the Highway Department for central filing.

B. SPECIFICATIONS FOR WATER WORKS CONSTRUCTION

- 1. The Developer must determine which service area the parcel(s) in question are, and meet the requirements of the appropriate governing body. The appendices of these specifications should be referenced for the following:

Central Hooksett Water Precinct Design and Construction Requirements for Water Works	Appendix A
Hooksett Village Water Precinct Design and Construction Requirements for Water Works	Appendix B
Manchester Water Works Design and Construction Standards for Water Works	Appendix C

- 2. Design and Construction Standards for the above entities have been included at the time of publishing of this document. The Developer should contact the appropriate governing body at the time of design and construction to verify any updates. Each governing body may also be contacted for complete Rules and Regulations for development within their service areas.
- 3. See Specifications for Road Construction (Part II) for requirements for excavation, backfill, pavement, and erosion control. Where a conflict may arise between Standards for Water Works and Standards for Road Construction, the more stringent standard shall apply.

C. Water Works Forms

TOWN OF HOOKSETT
WATER WORKS INSPECTION CHECKLIST

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____
Location: _____
Developer: _____
Contracted Road builder: _____
Contracted Water Main builder: _____
Length of Water Main: _____ Water Main size _____ diameter
Water Department's Authorized Agent: _____
Developer's Authorized Agent: _____

INSPECTION CHECKLIST

Water Mains -

check at delivery

_____ Size to match plans	_____ CI valve boxes with "water" label
_____ DI class 52	_____ Hydrants - American Darling B-62-B
_____ Cement lined	_____ Resilient wedge gate valves
_____ PVC DR 18	

check at installation

_____ sand bedding (6" below to springline)	
_____ 1 ft sand blanket over pipe	_____ Filter fabric in paved locations
_____ Deep backfill compacted in 3 ft lifts	_____ No stones larger than 3" in backfill
_____ Final 3 ft of backfill compacted in 12" lifts	
_____ Min 5 ft deep, or insulated	_____ Flushing
_____ Pressure tested	_____ Chlorinated
_____ Leakage tested	_____ Bacterial testing

Water Services - use separate form for each service

check at delivery

_____ Copper type K

check at installation

_____ corporation at 12 o'clock position	_____ gooseneck installed
_____ Tapping saddle where required	_____ minimum depth 6 ft
_____ 1 ft sand blanket over pipe	_____ No stones larger than 3" in backfill
_____ Final 3 ft backfill compacted in 12" lifts	_____ Record location at each house
_____ Swing ties of service	

**TOWN OF HOOKSETT
CERTIFICATE OF SUBSTANTIAL COMPLETION OF WATER MAIN WORK**

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____

Location: _____

Developer: _____

Contracted Road Builder: _____

Contracted Water Main Builder: _____

Water Company: _____

Start of Construction: _____ Agreement Date: _____

Substantial Completion Date: _____

CERTIFICATION OF DEVELOPER

I hereby certify that the Work as identified on the As-Built Drawings of the above-noted project dated _____ conforms to the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

DEVELOPER

Signature

Title

CERTIFICATION OF DEPARTMENT

I have reviewed the DEVELOPER's As-Built Drawings dated _____ and hereby certify that to the best of my knowledge, the Work we witnessed being accomplished on the above-noted project has been completed in accordance with the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

Water Company/Dept. Superintendent or designated representative

Signature

Title

Attach Punch list of remaining work items.

**TOWN OF HOOKSETT
CERTIFICATE OF FINAL COMPLETION OF WATER MAIN WORK**

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____

Location: _____

Developer: _____

Contracted Road Builder: _____

Contracted Water Main Builder: _____

Water Company: _____

Start of Construction: _____ Agreement Date: _____

Final Completion Date: _____

FINAL CERTIFICATION OF DEVELOPER

I hereby certify that the Work as identified on the Final As-Built Drawings of the above-noted project dated _____ conforms to the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

DEVELOPER

Signature

Title

FINAL CERTIFICATION OF DEPARTMENT

I have reviewed the DEVELOPER's Final As-Built Drawings dated _____ and hereby certify that to the best of my knowledge, the Work we witnessed being accomplished on the above-noted project has been completed in accordance with the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

Water Company/Dept. Superintendent or designated representative

Signature

Title

Part IV

Sewer Works Construction

PART IV

SEWER WORKS CONSTRUCTION

A. GENERAL

1. Sewer Construction Procedure

- A. Prior to starting any construction, an **Application for Start of Construction** must be filed with the Town Engineer (or Highway Manager in absence of a Town Engineer).
- B. Prior to starting construction, subdivision design plans must be approved and signed by the Planning Board and filed with the Merrimack County Registry of Deeds. Bonds must be in place with all appropriate departments (Highway, Water, Sewer), and the appropriate escrow accounts established for construction observation and testing (Highway, Water, Sewer, Fire).
- C. Upon acceptance of the completed **Application for Start of Construction**, the Town Engineer (or Highway Manager in absence of a Town Engineer) will schedule a pre-construction meeting with all involved parties. At this meeting, the Developer will be required to submit a complete project schedule, identifying all inspections, for all departments (see inspection checklists for each department). At this meeting, the Town Engineer (or Highway Manager in absence of the Town Engineer) will issue a Notice to Proceed.
- D. For work in existing roadways, refer to Part II, Road Construction.

2. Sewer Main Inspection

- A. The Developer shall establish an escrow account with the Sewer Department to cover the cost of construction inspection and testing services. The Sewer Department will notify the Developer of the estimated cost of these services. Should the escrow account become depleted, no further inspections, sign-offs or approvals will be granted until the additional funds requested are deposited into the escrow account. Work performed without the required inspection will not be accepted by the Town.
- B. The Designated Representative of the Sewer Department shall be notified at least two (2) days prior to the requested time of inspection. The scheduled inspection time shall be confirmed by the inspector. The requirements of this notification are as follows:
 1. Two (2) working days do not include holidays and weekends.
 2. Inspectors will be available between 8:00 am and 3:00 pm Monday through Friday.
 3. No inspections will be made on weekends or holidays.
 4. Cancellation of scheduled inspection: In cases where the Designated Representative of the Sewer Department is not notified that an inspector's services are not required by 12:00 pm (noon) the day prior to the requested inspection, a minimum charge of three (3) hours will be assessed to the requesting person or company.

2. Bedding material shall consist of crushed stone graded to the following specifications:

100% passing	1" screen	Equivalent to
90 - 100% passing	3/4" screen	Standard Stone
20 - 55% passing	3/8" screen	Size #67 Section
0 - 10% passing	#4 sieve	703 of NHDPWH
0 - 5% passing	#8 sieve	Standard
		Specifications
		ASTM C33

3. Sand blanket material shall be graded sand free from organic materials, so graded that 100% passes a 1/2 inch sieve; 15% (maximum) passes a #200 sieve.
4. Backfill material for installation in road, traveled ways and shoulders, shall be natural material excavated from trench during construction excluding debris, pieces of pavement, organic matter, top soil, all wet or soft muck, peat, clay, stones greater than 6 inches in diameter, and all excavated ledge material not approved by the Engineer. For cross-country construction, suitable material shall be as described above, except that the Engineer may permit the use of top soil, loam, muck or peat, if he is satisfied that the completed construction will be entirely stable and provided that easy access to the sewer for maintenance will be preserved.
5. Pavement base course shall meet the requirements of Division 300 of the latest edition of the standard specifications for road and bridge construction of the State of New Hampshire Department of Public Works and Highways.

3.02 INSTALLATION:

A. Sewer:

1. Pipe Handling:

The Contractor shall arrange for the delivery of the pipe sections at approved locations in the vicinity of the portion of the sewer line in which the pipe sections are to be laid. To this end, he shall do such work as is necessary for access and for delivery of the pipe. Pipes shall be stored in an approved, orderly manner so that there will be a minimum of re-handling from the storage area to the final position in the trench and so that there is minimum of obstruction and inconvenience to any kind of

traffic. Deliveries shall be scheduled so that the progress of the work is at no time delayed, and also so that quantities of pipe shall not be stored for excessive lengths of time in crowded locations, or in locations where large storage areas might be considered objectionable. Storage of pipe will be restricted to approved or permitted areas.

The Contractor will be required to 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 injury to the pipe units.

The pipe shall not be dropped from trucks or into the trench.

The Contractor shall have on the job site with each pipe laying crew all the proper tools to handle and cut the pipe. The use of hammer and chisel, or any other method which results in rough edges, chips and damaged pipe, shall be prohibited.

Damaged pipe coating and/or lining shall be restored before installation as approved or directed by the Commission/Engineer.

2. Control of Alignment and Grade of Sewer Mains:

The Owner is responsible for establishing the location of the pipe, manholes and other appurtenances, and establishing bench marks along the route of the pipeline at convenient intervals for the use of the Contractor and for his own reference in checking the pipe and manhole invert and other elevations throughout the project.

The Contractor will use an in-pipe laser alignment instrument to assist in setting the pipe. A pipe ventilation blower shall be used with the laser.

The use of laser beams, string levels, hand levels, carpenters levels and other relatively crude devices for transferring grade or setting pipe will not be permitted.

During construction, the Contractor shall provide the Commission/Engineer, at his request, all reasonable and necessary materials, opportunities and assistance for setting stakes and making measurements, including the furnishing of one or two rodmen or chainmen as needed at intermittent times. He shall not proceed until he has made timely demand upon the Superintendent/Engineer for, and has received from him, such inspection as may be necessary as

the work progresses. The work shall be done in strict conformance with controls and instructions. The Contractor shall maintain all vertical and horizontal survey control stakes.

3. Preparation of Bed:

As soon as excavation has been completed to the proper depth as shown on the Standard Trench Section drawing a layer of bedding material shall be placed to the elevation necessary to bring the pipe to grade and compacted. It shall be the Contractor's responsibility to control any water in the trench below the pipe invert and he shall place concrete, clay or other impermeable material in the bedding at intervals to prevent horizontal movement of the bed, or make it difficult to handle water in the trench.

If in the opinion of the Superintendent/Engineer, the material of the bottom of the bedding (6" below grade of pipe bottom) is unsuitable for foundation, it shall be removed and replaced by bedding material.

4. Laying Pipe:

Each pipe length shall be inspected for cracks, defects in coating or lining, and any other evidences of unsuitability. Before lowering in place, the pipe shall be struck with a suitable tool to verify its soundness.

Pipe shall then be laid on the trench bedding as shown on the Standard Trench Section drawing, and the spigot pushed home. Jointing shall be in accordance with the manufacturer's instructions and the appropriate ASTM Standards, and the Contractor shall have on hand for each pipe-laying crew, the necessary information to install the pipe in a workmanlike manner. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of the flow.

After the pipe has been set to grade, additional bedding material shall be placed in 6 inch layer up to the spring line of the pipe. Tamping bars shall be carefully employed to assure compaction of the bedding under the lower quadrants of the pipe.

After this, filter fabric shall be placed in all paved locations. The sand blanket shall be carefully placed in 6 inch layers to a depth of 12 inches over the crown of the pipe. Each layer shall be thoroughly compacted with mechanical equipment. Care should be taken that the equipment does not damage the pipe.

At this point, the pipe shall be checked for line and grade and any debris, tools, etc., shall be removed.

If inspection of the pipe is satisfactory, the Contractor may then refill or backfill the remainder of the trench in accordance with the Standard Trench Section drawing. Backfill material shall have no stones larger than 6" in diameter.

At any time that work is not in progress, the end of the pipe shall be suitably closed to prevent the entry of animals, earth, etc.

At the end of each day's work or at intervals of no more than 300 feet of pipe, the Owner/Engineer, with the Contractor, will inspect the pipe for alignment with lamps or mirrors. Unsatisfactory work shall be dug up and reinstalled to the satisfaction of the Superintendent/Engineer.

5. Connections to Existing Sewers:

Where new construction is intended to connect to an existing sewer, a new manhole shall be installed at the connection. Special care shall be taken to insure a tight joint between the new and existing sewers.

B. Manholes:

1. Adjusting Frames to Grade:

Frames shall be centered over the manhole opening and flush to the finished pavement. A minimum of 2 courses of brick are required under the frame yet the adjusting course shall not exceed 12" of brick. Brick and Portland cement mortar are the only masonry materials to be used between the precast structure and the cast iron frame.

2. Installation of Manhole Bases and Sections:

Pre-cast bases shall be placed on a 6 inch layer of compacted bedding material as described below. The excavation shall be properly dewatered while placing bedding material and setting the base or pouring concrete. Waterstops shall be used at the horizontal joint of poured-in-place manholes.

Inlet and outlet stubs shall be connected and sealed in accordance with the manufacturer's recommended procedure, and as shown on the Standard Manhole drawings.

Barrel sections and cones of the appropriate combination of heights shall then be placed, using the manufacturer's

recommended procedure for sealing the horizontal joints and as shown on the Standard Manhole drawings, or the remaining barrel of the manhole shall be cast above the base. Joints shall be sealed with a double row of Kent Seal No. 2 or approved equal.

A leakage test shall then be made. If the manhole has been backfilled and it fails the leakage test, the Contractor can try sealing the manhole from the inside. If it fails again, it must be excavated and sealed from the outside.

Following satisfactory completion of the leakage test, the frame and cover shall be placed on the top or some other means of preventing accidental entry by unauthorized persons, children, animals, etc., until the Contractor is ready to make final adjustment to grade. A sewer manhole will be installed at the end of each main with a 3' stub.

3. Setting Manhole Frames and Covers:

Manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the drawings. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

Manhole covers shall be left in place in the frames on completion of other work at the manholes.

4. Connections to Existing Manholes:

Where new construction is intended to connect to an existing brick or block manhole, the existing manhole shall be replaced. If the existing manhole is of concrete or pre-cast concrete and in satisfactory condition, as determined by the Superintendent/Engineer, this requirement may be waived.

C. Sewer Service Connections:

Installation shall be as shown on "House Sewer Details". Residential sewer services shall not be connected to manholes. Residential services shall be connected to wyes only. Industrial services shall be connected only to manholes. Commercial services shall be connected as directed by the Hooksett Sewer Commission, depending upon proposed use.

Sewer Service shall be a minimum of 6 inch diameter pipes from property line to sewer. It can be 6" or 4" from property line to building. The minimum slope for sewer services shall be 1/4 per foot of length, unless otherwise directed by Superintendent/Engineer.

Contractors installing sewer service laterals shall maintain record of elevation and location of sewer service termination points, submitting same to sewer department on one 8-1/2 x 11" sheet of paper for each service termination. Swing ties shall be taken to fixed permanent local features (hydrants, building corners, utility poles, etc.). At each service termination point the sewer shall be plugged with a suitable watertight cap or plug. An approved ferrous rod shall be driven to within 2" of surface at the location to permit future location with metallic detection equipment. Service locations shall be shown on record plans.

D. 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 as shown on the details. All inverts must be clean and smooth.

Mortar joints shall be tooled flush to the face of the brick to prevent minor depressions. Shelves shall be constructed to the mid-point of the pipe on pipe size range from 8" to 16" and to the highest pipe crown on larger pipe. The brick shelf shall be pitched to drain toward the flowing channel with a one inch difference from the structure wall to the channel edge.

E. Stubs:

Installation shall be made in the same manner as the upstream entrance to any manhole, using jointing methods shown on the Standard Manhole drawings.

F. Trench Materials:

1. Pipe bedding material shall extend from a horizontal plane through the pipe axis to 6 inches below the bottom of the pipe outside surface. Pipe sand blanket material shall cover the pipe a minimum of 12 inches above the crown of the outside surface. Compaction shall be in 12 inch layers for bedding and blanket materials. Backfill material shall be compacted in 3 feet layers to the ground surface except for road construction where the final 3 feet shall be compacted in 12 inch layers to the road base surface.

2. In trench dimensions shall be as follows:

For sewer pipe up to 15 inches in diameter, the allowable trench width at plane 12 inches above pipe shall be no more than 36 inches. For pipe greater than 15 inches, the allowable width shall be equal to the pipe outside diameter plus 24 inches.

3. Wood sheeting: Where sheeting is placed alongside the pipe and extends below mid-diameter, it shall be cut off and left in place to an elevation not less than one foot above the top of the pipe. Where sheeting is to be left in place, it shall be cut off at least 3 feet below finish grade, but not less than one foot above the top of the pipe.

G. Insulation:

1. Sewer pipe shall be insulated where:
 - a. Sewer pipe has less than 5 feet of cover.
 - b. Sewer pipe crosses under an open culvert and pipe separation is less than 3 feet.
2. Insulating material shall be 3 inches thick foam-glass pipe insulation with pit-wrap jacket as manufactured by Owens-Corning or equal.

H. Flushing:

Following installation, testing and acceptance of pipe, manholes and inverts, Contractor shall fully flush all lines from topmost manholes through system to bottom manhole. All pipes shall be inspected for cleanliness prior to acceptance. Downstream manhole shall be plugged and flushing water pumped out. Flushed water shall not be discharged to sewer system. All flushing shall be performed in the witness of Superintendent/Engineer.

PART IV - PUMP STATION DESIGN REQUIREMENTS

4.01 GENERAL:

- A. All Hooksett Sewer Commission technical standards supplement the New Hampshire Department of Environmental Services, Water Supply and Pollution Control Division design standards. In either case, the most stringent standard (s) shall dictate.
- B. Pump stations shall be designed to satisfy the long-term needs of the Town, and must accommodate future growth within the topographic service zone where it is located. The Hooksett

Sewer Commission shall determine the suitability and adequacy of proposals to accommodate the at-large needs of Hooksett.

C. Pump Station Type: Pump stations shall be designed as 1 of 2 classes of stations, as defined below:

1. Class A Pump Station: designed to accommodate 500 gpm pumping rate or greater, or equipped with 25 horsepower pumps or greater.

Class A pump stations shall be wet well/dry well stations built to full municipal design standards as found herein.

2. Class B Pump Station: shall be designed to accommodate less than 500 gpm pumping rate, and be equipped with less than 25 horsepower pumps.

Class B pump stations shall be submersible pump stations, constructed to enable future expansion to a Class A pump station, and built to standard defined herein.

D. Escrow: Upon application to the Hooksett Sewer Commission, the Applicant shall submit two copies of the plans and specifications for technical review. The Hooksett Sewer Commission shall determine an appropriate review escrow, which shall be established with the Hooksett Sewer Commission prior to commencement of the technical review. The escrow fee shall not be construed as an estimate or cost of review, but an account from which review fees shall be paid. Should the escrow amount diminish to zero, all review effort shall be suspended until the escrow is re-established by the Applicant.

E. Application:

1. The Applicant shall meet with the Hooksett Sewer Commission and submit a USGS Topographic quadrangle of the at-large area (minimum surrounding 5 acres) of the proposed project. The map shall have the following features labeled clearly:

- Proposed project outline, pump station location
- Topographic drainage divide
- Topographic low point(s) within drainage area
- Force main route
- Existing sewer where force main will discharge
- Proposed average daily wastewater flow, using the Hooksett Sewer Commission methodology.

2. The Hooksett Sewer Commission shall review the application to determine whether sewer service is available in the proposed area. Should service be available, the topographic service zone shall be determined, based on the USGS quadrangle submitted by the Applicant. From this information, the Hooksett Sewer Commission shall determine

whether the applicant shall design and build a pump station of Class A or B. It is recommended that the Applicant make initial application prior to designing the sewer system and/or pump station.

3. When the design is approved, the Applicant shall submit to the Hooksett Sewer Commission, for signing, ten copies of plans and a filled out NHDES "Discharge Permit Request" with a check for any fees charged by NHDES. The Applicant may also submit additional plans for the Hooksett Sewer Commission signing for his or her own use. Construction must take place with signed plans. If the project involves work other than sewer, at least two of the six plans submitted must be "full sets" which depict all work taking place on site, including architectural, site, electrical, and other plans associated.
4. Prior to commencing construction, the Applicant shall obtain a sewer permit from the Hooksett Wastewater Treatment Plant Superintendent.

F. Pumping Facilities Prohibited: The following pump facilities shall not be permitted in Hooksett:

1. Pneumatic Ejector Stations
2. Low Pressure Force Main Systems: Any wastewater collection system which requires pumps located on individual private properties to serve those properties and which pumps to a common force main.

Existing homes to be converted to public sewer service from an on-site waste disposal system are exempt from this prohibition.

3. Pump stations are prohibited from any site which may be served by gravity sewers, whether existing or conceptual.

4.02 CLASS A PUMP STATIONS: Class A Pump Stations shall be wet well/dry well type stations, constructed of two completely separate chambers including a dry well to house pumps, motors, piping and valving systems, and any appurtenant equipment. Wet well shall store wastewater for cyclic or constant level (variable speed) pumping, and shall contain screening or comminution device for control of large solids.

- A. Class A Pump Stations shall have all controls, indication, compressors, and electrical equipment housed in an above-ground building, constructed over the dry well. The pumps, valves and associated hardware shall be placed in the lower level.

The control structure shall be built of 12 inch masonry block, with double access doors to building and wet well.

- B. Class A Pump Station shall be equipped with two (or more) vertical close coupled, non-clog type, pumps capable of passing 3-1/2 inch solids, with 460 volt, phase electric motor. Discharge elbow shall be cast iron, with a cleanout fitting. Mechanical seals shall be double carbon ceramic seals.
- C. Sewer inlet shall be equipped with either a bar rack, screen box, or comminutor.
- D. Dry wells shall be provided with lifting eyes in roof of station to enable removal of pumps. Lifting eyes shall be directly over each pump with a minimum of 36" clearance over the pump motor, to permit operating a lifting device.
- E. Pump station ladders shall be equipped with safety rails which extend through the hatch opening. Large or deep pump stations may be required to install "ship type" ladders for safety.
- F. Class A Pump Stations systems shall be controlled by bubbler tube system, with duplex air compressors.
- G. Class A Pump Stations shall be equipped with a standby generator. Maximum noise level is 65 decibels.
- H. Class A Pump Station dry well shall provide reserve space for a future additional pump. There shall be a suction line from the wet well to the dry well for the future pump as well, with a blind flange sealing the connection in the dry well.
- I. All electrical shall be explosion proof in the wet well.
- J. It is going to need a flow meter and a sump pump.

4.03 CLASS B PUMP STATIONS: Class B pump stations shall be duplex submersible pump stations with a separate wet well, valve pit, and below-ground emergency storage tank, or above-ground generator building. Class B pump stations shall conform to the following:

1. Pumps shall be of the submersible non-clog type capable of passing 3-1/2 inch solids complete with 460 volt, 3 phase electric motors, slip flange cast flange cast iron base plate assembly, and rail system for pump removal.
2. Pump control panel, indicators, annunciators and compressors shall be housed in an above-grade building. Building shall be constructed adjacent to the pump station, shall be minimum 10' x 10' dimension, built on a 4" concrete slab. Building shall be constructed of

pressure-treated lumber, block masonry or other approved material.

3. Pump controls and power cables shall be connected at a junction box placed outside of the wet well. Electrical connections within wet well not permitted.
4. Removal of pumps shall not require personnel to enter wet well.
5. Pump stations shall be equipped with davits, winches or other approved device for removal of pumps from station.
6. Class B Pump Station wet well level may be sensed by sealed mercury float switches or by "bubbler tube" system
7. For Class B Pump Stations equipped with pumps greater than 15 horsepower, a standby generator shall be provided as defined in Section 4.04 with pumps of 15 hp or less, an emergency Storage Tank shall be provided, as defined in Section 4.05.
8. Plans for Class B Pump Stations shall provide for a future pump station upgrade. Site space shall be reserved for future expansion to wet well/dry well (Class A) configuration as well as space for future standby generator. The site plan shall have reserve space clearly delineated and labeled.
9. All electrical equipment inside pump station shall be explosion proof.
10. Valve pit will have a check valve and gate valves for each pump. There will be one gate valve on each side of check valve. There will be a Bilco "SS" type hatch or equal.

4.04 STANDBY ELECTRIC GENERATOR: Standby generators shall be capable of powering all pumps, lights, blowers, sump pumps, compressors and other electrical devices associated with the pump station. The generator shall be in accordance with the following:

1. Stand-by generator shall be enclosed in a building, minimum dimension 10'x 10', with doorway opening adequate to permit complete replacement of unit.
2. Generators shall be powered by propane or natural gas. Liquid fuel generators are unacceptable.
3. Generators shall be equipped with exerciser to permit regular timed operation of the generator. Exerciser must be adjustable for length between exercise cycles and length

of exercise, and will cause lock out of power demand during exercise phase.

4. Generator shall be equipped with a control panel where all control switching and instrumentation shall be located. All generator functions shall be controlled and monitored from the panel and shall include override start-up or shut-down, test or other required operations. Start-up and shut-down switching (including manual override) shall include, respectively, automatic electrical load ramp-up and thermal cool-down phases to permit safe start-up and shut-down of generator.
5. Control panel shall be equipped with sensors, indicators and automatic shut-down of generator in the event of:
 - motor overtemperature
 - motor overspeed
 - low oil pressure
 - overcrank (failure to start)

All of the above-noted conditions constitute generator failure, and are considered pump station Alarm Condition, as defined in Part IV 4.06, B.

4.05 EMERGENCY STORAGE TANKS:

- A. Emergency Storage Tanks shall be designed to contain one half of an average day's flow (12 hours storage) or 10,000 gallons, whichever is greater, beginning no lower than the high water alarm level. Emergency Storage Tanks shall be capable of carrying H-20 wheel loads. The floor of the tank shall be sloped so as to effect complete drainage.
- B. Electrical connections shall be provided to the pump station enabling ready attachment by a mobile power generator. A manual transfer switch shall be provided which locks out the power supply while generator is operating.

4.06 PUMP STATION CONTROLS:

All pump station controls will be housed in a building, with minimum dimensions of 10' x 10'.

- A. Level Control: All wet well/dry well pump stations shall be controlled by means of a bubbler level control system, with duplex compressor units. Submersible pump stations may be controlled by mercury-float type switches.

B. Alarm Conditions: All pump stations shall be equipped with all sensing, control and annunciation equipment to accommodate alarm conditions as defined.

- Local Alarm: Local alarm condition shall be signaled by flashing exterior dome light, visible outside site fence, and shall be identified on annunciation panel at the site. Local alarm conditions are defined below.
- Common Alarm: Common alarm conditions are those conditions which must be signaled via telemetry system to security personnel, and are defined below:
- Alarm Conditions: The following are alarm conditions, and are defined as local alarm (LA) and common alarm (CA)
 - pump failure (LA, CA)
 - pump station low/high ambient temperature (LA)
 - high/low water in wet well (LA, CA)
 - loss of one or more phases of power supply (LA, CA)
 - high water in pump room sump (wet well/dry well pump stations only) (LA, CA)
 - loss of telemetry signal (LA, CA)
 - H2S or methane alarm (LA, CA)
 - generator running (LA)
 - generator failure (LA, CA)

High water alarms shall be detected by a separate float type switch independent of the bubbler control system.

- C. Telemetry: All pump stations shall be equipped with a telemetering system to signal Common Alarm (CA) condition. Telemetry shall be connected to Honeywell Security of Manchester, NH, and shall utilize a dedicated telephone connection. The power source for the telemetering and alarm system shall be an independent battery with continuous charge.
- D. All pump stations shall be equipped with main breaker and independent circuit breakers for each pump.
- E. All pump stations shall include hand-off-automatic switching, to permit complete override operation of all pumps. Automatic switching shall be run off wet well level, and shall include lead/lag alternation with manual lead/lag override options.
- F. Each pump shall have an independent hour meter, to record total length of pump operation.
- G. All pump stations shall be equipped with flow meter, 12" circular chart recorder and totalizer calibrated in gallons. Flow meter shall be magnetic type meter or similar approved device.

2. All interior metals, including structural steel, piping, railings, equipment and stairs:

1st Coat: 66-1211 Epoxokine primer on unpainted metal or touch-up (4.0 mils DFT)

2nd Coat: 66 Hi-Build Epoxoline (3.0 mils DFT)

3rd Coat: 66 Hi-Build Epoxoline (3.0 mils DFT)

3. All submerged ferrous metals:

Lightly hand-sand all shop-primed surfaces prior to touch-up painting or finish painting to provide proper bonding surface.

1st Coat: 66 Hi-Build Epoxoline on unpainted metal or touch-up (4.5 mils DFT)

2nd Coat: 104 H.S. Epoxy Coating (10.0 mils DFT)

3rd Coat: 104 H.S. Epoxy Coating (10.0 mils DFT)

4. PVC piping:

1st Coat: 66 Hi-Build Epoxoline (4.0 mils DFT)

5. Copper and bronze piping:

1st Coat: 32-1210 Tneme-Grip (Primer) (0.5 mils DFT)

2nd Coat: 66 Hi-Build Epoxoline (4.0 mils DFT)

3rd Coat: 66 Hi-Build Epoxoline (4.0 mils DFT)

6. Galvanized metals and aluminum:

1st Coat: 66 Hi-Build Epoxoline (4.0 mils DFT)

2nd Coat: 66 Hi-Build Epoxoline (4.0 mils DFT)

7. Painted woodwork and gypsum board:

1st Coat: 36-603 Undercoat (2.0 mils DFT)

2nd Coat: 23 Enduratone (2.0 mils DFT)

3rd Coat: 23 Enduratone (2.0 mils DFT)

4.10 ACCEPTANCE OF PUMP STATION INSTALLATIONS: Acceptance by the Hooksett Commission of pump station installations shall be in phases as defined below:

A. Substantial Completion: Substantial Completion is defined as that point at which all pump station equipment, including the force main, is fully operable; the installation has been started up and tested to the satisfaction of the Hooksett Sewer Commission. Minor site features such as site fence, paving, painting or finish items need not be complete.

1. Bond of Completion: Prior to finding Substantial Completion, the Hooksett Sewer Commission will estimate the value of remaining work to be completed. The Applicant shall supply a cash Bond of Completion to the Hooksett Sewer Commission, in the amount of the above estimate. No documents, promissory notes, letters of credit or instruments other than a cash bond will be accepted for the Bond of Completion. The Hooksett Sewer Commission shall act to finalize the installation. All expenses incurred in completing the Pump Station and Force Main shall be deducted from the bond. Should the bond be insufficient to effect completion, the Applicant remains financially responsible for completion.
2. Guarantee Bond: The Applicant shall guarantee the pump station against defects for a period of two years following Final Completion, and shall provide a cash Guarantee Bond to the Hooksett Sewer Commission in the amount of 10% of the pump station value. The bond shall cover the cost of any repair or service required of any part within the pump station site. The pump station value shall be subject to review and approval of the Hooksett Sewer Commission, prior to submission of an acceptable cash bond. No documents, promissory notes, letters of credit or instruments other than a cash bond will be accepted.
3. During the period after which Substantial Completion has been declared, but prior to Final Completion, the Applicant remains responsible for all maintenance and repair of the pump station.

During this period, the Hooksett Sewer Commission will operate the station, performing routine operational efforts and shall accept invoices for electrical and telephone service (not installation-related, nor repair charges).

4. Prior to finding Substantial Completion, the Applicant shall supply four (4) sets of manufacturer's Operation and Maintenance manuals for the pump station.

5. Upon Substantial Completion, properties served by this pump station whose sewers are fully accepted shall be considered as receiving sewer service.
- B. Final Completion: Final Completion is defined when all features of the pump station and force main whether defined on plan, in this document, or the Hooksett Sewer Commission Sewer Use Ordinance, are fully complete, as found by the Hooksett Sewer Commission.
1. When the Applicant believes the project to be fully completed, he/she shall petition the Hooksett Sewer Commission for acceptance.
 2. Prior to finding Final Completion, the Hooksett Sewer Commission must receive:
 - Complete As-Built plans of Pump Station and Force Main, stamped by a registered Professional Engineer.
 - Legally defined Deed of pump station site (deeded to the Hooksett Sewer Commission).
 - Legally defined easements for force main (if required).
 3. A complete package of manufacturer's recommended spare parts. At a minimum, such parts shall include:
 - one of each type of seal used
 - one of each type of wear ring used
 - one of each type of O-ring, or rubber seal used
 - one gallon of any paint used, in the same color.
 4. Upon Final Completion, the Applicant shall be returned the Bond of Completion minus any outstanding debt owed to the Hooksett Sewer Commission in relation to the project at large.

PART V - FORCE MAINS

5.01 GENERAL:

- A. Whenever possible, force mains shall be installed with positive slope without high or low points.
- B. Engineer shall include design calculations to support pressure class of pipe design.
- C. Force Main shall be 4-inch diameter and larger.

5.02 MATERIALS:

- A. Plastic Pipe: PVC pressure pipe shall conform to AWWA C900. Fittings shall be ductile iron with a minimum working pressure of 350 psi and have restrained mechanical joints (retainer glands).
- B. Ductile Iron Pipe: Ductile iron pipe shall be AWWA Class 52 with push-on joints. Ductile iron fittings shall have a minimum working pressure of 350 psi and have restrained mechanical joints (retainer glands).
- C. Trench Material: Force main bedding and sand blanket shall be the same as for gravity pipe (see Part III, 3.01, H)
- D. Accessories: Accessories such as gaskets, glands, nuts, bolts, etc. shall be provided as required to make the installation complete.
- E. Flexible Couplings: Flexible couplings shall be constructed of ductile iron with stainless steel nuts and bolts. Couplings shall be Rockwell 441, Ford 501, or comparable Dresser model.
- F. Gate Valves: Gate valves shall be of the resilient seat type with neoprene seat and cast iron body. The valves shall be epoxy coated and be designed in accordance with AWWA C502. Valves shall have restrained mechanical joints (retainer glands), 2-inch square operating nut, and have a working pressure of 175 psi. Valves shall open left and have a non-rising stem.
- G. Valve Boxes: Each exterior valve shall be provided with a valve box and cover. The box shall be constructed of cast iron and be adjustable. The word "SEWER" shall be cast into the covers.
- H. Handling and Storage: All materials shall be handled and stored in accordance with the manufacturer's recommendations.
- I. Air Release Valves: Air release valves shall be within manhole. Air release valves shall be of cast iron construction with brass internal parts, as manufactured by APCO or approved equal. Air release valves shall be located at topographic high points.
- J. Cleanouts: Cleanouts shall be located at all topographic low points. Cleanouts shall be installed in minimum 5' diameter manholes, with two cast iron wyes installed on the force main, to provide access for cleanout in two directions. Branches of both wyes shall be fitted with blind flanges, and wyes shall be set at slightly opposing angles, for ease of access. Branches shall be same diameter as force main. Wyes shall be connected to force main with Uniflange or equal flange adaptor.

5.03 INSTALLATION:

- A. Bedding, excavation and backfilling shall conform to the same standards as gravity pipe (Section Part III, 3.02, F).
- B. Deflection of force mains shall not exceed maximum deflection as recommended by the pipe manufacturer.

PART VI - TESTING

6.01 SEWERS:

A. Leakage Testing of Sewers:

1. General:

- a. Gravity sewers shall be tested with low pressure air.
- b. The Contractor shall have the proper plugs, and other equipment required to perform all tests as required by the Commission/Engineer. Testing of each section of sewer installed include the portions of service connections that are to be installed under the Contract.
- c. No more than 1,000 feet of sewer main is to be laid before testing.
- d. After completing backfilling of the sanitary sewer, the Contractor shall, at his expense, conduct a line acceptance test using low pressure air. The test shall be performed according to stated procedures and in the presence of the Commission/Engineer.

2. Leakage Testing Procedures:

- a. Flush and clean the line prior to testing, to wet the pipe surface and clean out debris.
- b. All pneumatic plugs shall be seal tested before being used in the actual test installation. One (1) length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 24 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
- c. After a manhole to manhole reach of the pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25

psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.

- d. After the stabilization period (4.0 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "acceptable" if the time required in minutes for the pressure to decrease from 4.0 to 3.0 psig (greater than the average back pressure of any groundwater that may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

<u>Pipe in Diameter (In inches)</u>	<u>Minutes</u>
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.5
24	11.5

- e. In areas where groundwater is known to exist, the Contractor shall install a one-half inch diameter capped pipe nipple, approximately 10" long through the manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The hose shall be held vertically and a measurement of the height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psig, and the 4.0 psig test pressure will be 9.0 psig. The allowable drop of one pound and the timing remain the same.
- f. If the installation fails the air test, the Contractor shall at his expense, determine the source of leakage. He shall then repair or replace all defective materials and/or workmanship. The line shall then be retested.

3. Deflection Tests:

PVC sewer pipe shall be diametrically gauged for excessive deflection after installation and backfill to insure sufficient settlement of the trench backfill material by passing a properly sized "go, no-go" mandrel through the installed sewers. The total length of each pipe size used shall be tested. Any pipe found to have greater than 5% diametrical deflection shall not be accepted.

4. Video Camera:

All pipelines will be subject to the scrutiny of a video inspection prior to acceptance. Water must be flushed through the line to be observed immediately prior to a video run. The video inspection will be at the Contractor's expense.

6.02 MANHOLES:

A. Leakage Test of Manholes:

1. General: Leakage test shall be made and observed by the Commission/Engineer on each manhole. The test shall be a Vacuum Test at all manholes. All testing shall be done prior to backfilling the manhole except when so ordered by the Commission/Engineer
2. Vacuum Test Procedure:
 - a. The testing shall be done after assembly of the manhole.
 - b. The manhole-to-pipe connection shall be flexible connector, such as the Kor-N-Seal or approved equal.
 - c. A 60 inch-lb. torque wrench shall be used to tighten the external clamps.
 - d. All lift holes and inside joints shall be plugged with a non-shrinking mortar, as approved by the Engineer.
 - e. The seal between manhole sections shall be sealed with a double row of Kent Seal No. 2.
 - f. The Contractor shall plug the pipe openings, taking care to securely brace the plugs and the pipe.
 - g. With the vacuum tester set in place:
 1. Inflate the compression band to effect a seal between the vacuum base and the structure.

2. Connect the vacuum pump to the outlet port with the valve open.
 3. Draw a vacuum to 10" of Hg.
 4. Close the valve.
 5. Record the time required for the vacuum pressure to drop from 10" of Hg to 9" of Hg.
- h. Each manhole shall pass the leakage test if the time required to drop from 10" of Hg to 9" of Hg is equal to or greater than the following times per manhole depth classification:

<u>Manhole Depth (ft)</u>	<u>Time (Seconds)</u>
0 - 10	120
10 - 15	150
15 - 20	180
20 - 25	210

- i. If the manhole does not pass the test, it shall be repaired and retested, at the Owner/Contractor's expense.

6.03 FORCE MAINS: All force mains shall be hydrostatically tested according to the following AWWA C600 Section 4:

A. Pressure and Leakage Test:

1. Pressure Test Restrictions:

- a. Test pressure shall not be less than 1.25 times the working pressure at the highest point.
- b. Test pressure shall not exceed pipe or thrust-restraint design.
- c. The hydrostatic test shall be of at least 2 hour duration.
- d. Test pressure shall not vary by more than 5 psi (35 MPa or 0.35 bar) for the duration of the test.
- e. Valves shall not be operated in either direction at differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests at these pressures, the test setup should include provision, independent of the valve, to reduce

the line pressure to the rated valve pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.

- f. Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.
2. Pressurization: After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing. Each valved section of pipe shall be slowly filled with water, and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the owner. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.
3. Air Removal: Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the Superintendent/Engineer.
4. Examination: Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the Superintendent/Engineer.
5. Leakage Defined: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi (35 MPa or 0.35 bar) of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

6. Allowable Leakage for Ductile Iron and PVC Force Mains:

- a. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{133,200}$$

Where:

L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during the leakage test, in pounds per square inch (gauge).

This formula is based on an allowable leakage of 11.65 gpd/mi/in. of nominal diameter at a pressure of 150 psi.

- b. Allowable leakage at various pressures is shown in Table 6.

Table 6 Allowable Leakage per 1000 ft (305 m) of Pipeline*—gph/ft

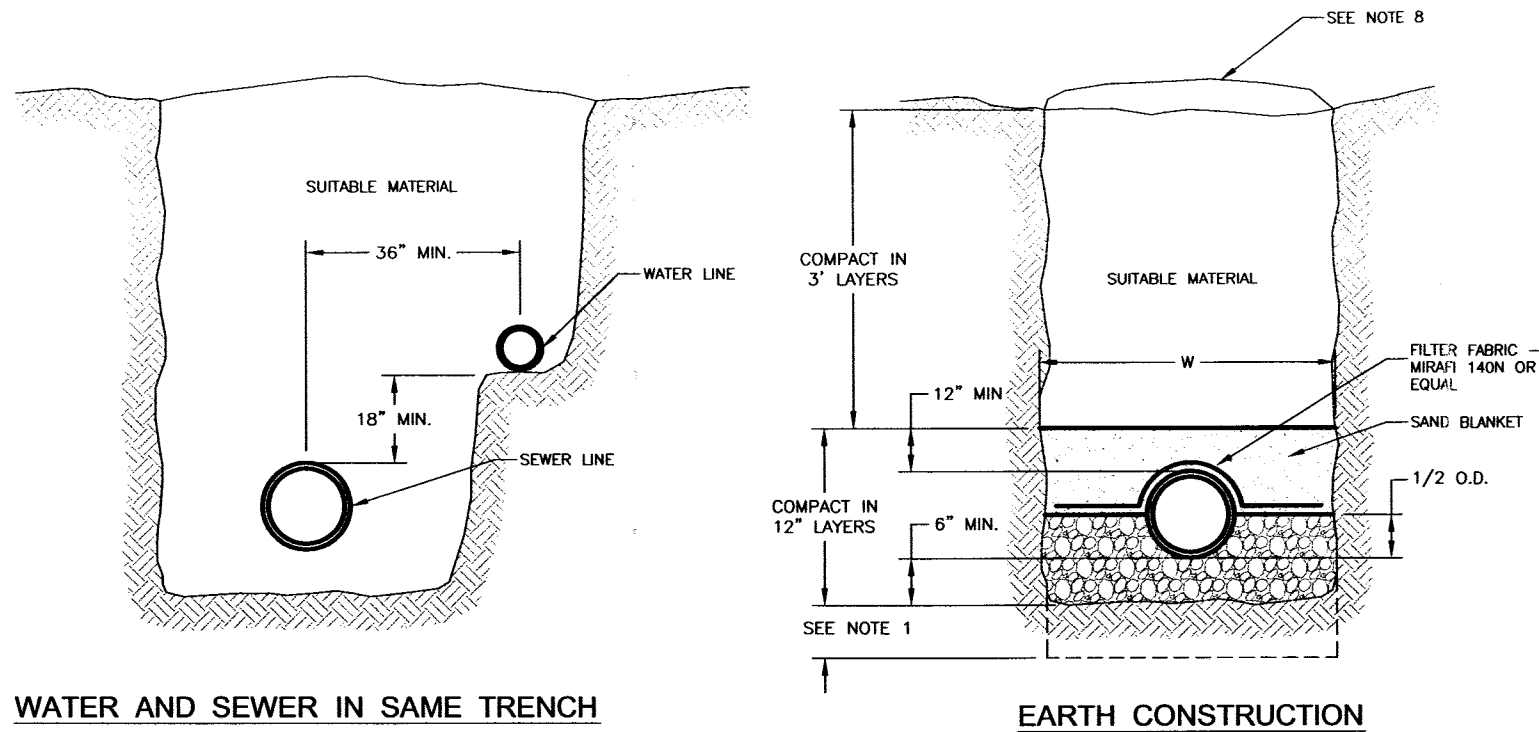
Avg. Test Pressure psi (bar)	Nominal Pipe Diameter—in.															
	.3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	64
450 (31)	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82	4.78	5.73	6.69	7.64	8.60
400 (28)	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11
350 (24)	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58
300 (21)	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02
275 (19)	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72
250 (17)	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225 (16)	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	4.73	5.41	6.03
200 (14)	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175 (12)	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150 (10)	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125 (9)	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100 (7)	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.26	2.70	3.15	3.60	4.05

- c. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gph/in. or nominal valve size shall be allowed.

- d. When hydrants are in the test section, the test shall be made against closed hydrant valves.

7. Acceptance of Installation:

- a. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified in Section 6, the Contractor shall, at his own expense, locate and make approved repairs as necessary until the leakage is within the specified allowance .
- b. All visible leaks are to be repaired, regardless of the amount of leakage.



NOTES:

1. JOINTS SHALL BE DEPENDENT ON A NEOPRENE OR ELASTOMETRIC GASKET FOR WATER TIGHTNESS. ALL JOINTS SHOULD BE PROPERLY MATCHED WITH THE PIPE MATERIALS USED. WHERE DIFFERENT MATERIALS ARE TO BE CONNECTED AT THE STREET SEWER OR AT THE FOUNDATION WALL, APPROPRIATE MANUFACTURED ADAPTERS SHALL BE USED.

2. WYES: WHERE A WYE IS NOT AVAILABLE IN THE EXISTING STREET SEWER, AN APPROPRIATE CONNECTION SHALL BE MADE, FOLLOWING THE MANUFACTURER'S INSTRUCTIONS, USING A BOLTED, CLAMPED, OR EPOXY CEMENTED SADDLE TOPPED INTO A SMOOTHLY DRILLED OR SAWED OPENING IN THE SEWER. THE PRACTICE OF BREAKING IN AN OPENING WITH A SLEDGE HAMMER, STUFFING CLOTH OR OTHER SUCH MATERIAL AROUND THE JOINT, OR EXPECTING MORTAR TO HOLD THE CONNECTION, AND OTHER SUCH CRUDE PRACTICES OR INEPT HASTY IMPROVISATIONS WILL NOT BE PERMITTED. THE CONNECTION SHALL BE CONCRETE ENCASED AS SHOWN IN THE DETAIL.

3. PIPE INSTALLATION: THE PIPE SHALL BE HANDLED, PLACED, AND JOINTED, IN ACCORDANCE WITH INSTALLATION GUIDES OF THE APPROPRIATE MANUFACTURER. IT SHALL BE CAREFULLY BEDDED ON A 4 INCH LAYER OF CRUSHED STONE AND/OR GRAVEL, AS SPECIFIED IN NOTE 7. BEDDING AND RE-FILL FOR A DEPTH OF 12 INCHES ABOVE THE TOP OF THE PIPE SHALL BE CAREFULLY AND THOROUGHLY TAMPED BY HAND OR WITH THE APPROPRIATE MECHANICAL DEVICES. THE PIPE SHALL BE LAID AT A CONTINUOUS AND CONSTANT GRADE OF NO LESS THAN 1/8 INCH PER FOOT. PIPE JOINTS MUST BE MADE UNDER DRY CONDITIONS. IF WATER IS PRESENT, ALL NECESSARY STEPS SHALL BE TAKEN TO DEWATER THE TRENCH.

4. TESTING: THE COMPLETED HOUSE SEWER SHALL BE SUBJECTED TO A LEAKAGE TEST IN ANY OF THE FOLLOWING MANNERS:
(PRIOR TO BACKFILLING)

A. AN OBSERVATION TEE SHALL BE INSTALLED AS SHOWN AND, WHEN READY FOR TESTING, AN INFLATABLE BLADDER OR SHALL BE INSERTED JUST UPSTREAM FROM THE OPENING IN THE TEE. AFTER INFLATION, WATER SHALL BE INTRODUCED INTO THE SYSTEM TO A HEIGHT OF 5 FEET ABOVE THE LEVEL OF THE PLUG.

B. THE PIPE SHALL BE LEFT EXPOSED AND LIBERALLY HOSED WITH WATER TO SIMULATE, AS CLOSELY AS POSSIBLE, WET TRENCH CONDITIONS OR. IF THE TRENCH IS WET, THE GROUND WATER SHALL BE PERMITTED TO RISE IN THE TRENCH OVER THE PIPE. INSPECTION FOR LEAKS SHALL BE MADE THROUGHOUT THE CLEAN OUT WITH A FLASHLIGHT.

C. DRY FLUORESCENCE DYE SHALL BE SPRINKLED INTO THE TRENCH OVER THE PIPE. IF THE TRENCH IS DRY, THE PIPE SHALL BE LIBERALLY HOSED WITH WATER OR, IF THE TRENCH IS WET, GROUND WATER SHALL BE PERMITTED TO RISE IN TRENCH OVER THE PIPE. OBSERVATIONS FOR LEAKS SHALL BE MADE IN THE FIRST DOWNSTREAM MANHOLE.

LEAKAGE OBSERVED IN ANY OF THE ABOVE TESTS SHALL BE CAUSE FOR NON-ACCEPTANCE AND THE PIPE SHALL BE DUG UP, IF NECESSARY AND RE-LAID SO AS TO ASSURE WATER TIGHTNESS.

5. ILLEGAL CONNECTION: NOTHING BUT SANITARY WASTE FLOW FROM HOUSE TOILETS, SINKS, LAUNDRY, ETC. SHALL BE PERMITTED. ROOF LEADERS, FOOTING DRAINS, SUMP PUMPS, OR ANY OTHER SIMILAR CONNECTION CARRYING RAIN WATER, DRAINAGE, OR GROUND WATER SHALL NOT BE PERMITTED.

6. HOUSE WATER SERVICE SHOULD NOT BE LAID IN THE SAME TRENCH AS SEWER SERVICE BUT, WHEN NECESSARY, SHALL BE PLACED ABOVE AND TO ONE SIDE OF THE HOUSE SEWER AS SHOWN.

7. BEDDING: SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATERIAL, AND MEETING ASTM C33-67.

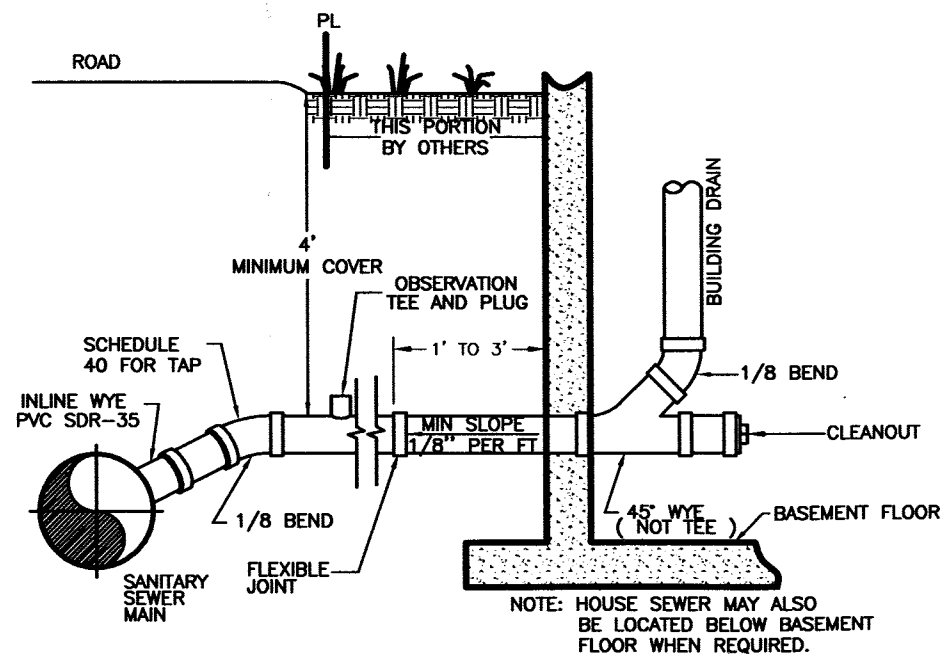
100% PASSING	1 INCH SCREEN
90-100% PASSING	3/4 INCH SCREEN
20-55% PASSING	3/8 SCREEN
0-10% PASSING	#4 SIEVE
0-5% PASSING	#8 SIEVE

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

8. LOCATION: THE LOCATION OF THE WYE SHALL BE RECORDED AND FILED WITH THE SEWER DEPARTMENT. IN ADDITION, A METALIC TAPE SHALL BE PLACED OVER THE PIPE TO THE WYE TO AID IN LOCATING THE BURIED PIPE.

9. CHIMNEYS: NOT PERMITTED.

10. SEWER SERVICE AND CLEAN OUT TO BE CONSTRUCTED AT TIME OF SEWER MAIN CONSTRUCTION TO EACH PROPOSED AND EXISTING LOT SERVICE TO BE BROUGHT TO RIGHT OF WAY LINE.

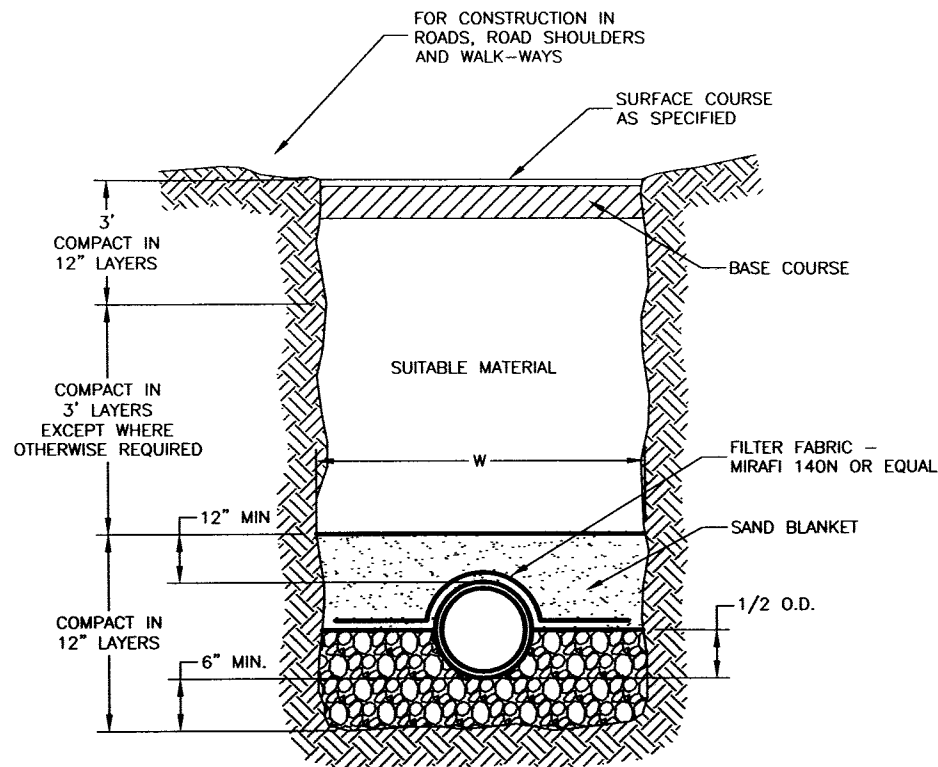


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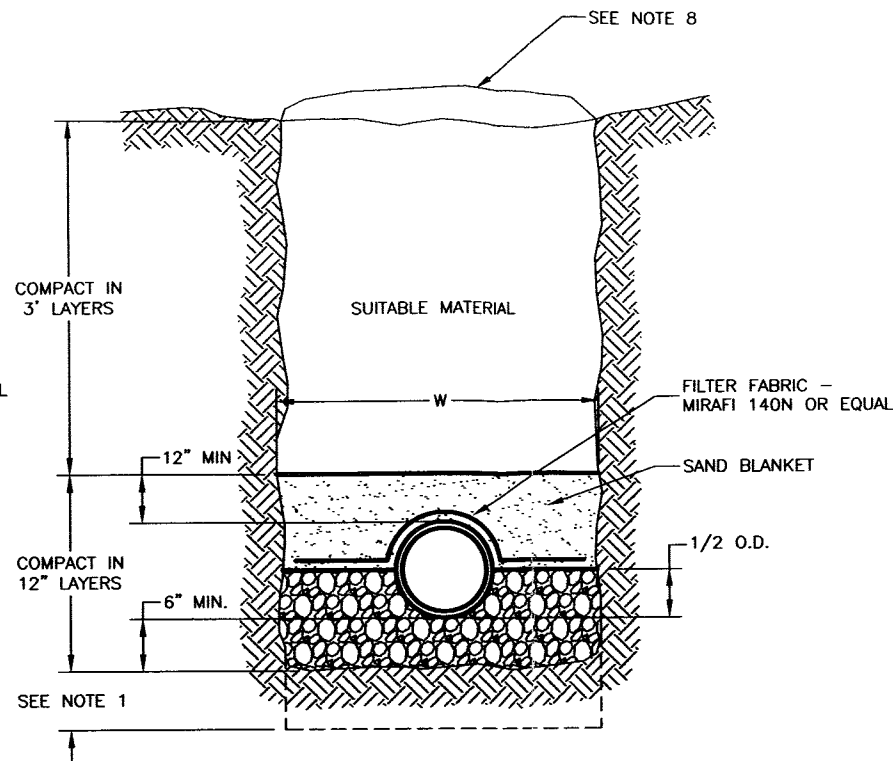
TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS
**SEWER SERVICE - TYPICAL
DETAIL**

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LEDGE CONSTRUCTION



EARTH CONSTRUCTION

NOTES:

1. ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE. REFILL WITH BEDDING MATERIAL. SEE ALSO NOTE 7.

BEDDING: SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATERIAL, AND MEETING ASTM C33-67.

100% PASSING	1 INCH SCREEN
90-100% PASSING	3/4 INCH SCREEN
20-55% PASSING	3/8 SCREEN
0-10% PASSING	#4 SIEVE
0-5% PASSING	#8 SIEVE

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

2. SAND BLANKET: CLEAN SAND FREE FROM ORGANIC MATTER, SO GRADED THAT 90-100% PASSES A 1/2 SIEVE AND NOT MORE THAN 15% WILL PASS A #200 SIEVE. BLANKET MAY BE OMITTED FOR CAST-IRON, DUCTILE IRON, AND REINFORCED CONCRETE PIPE PROVIDED, HOWEVER, THAT NO STONE LARGER THAN 2\"/>

3. FILTER FABRIC SHALL BE INSTALLED ABOVE PIPE - MIRAFI 140N OR EQUAL.

4. SUITABLE MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS, AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS, PIECES OF PAVEMENT, ORGANIC MATTER, TOP SOIL, ALL WET OR SOFT MUCK, PEAT, OR CLAY, ALL EXCAVATED LEDGE MATERIAL, AND ALL ROCKS OVER 6\"/>

IN CROSS COUNTRY CONSTRUCTION, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, MUCK, OR PEAT. IF HE IS SATISFIED THAT THE CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE SEWER FOR MAINTENANCE AND POSSIBLE RECONSTRUCTION, WHEN NECESSARY WILL BE PRESERVED.

5. BASE COURSE, IF ORDERED BY THE ENGINEER, SHALL MEET THE REQUIREMENTS OF DIVISION 300 OF THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION OF THE STATE OF NEW HAMPSHIRE, DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS.

6. WOOD SHEETING: IF REQUIRED, WHERE SHEETING IS PLACED ALONGSIDE THE PIPE AND EXTENDS BELOW MID-DIAMETER, IT SHALL BE CUT OFF AND LEFT IN PLACE AT AN ELEVATION NOT LESS THAN 1 FOOT ABOVE THE TOPE OF THE PIPE. WHERE SHEETING IS ORDERED BY THE ENGINEER TO BE LEFT IN PLACE, IT SHALL BE CUT OFF AT LEAST 3 FEET BELOW THE FINISHED GRADE, BUT NOT LESS THAN 1 FOOT ABOVE THE TOP OF THE PIPE.

7. W = MAXIMUM ALLOWABLE TRENCH WIDTH TO A PLANE 12 INCHED ABOVE THE PIPE. FOR PIPES 15 INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 36 INCHES; FOR PIPES GREATER THAN 15 INCHES NOMINAL DIAMETER, W SHALL BE 24 INCHES PLUS PIPE O.D. W SHALL BE THE PAYMENT WIDTH FOR LEDGE EXCAVATION AND FOR ORDERED EXCAVATION BELOW GRADE.

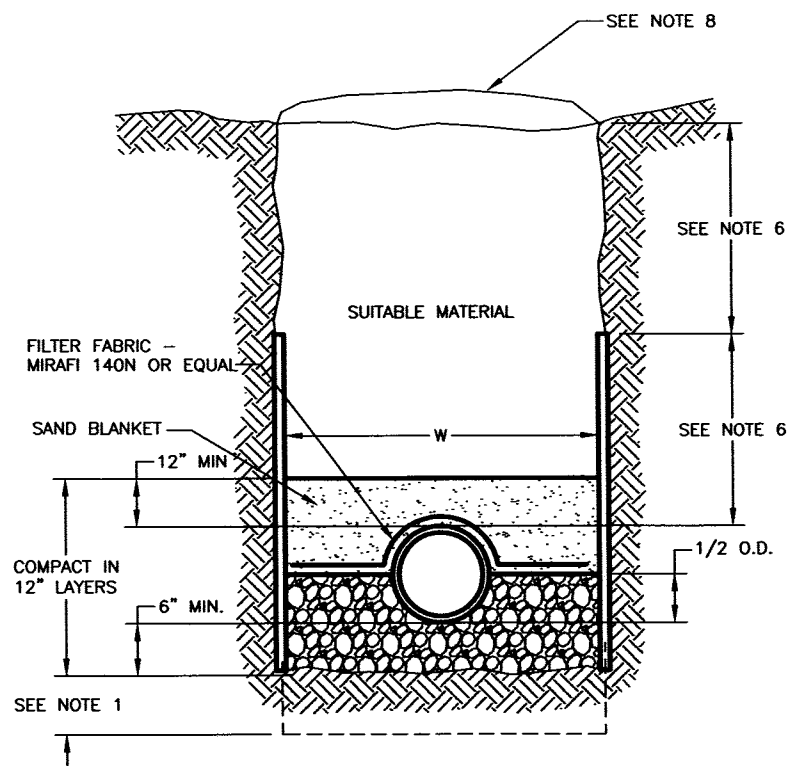
8. FOR CROSS COUNTRY CONSTRUCTION, BACKFILL OR FILL SHALL BE MOUNDED TO A HEIGHT OF 6 INCHES ABOVE THE ORIGINAL GROUND SURFACE.

9. NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL PROTECTION SERVICES DESIGN STANDARDS REQUIRE 10 FT SEPARATION. HOWEVER, SHOULD CONSTRUCTION OR OPERATIONS REVEAL OR EXPOSE A WATERLINE (MAIN OR SERVICE) RUNNING APPROXIMATELY PARALLEL AND LESS THAN 10 FEET HORIZONTALLY FROM THE PROPOSED SEWER INSTALLATION AND WHERE IT IS NOT PRACTICAL TO RELOCATE THE SEWER, THE FOLLOWING METHODS OF PROTECTION MUST BE EMPLOYED.

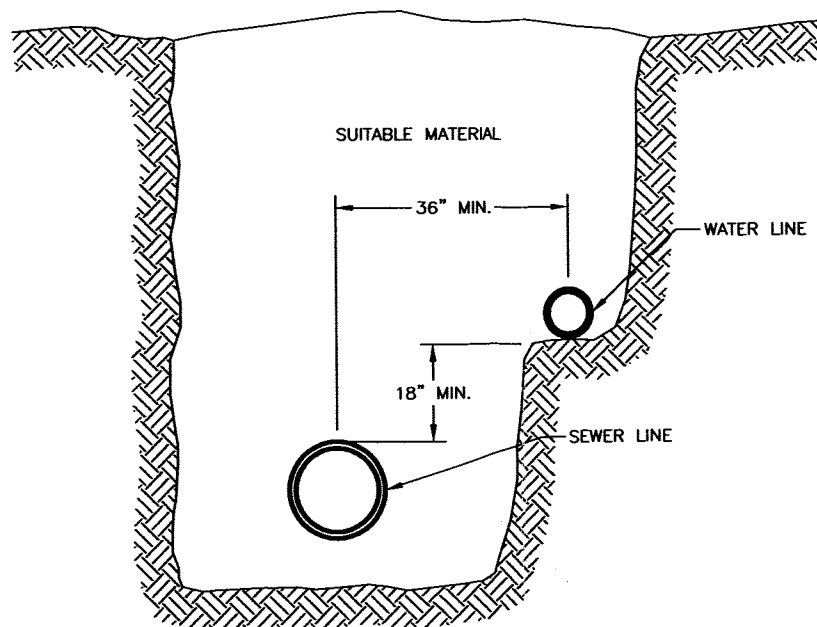
- A. SEWER PIPE SHALL BE CLASS 52 DUCTILE IRON PIPE.
- B. JOINTS SHALL BE PRESSURE TESTED WITH ZERO LEAKAGE AT 25 POUNDS PER SQUARE INCH FOR GRAVITY SEWERS, AND TIMES WORKING PRESSURE FOR FORCE MAINS.

10. WHERE WATER LINES AND SEWER LINES CROSS, THEY SHALL CROSS AS PERPENDICULAR AS POSSIBLE AND THE WATER MAIN SHALL CROSS AT LEAST 18 INCHES ABOVE THE SEWER. FURTHER, THE SEWER JOINTS SHALL BE LOCATED AT LEAST 9 FEET HORIZONTALLY FROM THE WATER MAIN. SEWER JOINTS SHALL BE PRESSURE TESTED WITH ZERO LEAKAGE AT 25 POUNDS PER SQUARE INCH FOR GRAVITY SEWERS, AND 1-1/2 TIMES WORKING PRESSURE FOR FORCE MAINS.

11. ALL SEWERS AT 8% OR GREATER SLOPE SHALL HAVE TRENCH DAMS INSTALLED.



EARTH CONSTRUCTION WITH SHEETING



WATER AND SEWER IN SAME TRENCH

(SPECIAL CONDITIONS SEE NOTE 10)

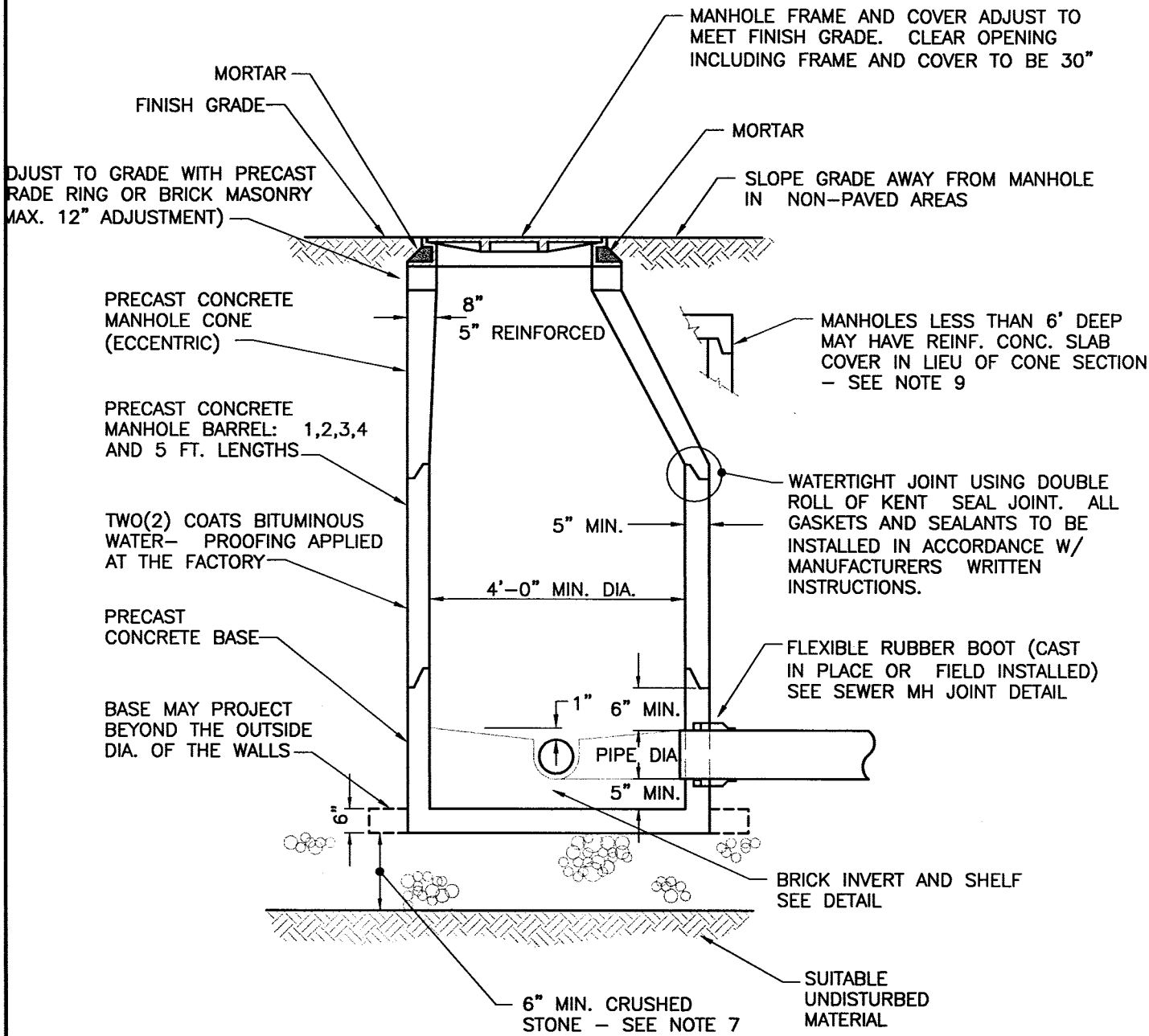
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TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS
STANDARD TRENCH SECTIONS

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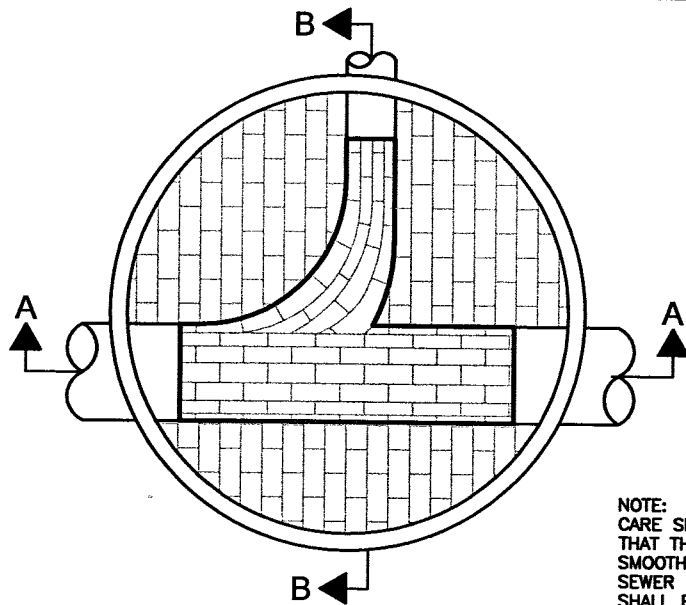
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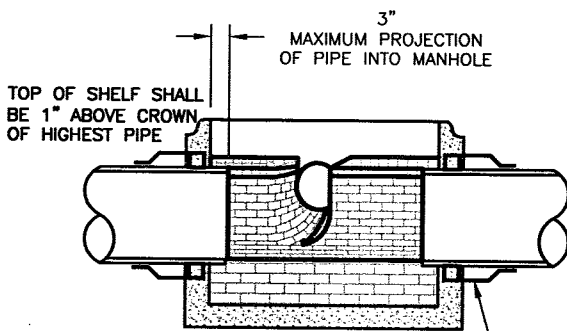
NOTE: MANHOLE STRUCTURE TO BE CAPABLE OF SUPPORTING AASHTO H-20 LOADING

DRAWN BY: GFT	TOWN OF HOOKSETT, NEW HAMPSHIRE DESIGN SPECIFICATIONS SEWER MANHOLE STANDARD DETAIL	REV. DATE:
CHECKED BY:		REV. DATE:
APPROVED BY:		SCALE: NTS
PLOT SCALE: 1:1		DATE: JULY, 2001
CAD FILE: S-01		FIGURE: S-01 A



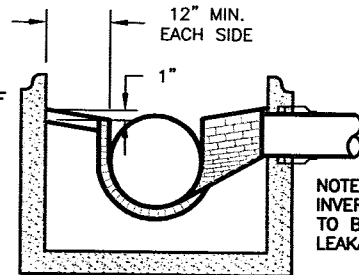
PLAN VIEW

NOTE:
CARE SHALL BE TAKEN TO ENSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE SEWER INVERT. INVERT BRICKS SHALL BE LAID ON EDGE.



SECTION A-A

SEE SEWER MANHOLE JOINT DETAIL



SECTION B-B

NOTE:
INVERT AND SHELF TO BE PLACED AFTER LEAKAGE TEST

NOTES:

- IT IS THE INTENTION OF THE COMMISSION THAT THE MANHOLE, INCLUDING ALL COMPONENT PARTS, HAVE ADEQUATE SPACE, STRENGTH, AND LEAKPROOF QUALITIES CONSIDERED NECESSARY BY THE COMMISSION FOR THE INTENDED SERVICE. SPACE REQUIREMENTS AND CONFIGURATIONS SHALL BE AS SHOWN ON THE DRAWING. MANHOLES MAY BE AN ASSEMBLY OF PRECAST SECTIONS, WITH OR WITHOUT STEEL REINFORCEMENT, WITH ADEQUATE JOINTING, OR CONCRETE CAST MONOLITHICALLY IN PLACE WITH OR WITHOUT REINFORCEMENT. IN ANY APPROVED MANHOLE, THE COMPLETE STRUCTURE SHALL BE OF SUCH MATERIAL AND QUALITY AS TO WITHSTAND H-20 LOADING WITHOUT FAILURE AND PREVENT LEAKAGE IN EXCESS OF ONE GALLON PER DAY PER VERTICAL FOOT OF MANHOLE, CONTINUOUSLY FOR THE LIFE OF THE STRUCTURE, A PERIOD GENERALLY IN EXCESS OF 25 YEARS IS TO BE UNDERSTOOD IN BOTH CASES.
- BARRELS AND CONE SECTIONS SHALL BE PRECAST REINFORCED OR NON-REINFORCED CONCRETE, OR POURED IN PLACE REINFORCED OR NON-REINFORCED CONCRETE.
- PRECAST CONCRETE BARREL SECTIONS, CONES, AND BASES SHALL CONFORM TO ASTM C478.
- LEAKAGE TESTS SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS.
- INVERTS AND SHELVES: MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT, CONSTRUCTED TO CONFORM TO THE SIZE OF PIPE AND FLOW AT CHANGES IN DIRECTION. INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST RADIUS POSSIBLE TANGENT TO THE CENTER LINE OF THE SEWER PIPES. SHELVES SHALL BE CONSTRUCTED TO THE ELEVATION OF THE HIGHEST PIPE CROWN AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL. UNDERLAYMENT OF INVERT SHELF SHALL CONSIST OF BRICK MASONRY.
- MANHOLE FRAMES AND COVERS SHALL BE OF HEAVY DUTY DESIGN AND PROVIDE A 30" CLEAR OPENING. A 3" (MINIMUM HEIGHT) LETTER "S" FOR SEWERS OR "D" FOR DRAIN SHALL BE PLAINLY CAST INTO THE CENTER OF EACH COVER. MANHOLE COVERS SHALL HAVE NO PENETRATING PICK HOLES.
- BEDDING: SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33

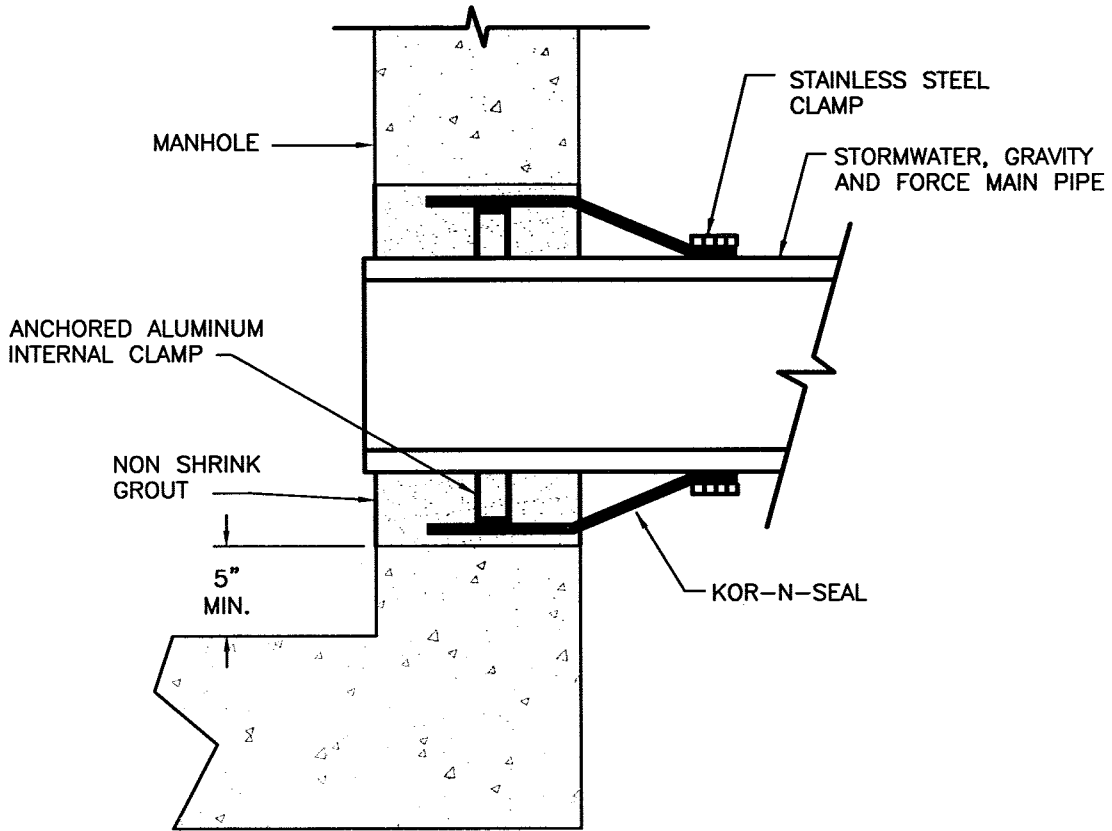
100% PASSING 1 INCH SCREEN	0-10% PASSING 4 SIEVE
90-100% PASSING 3/4 INCH SCREEN	0-5% PASSING 8 SIEVE
20-55% PASSING 3/8 INCH SCREEN	0% PASSING #2 SIEVE

 WHERE ORDERED BY THE ENGINEER TO STABILIZE THE BASE SCREENED GRAVEL OR CRUSHED STONE 1 1/2 INCH CRUSHED STONE SHALL BE USED.
- IN LIEU OF A CONE SECTION, WHEN MANHOLE DEPTH IS LESS THAN 6 FEET, A REINFORCED CONCRETE SLAB COVER MAY BE USED HAVING AN ECCENTRIC ENTRANCE OPENING AND CAPABLE OF SUPPORTING H-20 LOADS.

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CHECKED BY:			REV. DATE:	
APPROVED BY:			SCALE:	NTS
PLOT SCALE:	1:1		DATE:	JULY, 2001
CAD FILE:	S-02		FIGURE:	S-02 A

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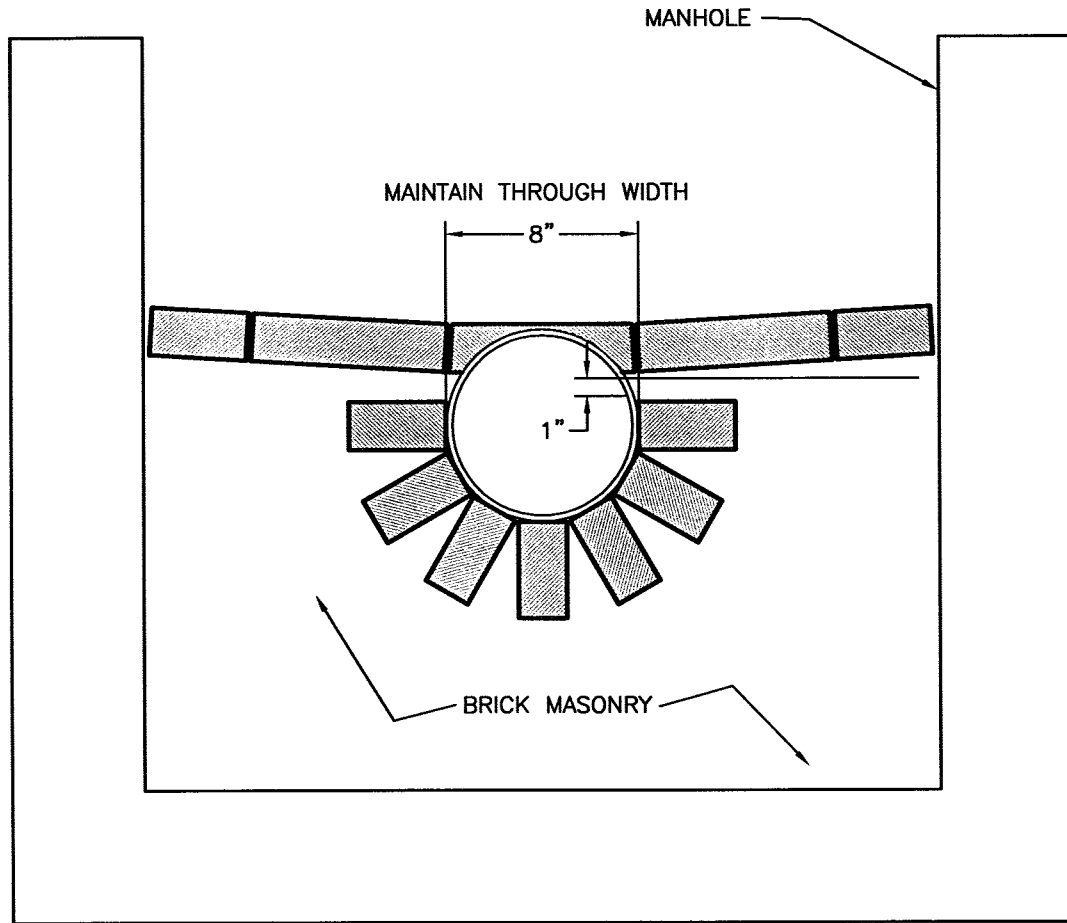


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APPROVED BY:	
PLOT SCALE:	1:1
CAD FILE:	S-03

TOWN OF HOOKSETT, NEW HAMPSHIRE
 DESIGN SPECIFICATIONS
**SEWER MANHOLE
 JOINT DETAIL**

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	S-03 A

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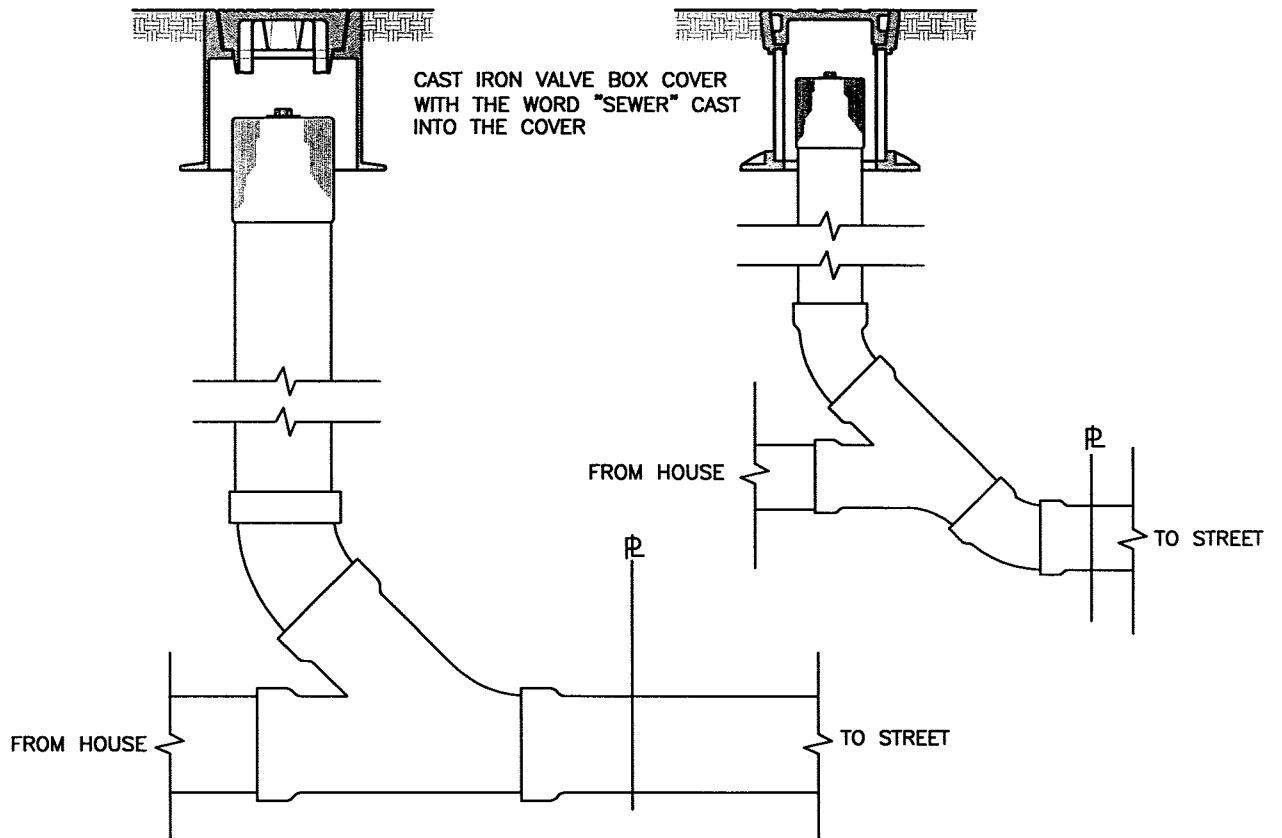


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CHECKED BY:	
APPROVED BY:	
PLOT SCALE:	1:1
CAD FILE:	S-04

TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS
**SEWER MANHOLE BRICK SHELF
AND INVERT CONSTRUCTION**

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	S-04 A

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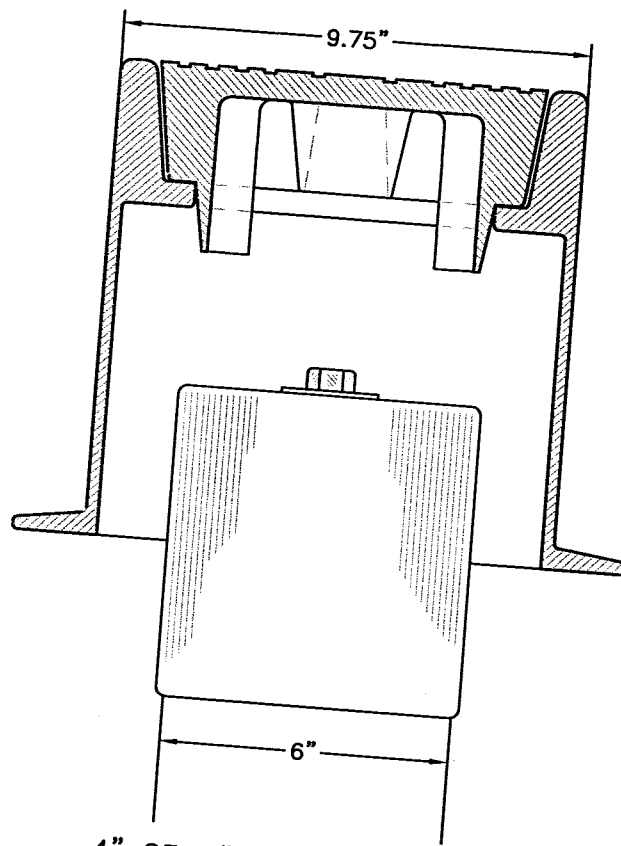
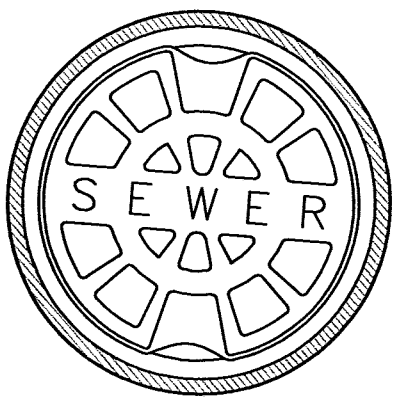
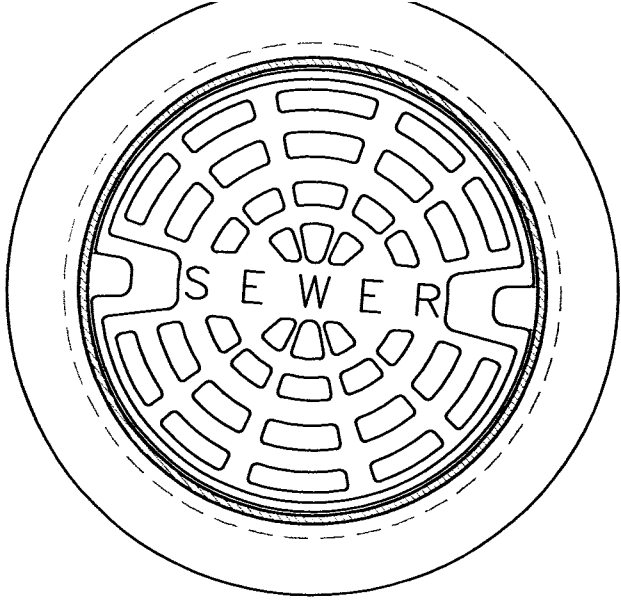


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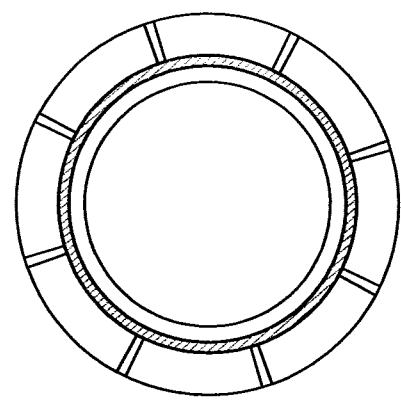
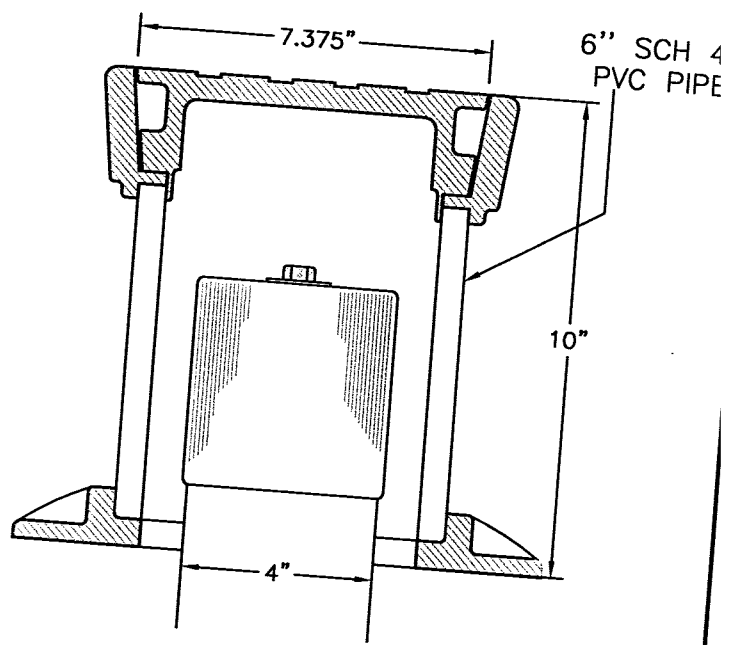
TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS

**SEWER SERVICE
CLEANOUT DETAIL**

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	S-08 A



4" OR 6" IN PAVED AREAS



LAWN AREA STYLE

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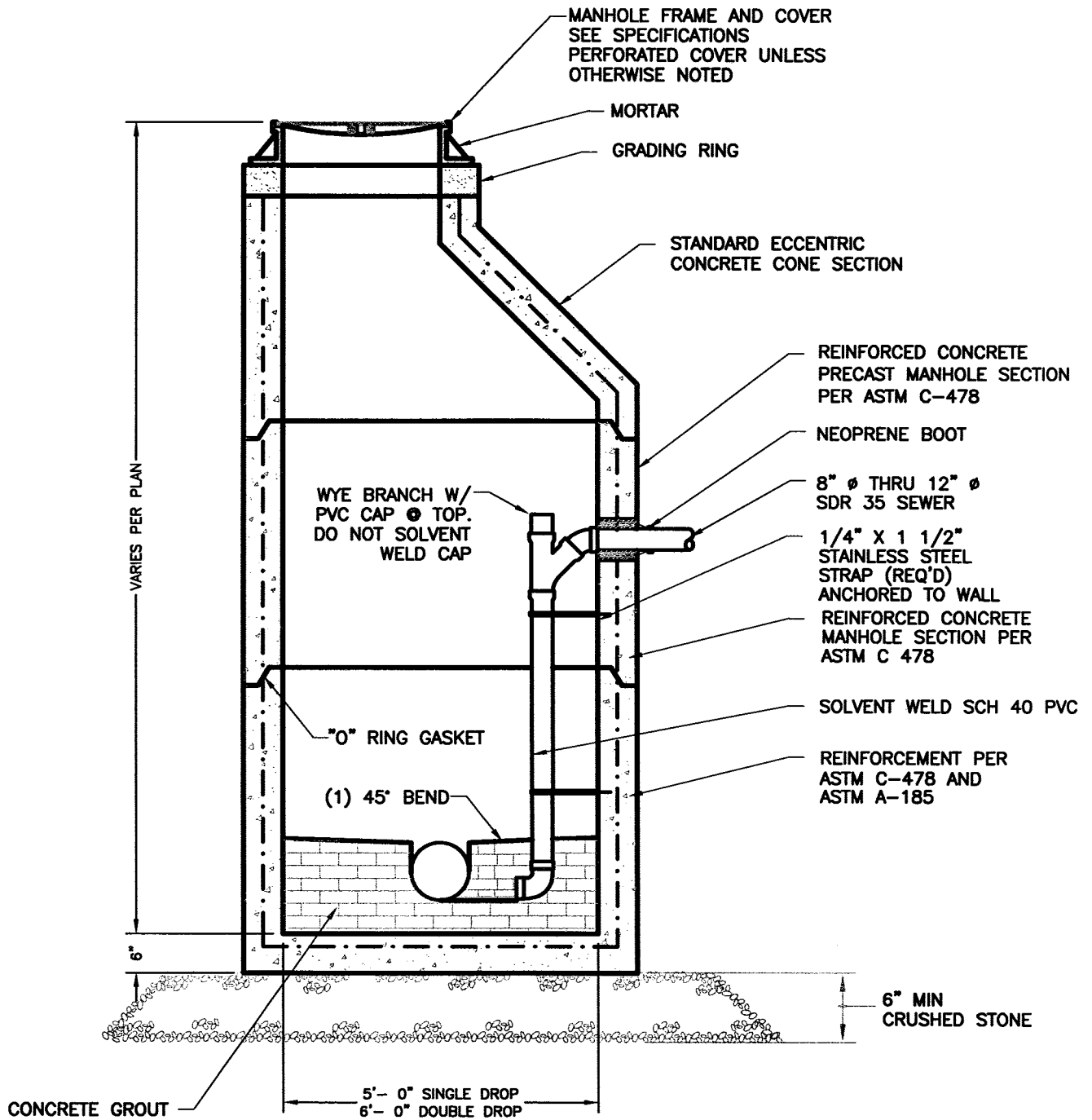
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PLOT SCALE:	
CAD FILE:	S-09

TOWN OF HOOKSETT, NEW HAMPSHIRE
 DESIGN SPECIFICATIONS
SEWER CLEANOUT COVERS

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	S-09 A

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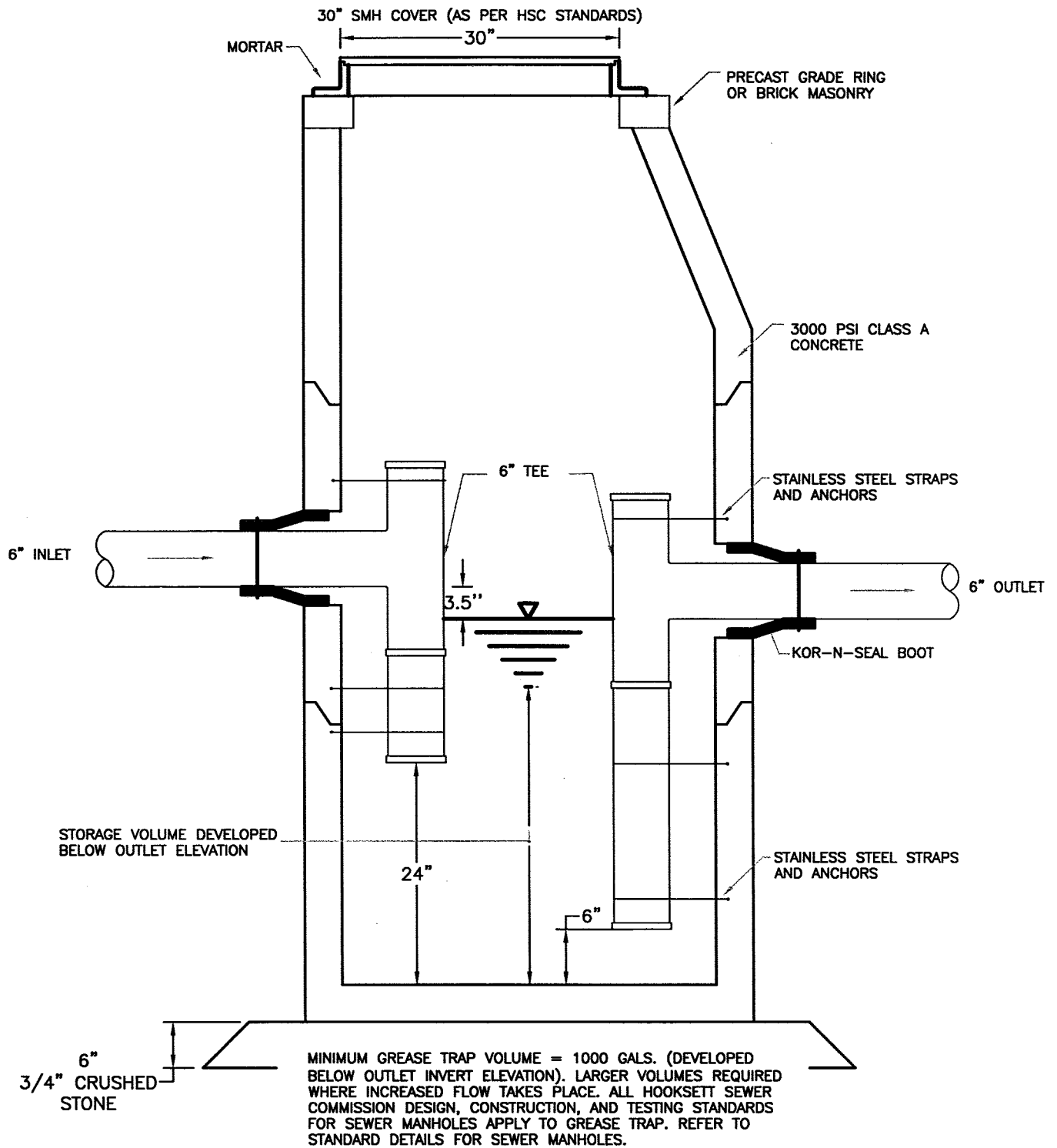
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PLOT SCALE:	1:1
CAD FILE:	S-07

TOWN OF HOOKSETT, NEW HAMPSHIRE
DESIGN SPECIFICATIONS

SEWER MANHOLE FORCE MAIN INTERNAL DROP DETAIL

REV. DATE:	
REV. DATE:	
SCALE:	AS SHOWN
DATE:	JULY, 2001
FIGURE:	S-06 A

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APPROVED BY:	
PLOT SCALE:	
CAD FILE:	S-10

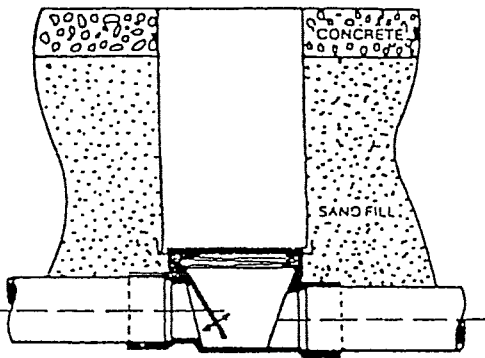
TOWN OF HOOKSETT, NEW HAMPSHIRE
 DESIGN SPECIFICATIONS
GREASE TRAP DETAIL

REV. DATE:	
REV. DATE:	
SCALE:	NTS
DATE:	JULY, 2001
FIGURE:	S-10 A

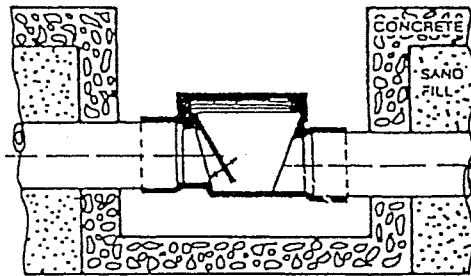
4" backwater valve

Installation Instructions

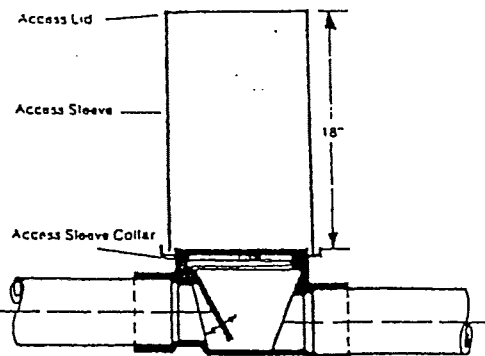
Type A Installation



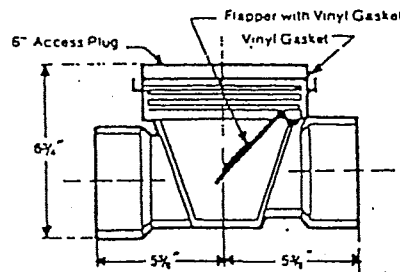
Type B Installation



4" Valve and Access Sleeve (#3285)



Dimensional Specifications for 4" Valve (#3284)



Approvals

IAPMO Listed
 CSA Certified to B181.1 & B181.2
 BNQ Certified to 3632-670

Application

The Canplas Backwater Valve is installed to prevent back flow in a building drain from any sewage collection point.

Product Specification

Where 4" Backwater Valves are required, furnish and install Can #3284 or #3285 (Backwater Valve sleeve) ABS or PVC units meeting IAPMO, CSA or BNQ standards.

The 4" in-line backwater valve (#3284) is intended for horizontal use in drainage systems. The access opening shall be positioned upright and pitched at the same incline as the pipe but not greater than $\frac{1}{4}$ " to the foot fall. The arrow on the side of the fitting and on the top of the inlet hub indicates the direction of flow of the drain.

If the valve is to be buried or imbedded under concrete, a sleeve must be placed around the outside of the 6" threaded socket and brought to the surface so as to provide access to the valve for inspection and cleaning purposes. Canplas' sleeve is easily solvent cemented to the collar on the upper section of the valve. A covering lid prevents foreign matter from entering the access sleeve, but is easily removed for inspection purposes.

Note: Periodic inspection is important to ensure satisfactory performance

A 3" in-line backwater valve (#3283) is available.

A 3" valve with the access sleeve is coded as #3287.

All backwater valve hubs are of DWV configuration. When connecting to plastic sewer and drain pipe, use adapter sleeve numbered 2842 (4") 2841 (3").

Cautions

1. Caution should be taken when solvent welding, not to allow excess solvent cement to run into the body of the fitting, causing the flap to be welded shut.

Part IV

C - Sewer Works Forms

_____ New Hookup

_____ Change in Use

TOWN OF HOOKSETT
Sewer Application / Permit For Commercial And
Residential Building Connection

OWNER: (Print or Type)

PROPERTY LOCATION

Name _____

Tax Map _____ Lot _____ Subdiv _____

MAILING ADDRESS (Present)

Address _____

Street / P.O. Box _____

Number of Units: _____

City _____ State _____ Zip _____

CHECK ONE: _____ **COMMERCIAL**
_____ **RESIDENTIAL**

TELEPHONE NUMBER _____

Please provide the following information:

- A. The name and address of the person or firm who will perform the proposed work is _____
- B. Plans and specifications for the proposed sewer connection are attached as Exhibit "A". (Show elevations between building and municipal sewer).

IN CONSIDERATION OF THE GRANTING OF THIS PERMIT, THE UNDERSIGNED AGREES TO AND UNDERSTANDS THE FOLLOWING:

Initials:

- _____ 1. To accept and abide by all sewer Ordinances.
- _____ 2. To maintain the sewer connection at no expense to the Town.
- _____ 3. To call, during normal working hours (7:00 A.M. to 3:30 P.M. Monday thru Friday) 24 hours before an inspection is needed.
- _____ 4. There will be no inspections done on Saturdays, Sundays, or Holidays.
- _____ 5. There will be an additional charge of \$35.00 per hour for inspections done after 3:30 P.M. Monday thru Friday.
- _____ 6. No portion of the trench will be covered until it has been inspected by the Superintendent or authorized agents.
- _____ 7. A backflow device must be installed on the sewer service.

\$ _____ System Development
 _____ Fee Paid
 \$ _____ Permit Fee Paid
 \$ _____ Escrow Amount

SIGNED _____
(applicant)

ADDRESS _____

Sewer Line Service Inspection:
Backflow Inspection:

Date _____ **By** _____
Date _____ **By** _____

SIGNED _____
(authorized signature for the Town of Hooksett)

TOWN OF HOOKSETT
SEWER INSPECTION CHECKLIST

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____

Location: _____

Developer: _____

Contracted Road builder: _____

Contracted Sewer Main Builder: _____

Length of Sewer Main: _____ Sewer Main size _____ diameter

Sewer Department's Authorized Agent: _____

Developer's Authorized Agent: _____

INSPECTION CHECKLIST

Manholes- use separate inspection form for each manhole
check at delivery

- | | |
|--|----------------------------------|
| _____ Precast Reinforced Concrete | _____ 30" diameter cover |
| _____ Bituminous coating | _____ "Sewer" stamped on cover |
| _____ Pipe connections Kor-n-seal | _____ Non-penetration pick holes |
| _____ No steps | |
| _____ Diameter (circle one) - 4 ft or 5 ft | |

check after installation

- | | |
|---------------------------------------|--|
| _____ Double roll or Kent-Seal joints | _____ Cover adjusted with brick (12" min) |
| _____ Joints grouted | _____ Frame bedded in mortar |
| _____ Invert w/ hard sewer bricks | _____ Shelf pitched |
| _____ Invert is clean and smooth | _____ Shelf constructed to mid-point of pipe |
| _____ Vacuum tested | |

Sewer Mains - use separate inspection form for each sewer reach
check at delivery

_____ SDR 35
_____ Size to match plans
_____ DI class 52

check at installation

_____ 3/4" stone bedding 6" under pipe and to springline of pipe	_____ Filter fabric in paved locations
_____ 1 ft sand blanket over pipe	_____ Pipe in laser alignment
_____ Deep backfill compacted in 3 ft lifts	_____ Ventilation blower
_____ No stones larger than 3" in backfill	_____ Check with transit
_____ Final 3 ft of backfill compacted in 12" lifts	_____ Flushing
_____ Min 5 ft deep, or insulated	_____ Deflection tested
_____ Air tested	
_____ TV inspected	

Sewer Services - use separate form for each service
check at delivery

_____ SDR 35	_____ Ductile Iron class 52
_____ 6" diameter	_____ 6" wye

check at installation

_____ 3/4" stone bedding 6" under pipe and to springline	_____ No stones larger than 3" in backfill
_____ 1 ft sand blanket over pipe	_____ Water tight caps or plugs
_____ Filter fabric in paved locations	_____ 2x4 and ferrous rod at end of pipe
_____ Deep backfill compacted in 3 ft lifts	_____ Record location at each house
_____ Final 3 ft backfill compacted in 12" lifts	
_____ Swing ties of service	

TOWN OF HOOKSETT
CERTIFICATE OF SUBSTANTIAL COMPLETION OF SEWER WORKS

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____
Location: _____
Developer: _____
Contracted Road Builder: _____
Contracted Water Main Builder: _____
Water Company: _____
Start of Construction: _____ Agreement Date: _____
Substantial Completion Date: _____

CERTIFICATION OF DEVELOPER

I hereby certify that the Work as identified on the As-Built Drawings of the above-noted project dated _____ conforms to the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

DEVELOPER

Signature

Title

CERTIFICATION OF DEPARTMENT

I have reviewed the DEVELOPER's As-Built Drawings dated _____ and hereby certify that to the best of my knowledge, the Work we witnessed being accomplished on the above-noted project has been completed in accordance with the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

Sewer Commission Superintendent or designated representative

Signature

Title

**TOWN OF HOOKSETT
CERTIFICATE OF FINAL COMPLETION OF SEWER WORKS**

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____
Location: _____
Developer: _____
Contracted Road Builder: _____
Contracted Water Main Builder: _____
Water Company: _____
Start of Construction: _____ Agreement Date: _____
Final Completion Date: _____

FINAL CERTIFICATION OF DEVELOPER

I hereby certify that the Work as identified on the Final As-Built Drawings of the above-noted project dated _____ conforms to the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

DEVELOPER

Signature

Title

FINAL CERTIFICATION OF DEPARTMENT

I have reviewed the DEVELOPER's Final As-Built Drawings dated _____ and hereby certify that to the best of my knowledge, the Work we witnessed being accomplished on the above-noted project has been completed in accordance with the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

Sewer Commission Superintendent or designated representative

Signature

Title

Return completed form to the Town Engineer (or Highway Manager in absence of the Town Engineer) to obtain Recommendation for Roadway Acceptance.

PART V

FIRE CISTERN CONSTRUCTION

A -FIRE CISTERN CONSTRUCTION

August 1998, Revised 9/14/98, 2/1/99

PART V

FIRE CISTERN CONSTRUCTION

A. GENERAL

1. Fire Cistern Construction Procedures

- A. Prior to starting any construction, an **Application for Start of Construction** must be filed with the Town Engineer (or Highway Manager in absence of a Town Engineer).
- B. Prior to starting construction, subdivision design plans must be approved and signed by the Planning Board and filed with the Merrimack County Registry of Deeds. Bonds must be in place with all appropriate departments (Highway, Water, Sewer), and the appropriate escrow accounts established for construction observation and testing (Highway, Water, Sewer, Fire).
- C. Upon acceptance of the completed **Application for Start of Construction**, the Town Engineer (or Highway Manager in absence of a Town Engineer) will schedule a pre-construction meeting with all involved parties. At this meeting, the Developer will be required to submit a complete project schedule, identifying all inspections, for all departments (see inspection checklists for each department). At this meeting, the Town Engineer (or Highway Manager in absence of the Town Engineer, will issue a Notice to Proceed).
- D. For work in existing roadways, refer to Part II, Road Construction.

2. Fire Cistern Inspection and Testing

- A. The Developer shall establish an escrow account with the Fire Department to cover the cost of fire cistern testing. The Fire Department will notify the Developer of the estimated cost of these services. Should the escrow account become depleted, no further testing, sign-offs or approvals will be granted until the additional funds requested are deposited into the escrow account. Work performed without the required testing will not be accepted by the Town.
- B. The Designated Representative of the Fire Department shall be notified at least two (2) days prior to the requested time of flow testing. The scheduled inspection time shall be confirmed by the inspector. The requirements of this notification are as follows:
 1. Two (2) working days do not include holidays and weekends.
 2. Inspectors will be available between 8:00 am and 3:00 pm Monday through Friday.
 3. No inspections will be made on weekends or holidays.
 4. Cancellation of scheduled inspection: In cases where the Designated Representative of the Fire Department is not notified that an inspector's services are not required by 12:00 pm (noon) the day prior to the requested inspection, a minimum charge of three (3) hours will be assessed to the requesting person or company.

- C. All water, approximately 4,000 gallons, required for flow testing shall be provided by the Developer. Refilling of the cistern at the completion of a successful test shall be provided by the Developer.
- D. Upon completion of the work and signing of the **Certificate of Substantial Completion of Fire Cistern**, any excess escrow funds will be returned to the developer.

3. Fire Cistern Estimates and Bonds

Bonding for Fire Cisterns shall be included as part of the Highway Department Bond. Refer to Section II for requirements.

4. As-Built Drawings

As-built Drawings for Fire Cisterns should be submitted to the Highway Department as part of the Road As-Built Drawings. Refer to Section II for requirements.

B -FIRE CISTERN SPECIFICATIONS

Table of Contents

- Part 1 General
 - 1.01 Scope and Responsibilities
 - 1.02 General
 - 1.03 Required Submittals
 - 1.04 Inspection and Quality Control

- Part 2 Products
 - 2.01 Layout/Configuration
 - 2.02 Foundations
 - 2.03 Concrete
 - 2.04 Piping and Miscellaneous Metals
 - 2.05 Testing
 - 2.06 Coatings
 - 2.07 Backfill
 - 2.08 Roadway and Shoulder Vehicle Pad

- Part 3 Execution
 - 3.01 Acceptance
 - 3.02 Warranty
 - 3.03 Maintenance and Operation

F. Prior to the start of construction of the cistern, a preconstruction meeting will be held at the Town offices. The meeting will be organized by the Town Engineer, or the Highway Department in the absence of the Town Engineer. The following parties will attend the meeting:

- Town of Hooksett Planning Department Representative
- Town of Hooksett Fire Department Representative
- Town of Hooksett Engineer, or designated representative
- Developer
- Contractor

The Developer shall submit a written gant-type construction schedule and an erosion control plan to the preconstruction meeting, both to be submitted to the Town for review.

1.02 GENERAL

- A. Cisterns are a critical facility. Failure of a cistern either due to leakage or structural distress may have catastrophic consequences. Long term permanence is required and the integrity of the cistern containing water for fire fighting must be assured for every day of its life, which may exceed 100 years. Designers, developers and contractors must be aware of the serious responsibility they undertake in cistern construction.
- B. Design and construction is to be guided by NFPA 1231, Suburban and Rural Fire Fighting. Refer to the latest issue at the time of construction. In the event of conflict between this publication and this specification, this specification shall govern.
- C. Cisterns shall require a building permit. Application for said permit to be made with the Building and Code Enforcement Office. Compliance with the BOCA National Building Code, 1996 edition, including seismic loading, is required. Seismic Performance Category C shall be used as the basis for design.
- D. The minimum USEABLE capacity shall be 30,000 gallons; 365 days per year.

1.03 REQUIRED SUBMITTALS

A. Site Plan

Design approval will require a site plan showing the following:

- Location of the cistern,
- Grading
- Dimensions showing the relationship to lot and easement boundaries,
- Highway centerline and pavement/shoulder edges,
- Drainage,
- Wetlands,
- Required setbacks,
- Elevation of the roadway and shoulders along the cistern frontage
- Two benchmarks in the vicinity of the cistern construction,
- Boundary information prepared by a New Hampshire licensed Land Surveyor with the seal and certification of this professional,
- Layout, drainage and grading information to be prepared by a New Hampshire licensed Professional Engineer, with the seal and certification of this professional on the site plan.

B. Structural Submittals

1. Fully detailed structural design drawings shall include the following:
 - Foundation requirements,
 - All appurtenances with plan, sections and details,
 - Reinforcing placement drawings showing all information required to describe the facility and assure its construction in compliance with good practice, this Specification and the referenced standards,
2. Written specifications including mandatory and other supplemental requirements of referenced specifications
3. Structural computations for the loads which will be encountered during the service life of the cistern, in addition to an AASHTO H-20 highway loading over the cistern.
4. Structural drawings, written specifications and structural computations shall be prepared by a New Hampshire licensed Professional Engineer with the Structural specialty designation by the New Hampshire Joint Board of Engineers, Architects and Land Surveyors. Each of these documents shall bear the seal and certification of this professional. This professional shall be the Engineer of Record for the Cistern, and is referenced below by this designation.

C. Shop Drawings

1. Shop drawings for all components of the cistern construction shall be endorsed by the Engineer of Record prior to submittal for Town approval. All submittals shall be accompanied by a transmittal. Three (3) copies of all shop drawings shall be provided. Shop drawings/submittals shall include:
 - a. penetration seal assemblies, fabricated pipe assemblies (including supports), precast concrete elements and similar fabricated assemblies, form work and accessories, concrete design mix, form-tie patching material, backfill materials including structural fill, crushed stone and fabric, seed mix
 - b. catalog cuts of proposed water stop, form ties, pre-cast joint sealers and similar proprietary materials, access manhole structure and casting,
 - c. complete details of proposed sealant linings including materials, applicators, concrete curing, approval, substrate preparation, protection, etc.
 - d. a list of all entities involved in the construction of the cistern, including the Engineer of Record, the site engineer, land surveyor, contractor and subcontractors, fabricators, testing agency and major suppliers.
 - e. an original and two copies of the proposed cistern Easement Deed, signed by the Owner of the land where the cistern is to be located, in a format ready for recording in the Merrimack County Registry of Deeds.

1.04 INSPECTION & QUALITY CONTROL

- A. Inspection and quality control shall be a joint responsibility of all members of the construction team. The long term performance of the structure must be assured by attention to details of construction so that construction issues do not compromise the design.
- B. Special inspections as required by the BOCA National Building Code shall be performed and documented along with quality control activities addressed below. Frequency of interim reports shall be after each placement of concrete or pre-cast elements.
- C. The Engineer of Record, or his designee, shall inspect the foundation after excavation and shall inspect each concrete placement - prior to placement to verify compliance of reinforcing, forms, waterstop, embedments, etc, and during the placement of concrete. A written report shall be submitted by the Engineer of Record to the Town of Hooksett Highway Department indicating satisfactory compliance with the design and this Specification prior to proceeding with the next placement or backfill.
- D. The Developer shall arrange for a qualified Testing Agency as required by ACI 301. Each concrete placement shall be tested as required by ACI 301. Strength testing shall be required, and the designated agency shall sample the concrete at the point of placement and perform the required tests.
- E. Manufacturers of fabricated assemblies, including precast roof panels shall be subject to a quality control program administered by an approved agency (see BOCA code). Certificates of compliance with this section shall be submitted.
- F. Upon receipt of the test results and completion of the Cistern, the Engineer of Record shall certify compliance with this Specification, applicable referenced specifications, and approved submittals.
- G. The Highway Department Manager may perform spot inspection and intermittent site work visits at any time to monitor compliance with this Specification. Safe access to the work shall be provided to the Highway Department Manager during the course of the work.
- H. The Hooksett Fire Department will perform flow testing of the cistern upon completion. The Contractor shall assist in this flow testing and shall provide all water. This shall include approximately 4,000 gallons of useable water for the test, and refilling of the cistern at the completion of a satisfactory test.
- I. A leakage test shall be conducted at the end of construction and prior to acceptance by the Town.
- J. Failure to meet this Specification or approved submittals will result in stoppage of the work until the discrepancy has been resolved. The Developer, Contractor, Engineer of Record or site engineer, as applicable, Highway Department Manager, and Fire Captain shall meet to discuss the issue. While the Developer, Contractor, Engineer of Record or site engineer are encouraged to provide input and suggestions for corrective action, the determination of the approving authority shall be final and will govern the course of acceptance, repair or reconstruction.

PART 2 - PRODUCTS

2.01 LAYOUT/CONFIGURATION

- A. Rectangular configuration of the cistern is assumed, but not required.
- B. Easement - a permanent easement, by the owner of the land, extending a minimum of twenty feet beyond the limits of the cistern shall be granted to the Town of Hooksett. This easement shall permit operation, maintenance and reconstruction of the cistern, without limitation within the bounds of the easement. The Town shall have no obligation to mow or otherwise maintain any vegetation or to perform any other activity not required for the functional purposes of the cistern. The Owner of the underlying fee may utilize the easement area as open space and maintain the vegetation. However, the owner may not erect any structures or plant any trees or shrubs within the easement. The easement shall be described by courses and distances and all corners shall be monumented with markers conforming to the requirements of the NH Land Surveyors Board. The easement shall be shown on a plan to be recorded by the Developer at the Merrimack County Registry of Deeds.
- C. The location of the cistern, the pipe connection points and the turnouts shall conform to the attached CISTERN LAYOUT SKETCH.
- D. The cistern shall be provided with the following connections:
 - 1. Access manhole (refer to miscellaneous metal paragraph below)
 - 2. Fill connection - 4 inch "Storz" connector. Riser shall turn 90 degrees so that the axis is horizontal. All steel shall be hot dipped galvanized.
 - 3. Vent - 8 inch with galvanized steel screen, 3/8 inch mesh, welded into standard long radius 180 degree elbow. Screen to be 36-48 inches above finished grade. Pipe to be Schedule 40 steel. All steel shall be hot dipped galvanized.
 - 4. Suction - 8 inch pipe with 90 degree long radius elbow, horizontal branch and eccentric reducer to 5 inch pipe to adapt to a 4-1/2 inch NST male adapter with threaded cap and retainer chain. The adapter and cap shall be brass. Suction pipe to be supported on the edge of tank or other foundation below frost level. Centerline of suction connection point to be a minimum of 24 inches and maximum of 36 inches above finished grade of the adjacent paved apron (*20-24" in other towns?*), located as shown on the CISTERN LAYOUT SKETCH. Horizontal branch shall be pitched to drain back to cistern. Suction pipe to be Schedule 40 steel. A 4 foot square anti-vortex valve plate, attached with setscrews and close fitting collar shall be provided six inches off the cistern floor. Plate shall be supported on a minimum of 6 points, 2 at center, 1 at each corner, with 5/8 inch anchor bolts and pipe sleeves. 8 x 5 eccentric reducers by Boston Pipe and Fittings of Cambridge, MA, or equal. All steel shall be hot dipped galvanized. The bottom of the suction pipe may not exceed 14 ft vertical distance from the pumper connection.
 - 5. The suction line shall be protected by bollards. Bollards shall be 8 inch pipe, concrete filled, set in concrete foundations a minimum of 24 inches in diameter to a depth of 5 feet below grade. Bollards shall be galvanized steel pipe, over painted with a compatible red exterior enamel. Bollards shall be set 4 feet apart, 1 foot in front of the suction connector.

6. All penetrations shall be through the top of the cistern. Penetrations shall be made with link-seal joint system in holes cast in the top slab at the correct size and location.
7. To facilitate inspection and maintenance, a sump of a minimum 24 inch diameter, 2 inches deep, shall be cast into the floor of the cistern. The sump shall be located near, but not directly under the access manhole. The cistern floor shall be sloped toward the manhole at a minimum slope of 1%. Concrete design shall consider this sump and adequate cover on reinforcing shall be assured.
- E. The cistern shall be designed such that it will not float when empty. Buoyancy calculations shall be provided. All hold-down hardware and appurtenances shall be of corrosion-resistant material.
- F. Cisterns shall be located no more than 220 feet truck travel distance from the nearest lot line of the furthest lot. The final location of any cistern must be approved by the Fire Department and the Planning Board.

2.02 FOUNDATIONS

- A. Cisterns shall bear on undisturbed soil of sufficient capacity to sustain all imposed loads. Minimum required bearing capacity shall be clearly stated on the design drawings and the Engineer of Record shall confirm acceptability of soil in writing after excavation has been completed and prior to placement of any stone or concrete.
- B. Drawings and specifications shall address measures to be taken in the event of over excavation or if ledge is encountered.
- C. If adverse soil conditions are likely, based upon history of the site, borings or other data, test pits shall be excavated and appropriate engineering measures incorporated into the design.
- D. During the construction of the cistern, the excavation shall be maintained stable and dry. The excavated area must be dewatered to a minimum of 2 feet below the bottom of the footing grade for the entire construction and testing period.
- E. The bedding material for the cistern shall be a 12-inch layer of 1-1/2 inch crushed, washed stone. The bedding material shall be compacted by mechanical means, and shall meet the following gradation requirements:

<u>Sieve Designation</u>	<u>Percent Passing</u>
2"	100
1-1/2"	95-100
1"	35-85
3/8"	20-52
No. 8	0-5

- F. Prior to placement of the bedding material, a layer of geotextile separation fabric shall be placed on subgrade which is stable and dry. The fabric shall be Mirafi 140N or equal.

2.03 CONCRETE

- A. Concrete is to be designed in accordance with the BOCA National Building Code, in the edition currently adopted by the Town of Hooksett, the American Concrete Institute (ACI) 318 Building Code Requirements for Reinforced Concrete, in the edition referenced in the adopted BOCA Code. Design shall incorporate the special considerations for tanks and permanence covered in ACI 350R, Environmental Engineering Concrete Structures and ACI 224R, Control of Cracking in Concrete Structures. These standards shall be referenced on the design computations.
- B. Deformed and plain reinforcement shall conform to ASTM A615.
- C. Concrete construction shall conform to ACI 301 Specification for Structural Concrete for Buildings, latest edition, the ACI Building Code, ACI 318, and the BOCA National Building Code. In the case of conflict, the more stringent requirements shall govern. Supplemental requirements applicable shall be specified. While sections of ACI 301 may be cited on construction documents, alternative specifications will not be approved.
- D. Concrete material shall comply with Standard Specification for Ready Mixed Concrete ASTM C94, latest edition. Water shall be closely controlled, and required Batch ticket information shall be furnished for each load at the time of placement.
- E. Design and Construction shall comply with the following ACI documents, latest edition:
 - 1. Admixtures in Concrete, Guide for Use of Admixtures in Concrete, ACI 212
 - 2. Placing Concrete by Pumping Methods, ACI 304 (*or Recommended Practices for Measuring, Mixing, Transporting and Placing Concrete*)
 - 3. Hot Weather Concreting, ACI 305
 - 4. Cold Weather Concreting, ACI 306
 - 5. Standard Practice for Curing Concrete, ACI 308
 - 6. Recommended Practice for Concrete Formwork, ACI 347
 - 7. Specifications for Structural Concrete for Building, ACI 301
 - 8. Standard Practice for Consolidating Concrete, ACI 318
- F. The proposed specific form ties and waterstop shall be specified, including the material and method proposed for tie removal and tie hole repair.
- G. Precast concrete may be utilized and it anticipated for the top slab. Details of bearing, sealants and fastening to withstand service and construction loads shall be shown on submittals.
- H. Details of all intersections between walls and walls and slabs, as well as any construction joints and splicing of reinforcing, if permitted, shall be shown. Reinforcing bar fabrication/placing drawings shall be submitted.
- I. Lap splices in walls and slabs, if any, shall be staggered, i.e. adjacent bars should be spliced on alternate sides.

- J. Vertical construction joints and stops in the concrete work shall be made at midspan. Provide dowels at construction joints of area equal to 0.5% of the vertical concrete area. Provide beveled keyways at all construction joints.
- K. At least 48 hours shall elapse before depositing any new concrete against previously placed concrete.
- L. All concrete shall attain a minimum compressive strengths at 28 days age of 4,000 psi. Refer to specifications and ACI 301 for design strengths required for selecting mix proportions.
- M. The use of calcium chloride is prohibited.
- N. Tolerances for concrete work is as follows:
 - 1. Walls - all walls shall be even in appearance. Horizontal and vertical surfaces shall be plumb and/or level within ¼" in 10 feet.
 - 2. Slabs - All slabs shall be even and level with a uniform appearance and have a smooth profile of surface. The surface shall be level to within ¼" in 10 ft.
- O. All reinforcing steel used shall meet or exceed the following specification requirements:
 - 1. All reinforcing bar details shall conform to the latest ACI Code and detailing manual, except as otherwise specified.
 - 2. All reinforcing bars shall conform to ASTM A615 Grade 60 except ties and stirrups, Grade 40. All welded wire fabric shall conform to ASTM A185 and shall be provided in flat sheets. Laps shall be Staggered and shall be 1-1/2 full mesh minimum.
 - 3. Schedule with the shop drawings, all necessary accessories to hold reinforcing securely in position. Minimum requirements shall be: high chairs - 4 feet on center; slab bolsters - 3'-6" on center; support bars for high chairs - #5.
 - 4. All bars, except as otherwise noted, shall be continuous and shall be run continuously around cornered, lapped at necessary splices and hooked at discontinuous ends. Laps shall be 30-bar diameter minimum, unless otherwise noted.
 - 5. The concrete protective covering for main reinforcement shall be, unless shown otherwise:
 - a. Footing bottoms - 3 inches
 - b. Columns; beams and formed surfaces in direct contact with solid or exposed to the weather (except slabs) - 2 inches.
 - c. Interior faces of walls and slabs exposed to the weather - 1 inch
 - d. Interior slabs - 3/4 inch
 - 6. All concrete, unless specifically noted to be plain concrete, shall be reinforced.
 - 7. All reinforcing shall be inspected and approved before the concrete is placed.

- P. The perimeter of the tank at the floor/wall joint shall be sealed with continuous 6-inch PVC waterstop. All butt ends shall be heat welded. All vertical wall joints and any horizontal slab joints shall have a continuous PVC waterstop.
- Q. All form ties shall be of a type that permit breaking off at least 1 inch below the surface of the concrete with a 1 inch diameter PVC cone. In addition, waterstop washers shall be placed halfway along the length. All form ties shall be broken at least 1 inch below the surface and sealed with a non-shrinking hydraulic cement.

2.04 PIPING AND MISCELLANEOUS METALS

- A. Piping shall be steel, Standard Pipe, conforming to ASTM A53, Welded and Seamless Steel Pipe, Grade B, Standard Weight (schedule 40), or stronger.
- B. Pipe joints shall be welded, except for terminal joints which shall be threaded to connect to proprietary threaded connectors.
- C. Miscellaneous metal for plates, supports, etc shall be steel and shall conform to ASTM A36 or better.
- D. Welding shall conform to American Welding Society (AWS) standards for pipe or structural welding as applicable, and shall be performed by qualified welders.
- E. Pipe assemblies shall be shop fabricated in one piece. Anti-vortex plates and pipe supports shall be shop fabricated and designed to minimize field assembly.
- F. All steel, including fasteners, shall be hot dip galvanized after fabrication in accordance with ASTM A123, Standard Specification for Zinc (hot dip) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip, and A153, Standard Specification for Zinc Coating (hot dip) on Iron and Steel Hardware. Stainless steel is an acceptable substitute for fasteners.
- G. Fabricated assemblies shall be wrapped for shipping and protected during installation. Threaded areas and field damage shall be repaired in accordance with ASTM A780, Standard Practice for Repair for Damaged Hot Dip Galvanized Coatings.
- H. A manhole entry at grade shall be provided for inspection and cleaning. This shall be a cast iron frame and cover, Neenah R1792HL, or approved equal. A locking mechanism consisting of two eyes attached to the supporting structure and a through bar, drilled to accept a "Knox" padlock, located directly over the manhole shall be provided. The all weather "Knox" padlock shall be obtained from the Hooksett Fire Department. The cost of the padlock shall be the responsibility of the Developer. A masonry pad shall be provided outside the manhole to maintain the lock out of the dirt.

2.05 TESTING

- A. The completed cistern shall be tested prior to acceptance and at the end of the warranty period. Testing shall be as follows:
 - 1. Hydrostatic - the tank shall be filled and allowed to stabilize for a minimum of one day. A precise reference point shall be established and the tank secured for 48 hours. After 48 hours, it shall be observed. Loss of over 30 gallons shall be considered to be leakage and the cistern test to have failed. The Developer shall cause the issue to be investigated. A report identifying the reason for the loss shall be submitted for

approval. Upon approval, correction shall be made and the cistern re-tested. This test shall be performed, and must pass, prior to coating.

2. Flow - The Fire Department shall connect to the tank and confirm an available flow rate of 1000 gpm, at a sustained rate, at low level in the cistern as specified herein. If the flow cannot be obtained, the cistern flow test will be considered to have failed. The Developer shall cause the issue to be investigated. A report identifying the reason for the failure shall be submitted for approval. Upon approval, correction shall be made and the cistern re-tested.

2.06 COATINGS

- A. Cisterns that do not have a source of water supply other than fill by the Fire Department shall be coated. Coating shall be applied only after completion, approval of the concrete walls and slab, and successful hydrostatic testing.
- B. The coating shall be applied to the interior of the cistern, covering the floor and exterior walls. Interior walls, if any, shall be coated a minimum of 4 feet from the intersection with an exterior wall to assure a "short circuit" is not created at their intersection with exterior walls.
- C. Coating shall consist of sixty (60) mils of CIM 1000 Membrane, or approved equal. Coating shall be applied in two coats of 30 mils each on walls.
- D. Full compliance with the manufacturer's requirements and recommendations for preparation and application is required.
- E. Substrate concrete shall be cured, then troweled, then abrasive blasted - brush-off-blast (ASTM D4259-88) and otherwise prepared to meet the manufacturer's requirements prior to coating.
- F. Coating shall not be applied outside of conditions established by the manufacturer as General Limitations
- G. Coatings shall be applied by experienced and trained personnel only (training is available from the manufacturer), and the Contractor shall be responsible for safe practices, including confined space entry if required. The Contractor shall conduct all work in accordance with applicable OSHA requirements.

2.07 BACKFILL

- A. Backfill material and placing requirements shall be specified. The following are minimum guidelines:
 1. Backfill shall be placed only after the concrete structure has been approved, and with written authorization. Backfill over the tank shall be:
 - a. Four (4) feet of fill; or
 - b. if less than 4 feet, the top and highest 2 feet of sides of cistern shall be insulated with vermin-resistant foam insulation and a minimum of 2 feet of fill.
 - c. All backfill shall extend 10 feet beyond the edge of the cistern, then maximum 3:1 slope. All fill and loam shall remain 6 inches below the rim of the manhole.

2. Backfill within five (5) feet of the structure shall be granular material, free draining, free of stones over 4 inches and placed in even lifts so as not to create unbalanced loads. Backfill material shall be screened gravel, compacted to 95% of the modified proctor value. The material shall meet the following gradation requirements:

<u>Sieve Designation</u>	<u>Percent Passing</u>
3"	100
2"	95-100
1"	55-85
No. 4	27-52
No. 200	0-12

3. Backfill outside this zone may be general fill, free of organic matter and stones over 1 ft in greatest dimension, and compacted as required for stability.
4. Backfill beneath and adjacent to paved areas shall be required as for roadways.
5. Upon completion of backfill and grading, the disturbed area within the easement shall be loamed, fertilized, seeded and mulched to establish permanent vegetative cover. Loam shall be screened and the minimum thickness placed is to be 4 inches. Seed mixtures and mulch shall be applied in accordance to the standards as found in the Erosion & Sediment Control Design Handbook for Developing Areas of NH, as amended.

2.08 ROADWAY SHOULDER & VEHICLE PAD

- A. The roadway shoulder and vehicle pad at the fire cistern, from the edge of the roadway pavement to the pumper suction connection, shall have a slope of 3/8" per foot downgrade. A defined swale shall be provided where both grades meet to remove runoff from the site. The vehicle pad at the fire cistern shall be sized to accommodate a pump truck with a minimum width of 22-24 feet from the edge of existing pavement, and shall be constructed with sub-base and pavement as required for road construction.
- B. A paved turnout for access to the cistern shall be at least 50 feet in length.

Part 3 - EXECUTION

3.01 ACCEPTANCE

- A. The cistern will be considered for acceptance by the Town Council after the following have occurred:
 1. Satisfactory completion and testing of the cistern as determined by the approving authorities.
 2. Delivery of the approved and signed easement deed (and plan if not already on record) with recording fees.
 3. Receipt of Certificate of Compliance by the Engineer of Record.

3.02 WARRANTY

- A. The Developer shall warrant the completed cistern to be free from defects for a period of 24 months from the time of acceptance of the cistern by the approving authority, or the Town Council, whichever is later. At the expiration of the twenty-four months, the cistern shall be inspected for overall integrity and tested for leakage and flow by the approving authorities. Any defects noted at this inspection and testing shall be repaired, utilizing the funds retained by the Town under the Post Construction Performance Guaranty.

3.03. MAINTENANCE AND OPERATION

- A. After acceptance, the cistern will be maintained and operated by the Hooksett Fire Department. The Fire Department Water Supply officer shall periodically inspect the cistern during the warranty period and thereafter to ascertain the condition of the cistern and appurtenances, including water level. During the warranty period, any defects shall be addressed as set out above for inspection and quality control as for failure to meet the specification or approved submittals.

END OF SECTION

C. Fire Cistern Details

(SEE FIRE DEPARTMENT FOR DETAILS)

D. Fire Cistern Forms

TOWN OF HOOKSETT, NH

FIRE CISTERN

CONSTRUCTION INSPECTION SHEET

Inspections must be conducted and work found acceptable at the following points during construction. The Town's authorized inspection agent must be notified at least 48 hours before the inspection is required.

<u>INSPECTION</u>		<u>Tank</u>	<u>MONITORING BY</u>	<u>DATE</u>
1	Observe after excavation and erosion control; prior to placing pea gravel or crushed stone base	C, F		
2	Observe slab rebar, formwork and waterstop, OR observe rebar, formwork of deadman; prior to placing concrete	C, F		
3	Observe concrete placement for base slab	C		
4	Observe wall rebar and interior formwork	C		
5	Observe wall formwork in place with top slab dowels prior to placing concrete	C		
6	Observe placement of concrete for walls	C		
7	Observe tank top installation	C		
8	Observe fiberglass tank in ground with straps and turn buckles, attached to anchor	F		
9	Observe form tie cones patched	C		
10	Observe interior substrate prior to applying waterproofing	C		
11	Leakage test	C, F		
12	Observe backfilling of cistern and placement of insulation; prior to fill cover	C, F		
13	Observe piping and painting; with sonotubes in place	C, F		
14	Observe final grading and landscaping	C, F		
15	Observe paving/grading	C, F		
16	Flow test (by Fire Dept.)	C, F		
17	Final inspection	C, F		

C = concrete tank
 F = fiberglass tank

TOWN OF HOOKSETT

CERTIFICATE OF SUBSTANTIAL COMPLETION OF FIRE CISTERN WORKS

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____ Location: _____

Developer: _____

Contracted Road Builder: _____

Contracted Cistern Builder: _____

Start of Construction: _____ Agreement Date: _____

Substantial Completion Date: _____

CERTIFICATION OF DEVELOPER

I hereby certify that the Work as identified on the As-Built Drawings of the above-noted project dated _____ conforms to the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

DEVELOPER

Signature

Title

CERTIFICATION OF DEPARTMENT

I have reviewed the DEVELOPER's As-Built Drawings dated _____ and hereby certify that to the best of my knowledge, the Work we witnessed being accomplished on the above-noted project has been completed in accordance with the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

Highway Superintendent or designated representative

Signature

Title

TOWN OF HOOKSETT

CERTIFICATE OF FINAL COMPLETION OF FIRE CISTERN WORKS

Approved Name(s) of Road(s) or Drive(s)

Subdivision Name: _____ Location: _____

Developer: _____

Contracted Road Builder: _____

Contracted Cistern Builder: _____

Start of Construction: _____ Agreement Date: _____

Final Completion Date: _____

FINAL CERTIFICATION OF DEVELOPER

I hereby certify that the Work as identified on the Final As-Built Drawings of the above-noted project dated _____ conforms to the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

DEVELOPER

Signature

Title

FINAL CERTIFICATION OF DEPARTMENT

I have reviewed the DEVELOPER's Final As-Built Drawings dated _____ and hereby certify that to the best of my knowledge, the Work we witnessed being accomplished on the above-noted project has been completed in accordance with the Project Design Plans, Approved Changes and the Town of Hooksett Standard Specifications for Construction.

Date

Highway Superintendent or designated representative

Signature

Title

FINAL CERTIFICATION OF FLOW TEST

I have witnessed a satisfactory flow test and hereby certify that, to the best of my knowledge, the fire cistern constructed on the above-noted project satisfactorily meets the flow requirements of the Town of Hooksett Standard Specifications for Construction.

Date

Fire Department Chief

Signature

Title

PART VI

FIRE ALARMS &
FIRE SPRINKLER SYSTEMS

PART VI

FIRE ALARMS AND SPRINKLERS

A. GENERAL

1. Fire Alarm & Sprinkler System Procedures

- A. Prior to starting any construction, a **Building Permit** must be obtained from the Building Department. Building permits will not be issued without an approved set of signed subdivision plans, and at least gravel sub-base on the road.
- B. Prior to starting construction, subdivision design plans or site plans must be approved and signed by the Planning Board and filed with the Merrimack County Registry of Deeds (where appropriate). The appropriate escrow accounts must be established for construction observation and testing.

2. Fire Alarms & Sprinkler Inspection

- A. No **Certificate of Occupancies** will be issued without the appropriate inspections and approvals.
- B. The Designated Representative of the Fire Department shall be notified at least two (2) days prior to the requested time of any alarm or sprinkler inspections. The scheduled inspection time shall be confirmed by the inspector. The requirements of this notification are as follows:
 1. Two (2) working days do not include holidays and weekends.
 2. Inspectors will be available between 8:00 am and 3:00 pm Monday through Friday.
 3. No inspections will be made on weekends or holidays.
 4. Cancellation of scheduled inspection: In cases where the Designated Representative of the Fire Department is not notified that an inspector's services are not required by 12:00 pm (noon) the day prior to the requested inspection, a minimum charge of \$50 for the first offense, and \$100 for each subsequent offense will be assessed to the requesting person or company.
- C. The fire department will conduct a rough inspection and a final inspection of all fire alarm systems and sprinkler systems at no charge. Any additional inspections required because of a failed inspection, or incomplete work, will cost \$50 for the first inspection and \$100 for any subsequent inspections. The required fee must be submitted at the time of the inspection request.

B. Specifications for Fire Alarms & Sprinkler Systems

Table of Contents

(SEE FIRE DEPARTMENT FOR SPECIFICATIONS)

APPENDIX A

**CENTRAL HOOKSETT WATER PRECINCT
DESIGN & CONSTRUCTION REQUIREMENTS
FOR
WATER WORKS**

**Taken From Bylaws and Regulations of the
Central Hooksett Water Precinct Version, 1987**

I N T R O D U C T I O N

This compilation contains the By-Laws and regulations of the Central Hooksett Water Precinct, a Village District established under RSA 52.

The By-Laws are ordinances of the Precinct which are adopted from time to time by the Precinct meeting.

The regulations of the Precinct, published as appendices to this volume govern water rates, material specifications, operational rules and other prudential matters as adopted from time by the Precinct Commissioners.

These rules and regulations have been recodified and published in looseleaf form as of July 1, 1987. Subsequent amendments to the By-Laws and regulations, when published, shall be available as dated insert replacement pages to this volume.

This volume shall be known as the "1987 Version" and contains the following amendments:

NONE

BY-LAWS

CENTRAL HOOKSETT WATER PRECINCT

GENERAL INFORMATION

Territory to which By-Laws apply:

Those portions of the Central Hooksett Water Precinct where the Precinct maintains pipe line.

Terms and Conditions:

These By-Laws shall constitute the Terms and Conditions according to which the Central Hooksett Water Precinct provides service to customers. By filing application for service with, and or taking water from the Precinct, customers shall be considered to be bound thereby, and to take water only for purposes stated in the application and at the established tariff rates.

Definitions:

"Precinct" shall mean the Central Hooksett Water Precinct acting through its Board of Water Commissioners.

"Customer" shall mean any person, firm, corporation, town, government or governmental division supplied by such Precinct.

"Main Pipe" shall mean the supply pipe from which service connections are made to supply water to customers.

"Service Pipe" shall mean the pipe running from the main pipe to the premises of the customer.

CENTRAL HOOKSETT WATER PRECINCT

TERMS AND CONDITIONS

1. Applications for Service. All applications for the use of water must be made in the form prescribed, stating fully and truly the use to which the water is to be applied. Such application must be signed by the owner of the premises or his duly authorized agent. All applications for service must be accompanied by a connection charge equal to the actual pipe cost to the Precinct for the installation of service pipe and connection to the main or One Hundred Dollar (\$100.00), whichever is more and which shall be in addition to the established rate for water used, as provided hereinafter.

2. Water Supply Development Fee. A Precinct Water Supply Development Fee (hereafter called Grant) of a minimum of \$600.00 (six hundred dollars) per new residential unit customer is hereby established. Said grant shall be calculated at the rate of 150 gallons per bedroom but in no event will the grant be less than the minimum set out above. For non-residential customers the grant shall be calculated at the rate of two dollars per gallon of projected use based on state of New Hampshire guidelines but in no event will the grant be less than the \$600.00 minimum set out above.

All grants collected under this policy shall be kept in a separate fund to be known as the Central Hooksett Precinct source Development Fund which shall be a capital reserve fund to be expensed by the Commissioners for capital costs associated with the establishment or acquisition of new or increased water supply which may include but not be limited to purchase by contract, purchased and development of watershed, construction of river water treatment facilities or the development of wells.

The grants established by this policy shall be collected at the time of application for service. Provided, however, that in the case of new main extensions by or for private parties, the aggregated grants for the services to be connected to the extension shall be assessed and collected from the private party prior to the Precinct's acceptance of the extended mains.

Parties making grants hereunder shall be entitled to an allocation of future daily water supply equivalent to the number of units represented by the amount of the grant. Nevertheless, no such grantor shall be entitled to draw, in the sole judgement of the Commissioners, will not overtax or damage the Precinct's works, storage or supply facilities, or otherwise pose any detriment or danger to the water supply of current Precinct customers.

If the grantor fails to use the entire amount of water allotted under his or her grant every year for 10 years following the date of the grant or the date the new supply source came on line, whichever is later, despite the unencumbered availability of the water supply, then on the eleventh year and thereafter, grantor will only be entitled to use the maximum amount of water that was used in any one year out of the preceding 10 years. For example, if the grantor is allocated 100 gallons per year, but only uses 50 gallons each year for 10 years, then in the eleventh year and thereafter, the grantor is entitled to use only 50 gallons. In no event do unused water allotments accumulate to subsequent years.

3. Temporary Service. When permission to open a street cannot be obtained or when for any physical reason it is impracticable to make excavation and provide independent service, water may be furnished temporarily from an adjacent service if deemed advisable by the Board of Water Commissioners and the adjacent owner gives his permission, but entirely at the expense of the customer. Water Service furnished to any buildings located on land not owned by the owner of the building, or to any trailer shall be considered temporary service and the whole cost of furnishing service from the nearest available main shall be entirely at the expense of the customer, who shall also be responsible for the payment for the water used in such building or trailers at the regularly established rates.

4. Ownership and Maintenance of Service Pipe. All service pipes, including the shut-off, from the main to the curb line, shall be owned and maintained by the Precinct. From the curb line to the building the service pipe shall be installed, owned and maintained by the customer.

5. Ball Valve. Every service must be provided with a ball valve located inside the building near the service entrance, easily accessible and protected from freezing. All piping shall be so arranged as to permit draining whenever necessary.

6. Maintenance of Plumbing. All customers shall maintain the plumbing fixtures within their own premises in good repair and protect from freezing at their own expense. They shall make repairs which may be necessary to prevent leaks and damage. No cross-connection between the public water supply system and any other supply will be allowed unless properly protected. No connection capable of causing backflow between the public water supply system and any plumbing fixture, device or appliance, or between any waste outlet or pipe having direct connection to waste drains is permitted. A Back flow preventer valve or valves shall be required in any case where the possibility of such back flow can or may exist--such valve or valves shall be installed without any bypass and subject to the specific approval of the superintendent. If after twenty-four (24) hours' notice by the Precinct, the owner of such a connection fails or refuses to break or properly protect the connection within the limit, the Precinct shall discontinue service by making a

been properly broken and protected.

In administering the provisions of this section, the Precinct shall observe and enforce the regulations of the New Hampshire Water Supply and Pollution Control Commission with respect to cross-connections and back flow devices, which regulations are now published as New Hampshire Code of Administrative Rules Part WS 314 "Cross-Connections."

7. Safeguarding Use of Hot Water Tanks. All customers having direct pressure hot water tanks shall place proper vacuum and relief valves in the pipe system to prevent any damage to such tanks should it become necessary to shut off the water on the street mains. The Precinct will not supply water to premises where direct pressure hot water tanks or appliances are used except at the risk of the customer.

8. Joint use of Service Pipe Trench. Water Service pipes will not be placed in the same trench with gas pipes, electric conduits, sewers, or similar structures except under special conditions, in which case a written permit must be obtained from the Board of Water Commissioners.

9. Winter Construction. Except in case of emergency, no new service pipes or extensions of main pipes will be installed during winter conditions (when frost is in the ground) which increases the cost of work, and in the event of an emergency shall require such construction, except the repairing of supply mains, the customer shall pay all extra expense over the ordinary construction cost.

10. Responsibility for Water Charges. Where there is more than one dwelling or business unit in a building supplied with water, the plumbing may be so arranged as to permit a separate service for each place of business or service and be responsible for payment of all charges for water service rendered to the property.

Any customer of the Precinct who as of the effective date of this ordinance is supplied water by the Precinct through unmetered service shall within one year of said effective date apply for and reimburse the Precinct for the cost of the installation of a water meter controlling such service.

11. Unauthorized Use of Water. Use of water is confined to the premises named in the contract. No customer shall supply another not entitled to use of water, nor shall he use it for any purpose not mentioned in his application. No person not entitled to the use of water shall obtain it from any hydrant, fountain, or other fixture of the Precinct without previous consent of the Board of Water Commissioners. A customer may supply a contractor for building purposes if he so desires, provided such contractor has made satisfactory arrangements with the Superintendent to pay for the water used and has a permit for such use.

12. Bills Payable. The charges for water service shall be established by the Precinct Commissioners and published as an appendix to these By-Laws. All bills for water service are due and payable when dated and shall be considered past due thirty (30) days after such date. Bills for water service shall be mailed to the customers' water service address unless the customer has requested otherwise. Non-receipt of a water service bill shall not relieve the customer of the obligation for payment nor for the consequences of nonpayment which may include termination of service.

In the event a customer's water service is terminated for nonpayment of water bill or for any other violation of this schedule, water service will not be reconnected until and unless an outstanding bill for water service is paid, the cited violation(s) cured and a reconnection charge has been paid.

13. Temporary Cessation of Services. Abatement of water charges may be had by notifying the Board of Water Commissioners in writing, in advance, of disconnect service at the curb cock and no charge will be made for any billing period after the one in which notice is given, and during which the premises are unoccupied for the entire billing period. Abatements as provided herein shall apply only to domestic service. Rates for non-domestic service are based on a yearly service, and no abatement will be made for temporary vacancy during that period.

14. Emergency Restriction. When necessary to conserve supply, the Precinct may restrict or prohibit the use of water. Such action may include limitations on the quantity of water made available or restrictions on the use of water for other than human consumption and sanitary purposes (i.e. bans on lawn sprinkling, filling of swimming pools automobile washing and the like).

15. Unmetered Water. The Superintendent may, for the convenience of the Precinct and in his sole discretion permit the bulk purchase of water for use within the Precinct/ Any such purchase shall be permitted only after specific application which shall specify the volume of water to be taken, the supply point and the time during which such taking shall be permitted. The estimated charge for each such taking shall be paid before the issuance of a permit therefor. The superintendent or his designee shall supervise any bulk supply hereunder.

16. Access to Premises. The Officers or Agents of the Precinct shall have free access to all premises supplied with water at all reasonable hours to permit the inspection of plumbing fixtures, to set, remove or read meters, to ascertain the amount of water used and the manner of use, and to enforce these Terms and Conditions.

17. Discontinuance of Service. Service may be discontinued by reason of non-payment of water bills or for violation of any term or condition contained herein. Service once discontinued may not be reconnected until the cause of the complain resulting in discontinuance of service has been removed and until a reconnection charge plus arrearages, if any, has been paid. Any bill not paid within thirty (30) days after becoming due shall be considered delinquent. Before service is discontinued, written notice to that effect shall be sent to the customer, at least seven days in advance, except that service may be discontinued without notice in case of fraudulent use or violation of Rule 5 of the Terms and Conditions.

18. No Liability for Interrupted or Unsatisfactory Service. If, by reason of shortage of supply or for the purpose of making repairs, extensions or connections or for any other reason beyond the control of the Precinct it becomes necessary to shut water in the mains, the Precinct will not be responsible for nay damages occasioned by such shut-off. Notice of shut-off will be given when practicable, but nothing in this rule shall be construed as requiring the giving of such notice.

The Precinct will not be responsible for damage caused by dirty water which may be occasioned by cleaning of pipes, reservoirs or standpipes, or the opening and closing of any gates or hydrants when the same is due to no lack of reasonable care on the part of the Precinct.

19. Fire Hydrant. Hydrants may not be used for any purpose other than extinguishment of fires or for such other purposes as may be authorized by the Precinct, but in the latter case, no hydrants shall be opened by any person other than an agent of the Precinct.

20. No tampering with Precinct Property. All gates, valves, shut-offs, and standpipes which are the property of the Precinct are not to be opened or closed or in any way tampered with by any person other than an authorized agent of the Precinct.

21. Private Fire Protection. Customers desiring private fire protection must consult with the Board of Water Commissioners before installing such service as to the availability of mains and adequate pressure. No private fire connection will be made on a water main of less than six inches (6") in diameter. All sprinkler pipes and other private fire connection pipes shall be so placed as to be readily inspected, and if concealed or so arranged with other pipes so as to not be readily inspected, or any unauthorized connections are in existence, meters shall be installed on each service at the expense of the customer.

21B. Residential Sprinkler Service. All Residential sprinkler services must have the capacity to supply 30GPM at all times and seasons. All services must be plumbed in after meter and supply Backflow Protection at all times. The additional fee for sprinkler service will parallel the established fees. 3/4" + 1" \$12.00 etc.

22. Swimming Pools. The availability of water service from the Department's mains to supply swimming pools is restricted to those locations where there is adequate main capacity and adequate pressure, and where the service to other customers will not be impaired thereby. Customers contemplating swimming pool installations to be so served must obtain permission therefor from the Board of Water Commissioners before installation.

In order to avoid impairment of service to other customers, refilling of pools shall be confined to the hours between 9 p.m. and 6 a.m. The Precinct reserves the right when necessary to conserve supply, to further restrict or prohibit the filling of swimming pools.

Failure to comply with any of the regulations contained in this section will result in discontinuance of service at the main to the entire property under the provisions of section 16. Service will not again be connected until the violation has ceased to exist and the reconnection charge paid.

23. Meters.

(a) The Precinct will install water meters on all services. The cost of the meter and its installation will be paid by the customer in addition to all other charges contained herein.

(b) The size of the meter will, in all cases, be determined by the Board of Water Commissioners.

(c) All meters shall be set, as nearly as possible, at the point of entrance of the service pipe to the building and the customer shall provide and maintain a clean, dry, warm and easily accessible (for reading and service) place therefor. In cases where no such location is available or where the customer's service pipe is not acceptable to the Precinct, the customer shall at his expense provide a meter pit at the property line for the installation of such meter. At the location of the meter, the customer shall provide, at his own cost, a meter horn with a ball valve on each side of the horn. The location of a meter may be changed at the request of a customer, but only at his expense, and by a licensed plumber in accordance with the applicable building code. Normal maintenance of meters shall be borne by the Precinct; however, damages caused by acts of the customer or by freezing shall be repaired by the Precinct at the customer's expense.

24. General Requirement for main Extensions. Precinct mains shall be extended only within the boundaries of the Precinct. No extension shall be constructed outside the Precinct boundaries nor to serve any premises located outside the Precinct boundaries. A person desiring to extend Precinct mains or service outside the Precinct boundaries shall petition for a change in the Precinct boundaries to include the applicable area as provided by law.

A party desiring to extend the Precinct mains shall file a written petition with the Board of Water Commissioners in the form provided by the board. A main extension shall be made only upon a special contract therefor which shall incorporate the terms of these ordinances and such other terms as the Precinct commissioners, in their discretion, deem necessary and advisable.

Main extensions shall be made only in existing highways, streets and roads or in ways which are laid out, in which grades have been established and which are to be dedicated to public use in accordance with Town of Hooksett road construction and dedication procedures. Notwithstanding the foregoing, a main extension may be constructed in private ways when, as and if:

i. Such ways are within a planned unit development or a like development configuration sanctioned by the Hooksett Zoning and Planning Ordinances;

ii. Such ways are to be constructed as roads or streets built according to the Town of Hooksett specifications for new roads;

iii. Such extension is otherwise in compliance with all other requirements of these by-laws and regulation adopted by the Precinct commissioners;

iv. Upon completion of installation and testing of the mains in accordance with Precinct standards, the said mains together with an easement for access, repair, inspection, maintenance and replacement shall be conveyed in fee simple absolute to the Precinct. Such easement shall be co-extensive with the course of the main, shall be at least twenty (20) feet wide and shall allow for vehicular and equipment access from at least one public way; and

v. That the real property ownership of customers to be served by the main extension shall be of such character that the Precinct shall have an adequate and effective lien thereon for the non payment of water rents, charges and tariffs as permitted by statute.

The Precinct shall furnish all materials and perform all labor necessary to install any main extension, either with its own employees or through an independent contractor employed by the Precinct. The costs of such extension shall be born by the petitioners and paid as the Board of Water Commissioners shall provide in the special contract for the extension. In all cases, a minimum of half of the estimated

cost of the extension shall be paid before work is commenced. The balance of the actual cost shall be paid before the main extension is put into service. In any case where the full contract price is not paid in advance, the commission shall require the petitioner to post a bond or other undertaking secured by a letter of credit or corporate surety to protect the Precinct against any nonpayment by the petitioner.

24-a. Construction of Main Extensions by Private Developers. Notwithstanding the foregoing general requirement that main extensions be constructed by the Precinct, such extensions may be constructed by private developers provided the following conditions exist and are observed:

i. That such extension shall have been found by the commissioners to be in the Precinct's best interest and serviceable by the Precinct's water supply and facilities;

ii. That the design and materials for such mains shall be to the same specifications and that the construction and installation shall be to the same standards as those obtaining for the installation and construction of main extensions in public ways;

iii. That complete construction plans for both the proposed extension and the roads or ways within which they are to be constructed shall be submitted to the Precinct commissioners not less than thirty (30) days prior to the proposed construction commencement date. Such plans shall be considered by the commission which may submit the same to the Precinct's consulting engineers for review. The Applicant shall pay all costs incurred by the commission for the consideration of construction plans;

iv. That any other utilities located or to be located under ground within the ways (whether public or private), particularly sewers, gas and electricity, shall be located and installed in accordance with the then-current requirements of the Town of Hooksett and regulations of the Precinct. In any event, no water main extension shall be installed below a sewer main nor laid parallel less than ten feet laterally from a sewer main or five feet laterally from a gas main or electric power supply conduit;

v. That installation of the extension shall be subject to construction supervision by the Precinct through its employees or agents including professional engineers. The developer shall reimburse the Precinct for all of its costs for such supervision;

vi. Before any main installation is commenced, the Precinct shall require that the developer post its bond in favor of the Precinct secured by a letter of credit or corporate surety in an amount sufficient to assure the Precinct that the proposed main extension project shall be completed and that all of the Precinct costs associated therewith shall be reimbursed. Such bond shall be required notwithstanding the fact that the developer may have posted a

road bond, so called, with the Town of Hooksett unless, in the opinion of the Precinct commissioners, such road bond adequately and expressly assures the completion of the water main extension and reimbursement of all of the Precinct's expenses as aforesaid. No bond shall be discharged until and unless the main extension has been accepted by the Precinct commission and a complete set of as-built drawing has been provided.

24-b. Standards and materials for main extensions, hydrants and equipment. The specifications for pipe, hydrants and fixtures to be used in any main extension project, whether constructed by special contract with the Precinct or by a private developer shall be as determined by the Board of Water Commissioners by reference to its published standards which may be amended from time to time.

24-c. Reimbursement for cost of main extensions. The property of any person contiguous to a public way in which a main extension is constructed pursuant to a special contract or by a private developer and who is not party to such contract shall be subject to the imposition of a connection charge equal to the actual pro-rated per-front-foot cost of the main extension project with respect such contiguous property: PROVIDED, However, that in the event such actual per-front-foot cost is higher than a standard maximum per-front-foot cost then observed by the Precinct commission, the standard cost shall form the basis of the connection charge. Such connection charge shall be payable when, as and if any water service for such property is connected to the main extension.

24-d. Further extensions, cost sharing. In the event within five (5) years after the date of the precinct's acceptance of a main extension, petition is made for further extension of the main, the petitioners requesting the further extension shall be required to contribute to the cost of the original extension in such a manner that the contribution if proportionate to the cost of the original extension based upon the extent of any increase in user density occasioned by the addition of second extension. Upon payment of such contribution, proportionate and equitable adjustments will be made and or paid to the petitioners for the original extension as provided by the terms of the special contract for said extension. Notwithstanding the foregoing, in the event customer density occasioned by a further extension shall be less than the density obtaining on the original extension, the said further extension shall be considered separate from the original and no cost contribution shall be required.

PENALTY

25. Violations of By-Laws. Any person who violates any provision of these By-Laws or any regulation of the Precinct, except with respect to the payment of bills for water service (Section 11) shall, in addition to any other penalty herein provided, be subject to a fine or forfeiture not to exceed One Hundred Dollars (\$100.00) for each violation. Each day any violation continues shall be considered a separate violation.

REGULATIONS

26. Appendices. The Precinct Commissioners are specifically authorized to adopt rules and regulations governing the prudential affairs of the Precinct including, but not limited to, water rates and charges, construction and material standards, operational standards and maintenance. Such regulations, as adopted and amended from time to time, shall have the force of law and shall be published as appendices to these By-Laws.

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APPENDIX 1

WATER RATES

GENERAL METERED SERVICE (GMS)

This schedule, effective February 1, 1990, is applicable to all water service in the Territory except municipal and private fire protection.

Rates:

I. The following minimum charge based on service size, assessed per quarter:

3\4" to 1" Service	\$12.00 per quarter
1 1/4 to 1 1/2" "	15.00 " "
2" Service	25.00 " "
3" Service	40.00 " "
4" Service	60.00 " "
6" Service	100.00 " "
8" Service	125.00 " "
10" Service	150/00 " "
12" Service	200.00 " "

II. All use per quarter: \$1.60 (One Dollar and Sixty Cents) per 1,000 Gallons.

Bills under this rate shall be rendered quarterly, November 1, February 1, May 1, and August 1, and are due and payable upon presentation.

MUNICIPAL FIRE PROTECTION (FP-M)

I. This rate is applicable to fire protection supported by municipal taxation, and applicable to privately owned and maintained fire hydrants and sprinkler systems which are situated on private land which is dedicated to residential purposed, actually contains over 250 units constructed solely for residential purposes, and the persons living within those residences have an actual ownership (as opposed to a lease or rental agreement) interest in the land on which those residences are situated.

Rate: For each hydrant: \$330. (Three Hundred Thirty Dollars) per year. Effective January 1, 1995.

PRIVATE FIRE PROTECTION (FP-P)

1. This rate is applicable to service provided to privately owned and maintained fire hydrants and sprinkler systems.

II. Rate:

- a) For each hydrant \$100.00 (One Hundred Dollars) per quarter
- b) For each sprinkler riser: A quarterly charge equal to the minimum quarterly charge for that size service.

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LATE CHARGE

A late charge of \$5.00 (Five Dollars) shall be assessed against any customer who pays his or her bill after the Due Date indicated on the bill.

RECONNECTION CHARGE

The charge for reconnection of service terminated for any reason under these By-Laws, which charge shall be in addition to accrued amount owing, shall be \$10.00

BACK FLOW INSPECTION CHARGE

All back flow prevention valves shall be inspected and tested by the Precinct at least twice a year. Inspection times will be at the convenience of the Precinct upon reasonable notice to the customer. The charge of each such inspection shall be \$25.00.

WATER SUPPLY DEVELOPMENT FEE

A Precinct Water Supply Development Fee (hereafter called Grant) of a minimum of \$600.00 (six hundred dollars) per new residential unit customer is hereby established. Said grant shall be calculated at the rate of 150 gallons per bedroom but in no event will the grant be less than the minimum set out above. For non-residential customers the grant shall be calculated at the rate of \$2.00 (two dollars) per gallon of projected use based on State of New Hampshire guidelines but in no event will the grant be less than the \$600.00 minimum set out above.

APPENDIX 2

SERVICE ELEVATION

In order to provide for a safe minimum service pressure throughout the Precinct water distribution system a limiting effective service elevation of 420 feet above main sea level is hereby adopted. In no event shall main extensions or service connections be allowed above the said limiting elevation. (Effective April 13, 1983).

APPENDIX 3

MATERIAL SPECIFICATIONS

1. Services:

Services from the precinct's mains to the interior of user's premises shall conform to the following:

- a) All services shall be of "K" copper from the main to the meter and shall have five feet of earth cover.
- b) All fittings shall be brass (Mueller, Ford or equal quality).
- c) All services shall have curb boxes which shall be of meter construction with 5/8 inch rod.

2. Mains:

Water mains and main extension projects installed after July 1, 1985 shall conform to the following:

- a) All pipes shall be ductile iron, Class 52.
- b) Valves shall be Met Pattern, open left.
- c) Fittings shall be ductile iron, Class 350.
- d) Hydrants shall be Eddy: break-flange; 5 foot 6 inch buried height; open right; Manchester Water Works specification,
- e) Main repairs shall be made only with solid ductile iron sleeves, 12 inch minimum length.

APPENDIX 4

CONSTRUCTION REQUIREMENTS

The following minimum standards and procedure shall be observed in all main extension projects, main or service connections and any construction or utility activity in the vicinity of Precincts mains and works.

a) All pipe and appurtenances shall be installed according to the Precinct By-Laws and regulations, American Water Works Association and New Hampshire Water Supply and Pollution Control Commission Standards, as interpreted by the Precinct superintendent. In the case of conflict among the said regulations and standards, the more stringent standard shall apply except as may otherwise be determined by the superintendent in his discretion.

b) All water main installation or interventions shall be subject to full-time inspection by Precinct employees or agents which may, in the discretion of the Precinct Commissioners, include professional engineers. The actual cost to the Precinct of all such inspection services shall be reimbursed by the party performing the inspected work.

c) All new underground utilities installations other than sewer and waste pipes, shall be installed a minimum distance of five feet horizontal from water mains, services and appliances. Sewer and waste pipes shall be installed at minimum distance of 10 feet horizontally and 18 inches below water mains and appliances.

d) Main extension installers shall be responsible to obtain all permits prior to commencing construction.

e) There shall be no soldered joints in the ground. A meter horn and double check valve shall be required on all services.

f) Each commercial, industrial, or hazardous connection must have an approved RPZ backflow prevention device.

g) Services must be installed in accordance with New Hampshire Water Supply Standards. In cases of conflict between such standards and the Precinct's By-Laws or specifications, the more restrictive standard shall apply.

h) Before use, each service line must be tested and approved by the superintendent or his agent.

i) All meters shall have outside registers, the wiring for which shall be provided and installed by the customer must be 18 gauge 2 conductor.

j) All fire protection sprinkler systems must have an approved RPZ backflow prevention device.

APPENDIX 5

CROSS-CONNECTION REGULATIONS

Cross-connection regulations by the New Hampshire water Supply & Pollution Control Commission shall apply within the Precinct and shall be enforced as Precinct Regulations. The following is a reprint of such regulations from the New Hampshire Code of Administrative Rules, Part WS 314 (Cross-Connections). Subscribers are warned to consult the New Hampshire Code of Administrative Rules for amendments to such rules.

NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES

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PART WS 314 CROSS-CONNECTIONS

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Section WS 314.02	Applicability
Section WS 314.03	Definitions
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Section WS 314.05	Required Forms; Permits
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APPENDIX I

Table I
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APPENDIX II

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PART 2 PRODUCTS

2.01 GENERAL

- A. All products included in this section shall conform to the requirements of the standard specifications referenced herein.
- B. Pipe size shall be as shown on the Drawings.
- C. All pipe materials and methods of jointing shall be as shown on the Drawings.

2.02 ACCEPTABLE MANUFACTURERS

- A. Specifications: Products specified in this section are based on those manufactured by the following firms:
 - 1. Ductile Iron Pipe - Atlantic States, U.S. Pipe, or Griffin.
 - 2. Ductile Iron Fittings and Valve Boxes - Tyler.
 - 3. Gate Valves - American Flow Control.
 - 4. Hydrants - American Darling.
 - 5. Brass Fittings - Mueller or Ford.
 - 6. Valve boxes - Clow Corporation
 - 7. Corporation stops - Ford
 - 8. Curb Stops - Ford
 - 9. Service Saddle - Ford
- B. Substitutions: Products of equal function, quality and performance may be proposed for substitution.

2.03 MATERIALS

- A. Ductile Iron Pipe: Pipe shall conform to ANSI A21.51/AWWA C151, Class 52, and shall have push-on joints. Pipe shall be double cement-lined with seal coat inside and out in accordance with ANSI A 21.4/AWWA C104. Push-on joints and rubber gaskets shall be in accordance with ANSI A 21.11/AWWA C 111. Each push-on joint shall include two (2) serrated brass wedges to provide electrical continuity.

- A. Polyvinyl Chloride (PVC) Pipe: Pipe and fittings shall conform to the most current AWWA C900 standard. Pipe shall be Class 150 and shall meet the requirements of Dimension Ratio (DR) 18.

Pipe (inches)	Size (inches)	Thickness DR	Outside Diameter (inches)
4	0.267	18	4.80
6	0.383	18	6.90
8	0.503	18	9.05
10	0.617	18	11.10
12	0.733	18	13.20

PVC Pipe shall have an integrally formed bell of hydrostatic design strength equivalent to the pipe barrel. The joint shall use a solid cross section elastomeric sealing ring meeting the requirements of ASTM F-477. Sufficient lubricant shall be a member in good standing of the Uni-Bell PVC Pipe Association.

The Pipe manufacturer shall be a member in good standing of the Uni-Bell PVC Pipe Association.

If requested by the ENGINEER, the manufacturer shall submit a certificate of compliance for the pipe to ensure that it meets the requirements of AWWA C900, and bears approval of National Sanitation Foundation, Underwriters Laboratory and Factory Manual.

The pipe shall be blue in color, the universal standard for potable water.

- B. Ductile Iron Fittings: Fittings shall be ductile iron, three hundred and fifty (350) psi pressure rating, conforming to ANSI A21.10/AWWA C110 or ANSI A21.53/ AWWA C153 with mechanical joints. Fittings shall be double cement-lined with seal coat inside and out in accordance with ANSI A21.4/AWWA C104. Fitting shall be manufactured by Tyler or approved equal. Tees for hydrant branches shall have mechanical joints on the run with a plain end having an integral rotating gland on the branch. The gland shall anchor mechanical joint pipe or valve ends to the plain end of the tee.
- C. Joints shall be furnished with either "Grip Ring", "Megalug" , or "Wedge Action" pipe restrainer glands. Grip Rings, as manufactured by Romec. Megalugs, as manufactured by EBAA Iron Sales, Inc. Wedge Action, as manufactured by Uni-Flange. Joints and gaskets shall conform to ANSI A21.11/AWWA C111. Glands shall be made of ductile iron conforming to ASTM A536-80. The ring of the Grip Ring shall be ductile iron grade 65-45-12 conform to ASTM A536-80.
- D. Gate Valves: Gate valves shall be resilient wedge type with a ductile iron body, and a non-rising bronze stem. The valves shall meet the requirements of AWWA C509 except for the body thickness which meets the requirements of AWWA C153. Valves shall be rated for a minimum of 250 psi working pressure. Valves shall have mechanical joints and gaskets as specified above. Valves shall open left. Valves shall be American Flow Control AFC - 2500 or equal.
- E. Valve Boxes: Boxes shall be cast iron, of heavy pattern, adjustable type, thoroughly coated with bitumastic paint, and shall be provided with cast iron cover. The upper section of the box shall be top-flange valve box type to prevent settlement. The lower section of the box shall be a belled base section that encloses the operating nut of the valve. Boxes shall have a barrel of not less than five (5) inch diameter and cast iron valve box extensions shall be provided to bring the cover to grade. Boxes shall be of the sliding adjustable type with a lap of at least six (6) inches when in the extended position. Covers shall have the word "WATER" cast into them. Valve boxes shall be Tyler or Bibby Lapearle.

- F. Hydrants: Hydrants shall conform to AWWA C502. Hydrants shall be furnished with a teflon-coated 5-1/4 inch valve, one 4-inch steamer connection, two 2-1/2-inch hose connections, plugged drain holes, and shall opening left. Inlet shall be mechanical joint conforming to ANSI A21.11/AWWA C111. Hydrants shall be compatible with specified depth of bury of water main. Hydrants shall be either American Darling B-62-B. The hydrant shall be painted to match the standard of the OWNER. Painting shall be done at the factory.
- G. Corporation stops shall be ball valve type with PTFE coated brass ball, CC (AWWA tapered) threads, double O-ring seal, a blow-out proof stem design, and compression-type fittings with a gripper band (or grip joint). The 3/4 inch and 1 inch corporations shall be either Mueller B-25008 or Ford FB1000. Corporations shall be supplied with pack-joint eighth or quarter bends where required.
- H. Service saddles shall be required for corporation stops in accordance with the table in paragraph 3.07. Service saddles shall be double strap type with 360 degree contact with the main line. The saddle body shall be constructed from nylon coated ductile iron and tapped for the size and thread type as noted above. The straps shall be constructed from stainless steel. Service Saddles shall be Smith-Blair or equal.
- I. Copper tubing for house services and chlorine injection points shall be Type "K" soft conforming to ASTM B88. The name or trademark of the manufacturer and type shall be stamped at intervals along the pipe.
- J. Curb stops shall be ball valve type with a drain hole, PTFE coated brass ball, double O-ring seal, a blow-out proof stem design, and compression-type fittings with a gripper band (or grip joint). The 3/4 inch and 1 inch curb stops shall be either Mueller B-25209 or Ford B44 series. Curb stops shall open left.
- K. Curb boxes shall be adjustable erie style with a 9/16" diameter steel by 24" long rod and a plug type cover. The box shall be furnished to meet the required depth of the curb stop.
- L. Adapter couplings may be required for fitting new services to existing service lines. Such fittings shall be provided with compression-type fittings with a gripper band (or grip joint) connection. Fittings shall be Mueller or Ford.
- M. Couplings used to connect plain ends of cast or ductile iron pipe shall be of the long body solid sleeve type (ie. 12" long). The fitting, glands, and nuts shall be as specified above. Couplings used to connect plain ends of pit cast pipe to ductile iron pipe shall be a flexible ductile iron transition coupling as manufactured by Dresser.
- N. Tapping Sleeve: Tapping sleeve shall be type 304 stainless steel with stainless steel nuts and bolts.

PART 3 EXECUTION

3.01 GENERAL

- A. Pipe and accessories shall be handled and stored in such a manner as to insure that pipe is installed in sound, undamaged condition. Care shall be taken not to injure the pipe coating or lining.

- B. Ductile iron pipe and fittings and the cement linings are comparatively brittle. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe or lining, scratching or marring machined surfaces, and abrasion of the pipe coating or lining.
- C. 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 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 twelve (12) inches from the visible limits of the crack.
- D. If authorized, cutting of the pipe shall be done so that the cut is square and clean, without causing damage to the pipe lining. 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.
- E. 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 to property.
- F. The Developer 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.
- G. Pipe shall not be dropped from trucks onto the ground or into the trench.
- H. The Developer shall have on the job site, with each laying crew, all the proper tools to handle and cut the pipe.
- I. Damaged pipe coating and/or lining shall be restored before installation only as approved or directed by the Designated Representative of the Hooksett Village Precinct.

3.02 CONTROL OF ALIGNMENT AND GRADE

- A. The Drawings show easement and property and other control lines necessary for locating the work as well as elevations and benchmarks used in the design of the work on the Drawings.
- B. During construction, the Developer shall provide the Designated Representative of the Hooksett Village Precinct, at his request, all reasonable and necessary materials, opportunities, and assistance for setting stakes and making measurements, including the furnishing of one (1) or two (2) rodmen or chainmen as needed at intermittent times. He shall not proceed until he has made timely request of the Designated Representative of the Hooksett Village Precinct for, and has received from him, 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 Developer shall carefully preserve benchmarks,, reference points and stakes, and in case of willful or careless destruction by his own men, 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.

3.03 PREPARATION OF BED

- A. As soon as excavation has been completed to required depth, place and compact bedding material to the elevation necessary to bring the pipe to grade as specified in Section 02225 - Excavation, Backfilling and Compacting.

- B. The compacted bed shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly for the full length of the barrel. Suitable holes for bells or couplings shall be dug around the pipe joints to provide ample space for making tight joints.

3.04 LAYING PIPE

- A. Laying of pipe and fittings shall be in accordance with the requirements of AWWA Specifications and as specified herein.
- B. Each pipe length shall be inspected for cracks, defects in coating or lining, and any other evidences of unsuitability.
- C. Pipe shall be laid in the dry and at no time shall water in the trench be permitted to flow into the pipe.
- D. The pipe shall then be laid on the trench bedding, and the pipe pushed home. Jointing shall be in accordance with the manufacturer's instructions and appropriate ASTM or AWWA Standards, and the CONTRACTOR shall have on hand for each pipe laying crew, the necessary tools, gauges, pipe cutters, etc. necessary to install the pipe in a workmanlike manner. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow.
- E. Blocking under the pipe will not be permitted except where a concrete cradle is proposed, in which case precast concrete blocks shall be used.
- F. After placement of the blanket material, the pipe shall be checked for any debris, tools, etc. which shall be removed.
- G. If inspection of the pipe indicates that the pipe has been properly installed as determined by the Designated Representative of the Hooksett Village Precinct, the Developer may then refill or backfill the remainder of the trench in accordance with Section 02225 - Excavation, Backfilling and Compacting.
- H. At any time that work is not in progress, the end of the pipe shall be suitably closed to prevent the entry of animals, earth, etc.
- I. Acceptable alignment shall be preserved in laying. The deflection at joints shall not exceed the manufacturers recommendations or three (3) degrees, or Twelve (12) inches for an eighteen (18) foot length of pipe. Deflection shall be determined by taking into account the vertical and horizontal deflections of the joint. Fittings, in addition to those shown on the Drawings, shall be provided, if required, in crossings utilities which may be encountered upon opening the trench. Solid sleeves shall be used only where approved by the Designated Representative of the Hooksett Village Precinct.
- J. Concrete thrust blocks shall be installed at all fittings and other locations as directed by the Designated Representative of the Hooksett Village Precinct. Minimum bearing area shall be as shown on the Drawings. Joints shall be protected by felt roofing paper prior to placing concrete. Concrete shall be placed against undisturbed material, and shall not cover joints, bolt, or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks.
- K. Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends on the upstream side. A rubber gasket shall be inserted in the groove of the bell end of the pipe and joint surfaces shall be cleaned and lubricated. The plain end of the pipe to be entered shall then be lubricated and inserted in alignment with the bell of the pipe to which it is

to be jointed and pushed home with a jack or by other means. After jointing the pipe, a metal feeler shall be used to make certain that the rubber gasket is located properly. The pipe shall then be deflected, if need be and two (2) brass wedges shall be inserted in the joint of the two pipes.

- L. Mechanical joints at valves, fittings and where designated shall be in accordance with AWWA recommendations and the instructions of the manufacturer. To assemble the joints in the field, the Developer/Contractor shall thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Bolts shall be tightened to the specified torques. Under no conditions shall extension wrenches or pipe over handle or ordinary ratchet wrench be used to secure greater leverage.
- M. Apply a bituminous coating to all buried rods, nuts, and bolts.

3.05 INSTALLATION OF VALVES AND FITTINGS

- A. Valves and boxes shall be set with the stem vertical and box vertically centered over operating nut. Valves shall be set on a firm foundation and supported by tamping selected excavated material under and at the sides of the valve. The gate box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade.
- B. Install couplings and fittings in accordance with manufacturer's instructions.
- C. All valves and fittings shall be installed in order to assure electrical continuity using mechanical joint retainer glands, grounding straps and brass wedges (push-on joints only).
- D. Valve and hydrant tees shall be utilized at all hydrant installations. Hydrant and valve tees shall have an integrally attached, rotatable gland which, after bolting to valve or adjoining fitting, the joint is effectively restrained from separation.
- E. Before backfilling, all exposed portions of any bolts shall be heavily coated with two (2) coats of bituminous paint.
- F. Tapping Sleeves and Tapping Valves:
 - 1. Shall be set vertically and squarely centered on the main to be tapped. Adequate support shall be provided under the sleeve and valve during the tapping operation. Sleeves shall be no closer than three feet from water main joints.
 - 2. Installations shall be made under pressure and the flow of water through the existing main shall be maintained at all times.
 - 3. Thrust blocks shall be provided behind all tapping sleeves. Proper tamping of supporting earth around and under the valve and sleeve is mandatory. After completing the tap, the valve shall be flushed to ensure that the valve seat is clean.

3.06 INSTALLATION OF HYDRANTS

- A. Hydrants shall be set at the location shown and bedded on a firm foundation. Each hydrant shall be set in true vertical alignment and properly braced. All nuts and bolts located below finish grade shall be given a heavy bituminous coating after installation.
- C. Concrete thrust blocks shall be placed between the rear of the hydrant inlet and undisturbed soil at the end of the trench. Minimum bearing area shall be as shown on the Drawings. Roofing felt

shall be placed around hydrant elbow before placing concrete.

- D. No hydrant shall be backfilled until directed by the Designated Representative of the Hooksett Village Precinct.
- E. The Developer/Contractor shall install plugs in the hydrant drain ports.

3.07 INSTALLATION OF MANUAL AIR RELEASE/ CHLORINATION INJECTION POINTS

- A. Install each valve box vertically, centered over the operating key, with the elevation of the top adjusted to conform to the finished surface at the completion of the Work. Adequately support the box during backfilling to maintain vertical alignment.
- B. Tapping pipe:
 - 1. Tapping ductile iron pipe: Corporation stops shall be installed in ductile iron pipe with a direct tap except as indicated on the following table where a service saddle shall be installed.

Tapping Saddle Requirements vs Pipe Size and Class

<u>Pipe Size</u>	<u>Saddle Requirements for Class 50 Pipe</u>	<u>Saddle Requirements for Class 51 Pipe</u>	<u>Saddle Requirements for Class 52 Pipe</u>
6-inch	All taps	All taps	Taps > 3/4 inch
8-inch	All taps	Taps > 3/4 inch	Taps > 3/4 inch
10-inch	Taps > 3/4 inch	Taps > 3/4 inch	Taps > 1 inch
12-inch	Taps > 3/4 inch	Taps > 1 inch	Taps > 1-1/4 inches
16-inch	Taps > 1-1/4 inches	Taps > 1-1/2 inches	Taps > 2 inches
20-inch	Taps > 2-1/2 inches	Taps > 3 inches	Taps > 3 inches

- 2. Tapping PVC pipe: Corporation stops shall be installed in PVC pipe using a service clamp or saddle in accordance with the recommendations of the PVC pipe manufacturer.
- 3. Service saddle shall be securely fastened to the water main. Securely attach the tapping machine to the corporation, open corporation and tap pipe. Corporations shall be tightened only sufficiently to be watertight. Corporations and service saddles must have electrical continuity to facilitate thawing and tracing.
- C. When installing the corporation stop without a service saddle, rigidly fasten the tapping machine to the pipe as near the vertical diameter as possible. The corporation stops shall be installed in the pipe at the twelve (12) o'clock. The length of travel of the tap should be so established that when the corporation stop is inserted and tightened with a fourteen (14) inch wrench, a minimum of one (1) thread and a maximum of three (3) threads will be exposed on the outside. When a wet tapping machine is used, the corporation stop shall be inserted with the machine while it is still in place. The stop shall be tightened only sufficiently to be watertight and care must be constantly exercised not to over tighten.
- D. The chlorination connections shall be constructed in accordance with detail shown on the Drawings.

3.08 INSTALLATION OF SERVICES

- A. Install corporation stops in the new water main either at the time of installation or later when service connections are constructed. Service connections shall be constructed after the new pipe has been tested and disinfected.
- B. When installing the corporation stop without a service saddle, follow the requirements stated in paragraph 3.07 C except that the corporation stops shall be installed in the pipe at the ten (10) o'clock or two (2) o'clock position.
- C. Service saddle shall be used in accordance with the table in paragraph 3.07 B.
- D. All work on service connections shall be properly coordinated with Hooksett Village Precinct.
- E. Install copper tubing from the corporation stop to the curb stop for a new service, or connect to the existing water service pipe for service changeover. Install to a depth of six (6) feet minimum. A "goose neck" shall be installed in the new service pipe. Care shall be exercised in the placing and laying of tubing to be sure that the pipe does not have any kinks and is not installed near sharp stones or ledge which would cause damage to the pipe. Place sand as shown on the Drawings adjacent to and above the tubing. No stones shall be placed or dropped on the tubing until the depth of sand backfill above the tubing is in excess of twelve (12) inches.
- F. Install curb stop and curb box (new service installation) at the approximate property line or as otherwise directed by the Designated Representative of the Hooksett Village Precinct and connect with new tubing. Install curb box vertically, centered over the operating key, with the elevation of the top adjusted to conform to the finished grade. Adequately support the box during backfilling to maintain vertical alignment. Care must be taken to insure that the curb box does not rest on the curb stop.
- G. Use couplings as required to connect new tubing with existing services.
- H. For copper services, use only fittings and lines which have been specifically designed to provide electrical continuity. Install all items in strict conformance with the manufacturer's literature in order to ensure electrical continuity.

3.09 TESTING

- A. The Developer shall furnish all necessary equipment and labor for carrying out a pressure test and leakage test on the pipeline in accordance with AWWA C600 Specifications.
- B. The Developer shall make any taps and furnish all necessary caps, plugs, etc., as required in conjunction with testing. He shall also furnish a test pump, gauges and any other equipment required in conjunction with carrying out the hydrostatic tests. He shall at all times protect the new water mains and the existing water mains against the entrance of polluting material.
- C. Testing requirements:
 - 1. Test duration: Two (2) hours, minimum.
 - 2. Test pressure: One hundred and fifty percent (150%) of maximum operating pressure as determined by the Designated Representative of the Hooksett Village Precinct, or one hundred (100) psi which ever is higher.

3. Allowable pressure loss: Pressure shall not vary more than ±5 psi for the duration of the pressure test.
4. Allowable leakage: Allowable leakage shall be determined by the following formula:

$$L = \frac{SD(P)^{0.5}}{133200}$$

L = allowable leakage, in gallons per hour.
 S = length of pipe tested, in feet.
 D = nominal pipe diameter, in inches.
 P = average test pressure, in psi (gauge).

5. Allowable leakage in gallon per hour per one thousand (1,000) feet of pipeline can be determined from the following chart.

Nominal Pipe Diameter-in.

Avg. Test Pressure psi	Nominal Pipe Diameter-in.										
	3	4	6	8	10	12	14	16	18	20	24
450	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82
400	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60
350	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37
300	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12
275	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55
175	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21
125	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01
100	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80

6. Acceptance of installation shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified, the CONTRACTOR shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowance.
7. All visible leaks are to be repaired regardless of the amount of leakage.
8. The leakage test shall be conducted concurrently with the pressure test.

3.10 CHLORINATION

- A. Before being placed in service, all new water pipelines shall be chlorinated in accordance with the requirements of AWWA C651. The procedure shall be discussed with the Designated Representative of the Hooksett Village Precinct prior to proceeding with the work.

- B. The location of the chlorination and sampling points will be determined by the Designated Representative of the Hooksett Village Precinct in the field. Taps for chlorination and sampling shall be uncovered and backfilled by the Developer as required.
- C. The general procedure for chlorination shall be first to flush all dirty or discolored water from the lines, and then introduce chlorine in approved dosages through a tap at one end, while water is being withdrawn at the other end of the line. The chlorine solution shall remain in the pipeline for at least twenty-four (24) hours.
- D. Following the chlorination period, all treated water shall be flushed from the lines at their extremities, and replaced with water from the distribution system. Bacteriological sampling and analysis of the replacement water shall be made after the replacement water has occupied the chlorinated pipeline for a minimum of sixteen (16) hours by the Developer in full accordance with AWWA C651. The Developer will be required to rechlorinate if the test fails to achieve satisfactory results. The line shall not be placed in service until the requirements of the Hooksett Village Precinct and the New Hampshire Department of Environmental Services, Water Supply and Pollution Control Division, are met.
- E. Special disinfection procedures, such as soaking or swabbing, approved by the Designated Representative of the Hooksett Village Precinct shall be used in connections to existing mains and where the method outlined above is not practicable.
- F. Form of chlorine: Calcium hypochlorite granules or sodium hypochlorite solution.
- G. Method of chlorine application: Continuous feed method or slug method.

END OF SECTION

APPENDIX C

**MANCHESTER WATER WORKS
DESIGN & CONSTRUCTION STANDARDS
FOR WATER WORKS**

July, 2000

**MANCHESTER WATER WORKS
MATERIAL SPECIFICATION SHEET**

Ductile Iron Pipe - The Ductile Iron Pipe shall be Class 52 and shall conform to ANSI A.21.51 (AWWA C-151) for "pipe centrifugally cast in metal molds or sand lined molds for water". Cement linings shall be double the standard thickness and shall conform to ANSI A.21.4 Seal coating shall be applied inside and out. A second application of seal coat shall be applied to the pipe interior after the initial coat has set. All pipe shall be push-on type joint, in accordance with ANSI A.21.11.

Mechanical Joint Fittings - The Mechanical Joint Fittings shall conform to AWWA C104/ANSI A21.4, C111/A21.11 or C153/A21.53, Class 350 minimum, ductile iron compact fitting, with double cement-lining thickness and seal coated inside and out. Fittings shall be complete with accessories - tee bolts shall be either ductile iron or corten. All M.J. fittings shall be cast in U.S.A.

Gate Valves 4"-12" - Gate Valves shall be 200 psi working pressure, vertical, plain non-rising stem, nut operated, open right with mechanical joint end connections. Valves shall comply with AWWA C500 or C509. Valves may be either Metropolitan Pattern or Resilient Seated (RS). RS valves shall meet the following requirements: Valve body and bonnet shall be of cast or ductile iron coated on all exterior and interior surfaces with a fusion bonded epoxy conforming to AWWA Standard C-550, latest revision, applied with a minimum thickness of eight (8) mils. The manufacturer shall certify that the coating is suitable for use in a potable water system, and the interior coating certified to be holiday-free. The gate shall be completely covered with rubber over all ferrous surfaces. The rubber shall be securely bonded to the gate body.

The "O" ring stem seal shall be replaceable with the valve under pressure in the full open position.

Valves shall be full port opening. Tapping valves shall have enlarged ports.

Butterfly Valves 16"-24" - All 16", 20" and 24" Butterfly Valves shall be open right with mechanical joint end connections, complete with accessories for buried service.

Valves shall be of the tight closing rubber seat type with seat bonded or mechanically retained into the disc or valve body. Valves shall have a full uninterrupted 360 degree sealing surface and shall be bubble tight at rated pressures in both directions. Valves shall be designed for use in either throttling application or for very infrequent operation after extended periods of inactivity.

Valves shall be in full compliance with AWWA Specification C-504, with the following exceptions:

Valve Bodies - All valve bodies shall be of cast iron conforming to ASTM A-126, Class B with integral cast ends and shall meet the following requirements: Valve body and bonnet shall be of cast or ductile iron, coated on all exterior and interior surfaces with epoxy conforming to AWWA Standard C-550, latest revision, applied with a minimum thickness of eight (8) mils. The manufacturer shall certify that the coating is suitable for use in a potable water system, and the interior coating certified to be holiday-free.

Valve Discs - All valve discs shall be streamlined and present the smallest profile possible consistent with the structural requirements of the pressure class. They shall be of offset or flow through design and material composition of cast or ductile iron. Disc sealing edge shall have a continuous uninterrupted 360 degree sealing surface of 18-8 stainless steel.

Valve Shafts - Valve shafts shall be of 18-8 type 304 stainless steel or carbon steel with stainless steel journals. Shaft design shall be of thru or stub type construction with at least 1" shaft diameter engagement into the disc. Shaft to disc connection shall be of a rigid, non-slip type connection.

Valve Seats - Valve seats shall be a rubber material bonded or mechanically retained.

Valve Bearings - Valve bearings shall be self-lubricating and non-corrosive and shall have a significant difference in hardness from the valve shaft.

Valve Actuators-General - All valve actuators shall be designed as an integral part of the valve and shall meet or exceed all the requirements of AWWA C-504. Actuators shall be of rack and pinion, link and lever or traveling design. All moving parts penetrating into the actuator shall have corrosion resistant surfaces in contact with the housing seals. All actuator types, in a given size, to be interchangeable and fastened to valves with readily accessible external bolts. All actuators must fit on the valves they are designed to operate in any mounted position or rotational direction without any special prior preparation to either the valve or the actuator.

Retainer Glands - Retainer Glands shall be heavyweight, ductile iron with six (6) ductile iron set screws, or of wedge-type, designed for 70 ft-lbs of torque.

Valve Boxes - Valve Boxes shall be slide type cast or ductile iron standard 5'-0" bury with the following three (3) components:

1. Gate box covers shall fit properly and seat flush in the gate valve box top sections.

2. The top section shall be a minimum of 26" in length with top flange,
3. The belled design base section shall be a minimum of 36" in length.
4. The cover shall be marked "water". The boxes shall be 5 1/4" inside diameter.

Hydrants - To be Clow Corporation Eddy or U.S. Pipe & Foundry, Inc., Metropolitan. All hydrants shall have as minimum these features: break type flange, swivelhead, 6" mechanical joint inlet connections with fusion bonded epoxy coated shoe. Nozzle dimensions: hose (2) 2 1/2", pump (1) 4 1/2", threads NST. Main valve opening 5 1/4", open right. Operating nut shall be pentagon in shape and sized as approved by the Manchester Water Works. Color of hydrants to be yellow. Standard trench depth 6' or as required. Hydrants shall open right.

SERVICE MATERIAL

All service material shall meet or exceed the requirements for AWWA C-800.

Curb Stops - Shall be ball type with copper compression fittings; body shall be heavy cast with a single or double end load design.

Corporation - The "inlet" side shall have AWWA tapered threads. The "outlet" side shall have compression type fittings for copper tubing and pipe (type K soft). The corporation shall be adaptable to the drill and tap combinations used in the Mueller A-3, B-100 and D-5 type tapping machines, or the Reed CDTM 1000.

Curb stops and corporations are to be cast from red brass having the following compositions: Cu - 85%, Sn - 5%, Pb - 5%, Zn - 5% with variation of 2% allowable. All curb stops and corporations shall be tested for tightness, and have the ability to withstand one hundred fifty (150) pounds working pressure. All copper connections shall have compression type fittings. All threads shall be standard and finished in a workmanlike manner, i.e., free of burrs. Nuts shall start freely in assembly. The company trademark or identifying mark shall be stamped on the brass service materials.

Copper - To be type "K" - soft. Sizes: 1 1/2" through 2" are to be 20' straight lengths.

Polyethylene(PE) Tubing (when allowed) - Tubing in sizes 1 1/2" and 2" allowed under certain circumstances. Tubing shall be Copper Tube Size (CTS) designed for 200 psi working pressure and shall conform to AWWA C901. Insert stiffeners shall be used on all compression joint connections.

Curb Boxes - For use with 3/4" and 1" curb stops. The length of curb boxes shall be 5'-6' with a 12" adjustment. The cover shall be heavy duty slotted with counter sunk pentagon solid brass plugs, coarse threaded. The rod shall be one-half inch (1/2")

offset with stainless steel yoke thirty inches (30") in length. The box bottom section shall have an arch pattern. The box upper section is to be one inch (1") in diameter.

Samples of all service material shall be submitted to the Manchester Water Works Distribution Engineer prior to the commencement of work.

The following water related materials are acceptable to the MWW:

VALVES APPROVED

- | | |
|-----------------------------|-------------|
| 1) U.S. Metro Seal | (R.S.) |
| 2) Clow | (R.S.) |
| 3) Waterous | (R.S.) |
| 4) American Control Valve | (R.S.) |
| 5) U.S. and M&H Met Pattern | Double Disk |

TAPPING VALVES APPROVED

- | | |
|--------------------|--------|
| 1) U.S. Metro Seal | (R.S.) |
| 2) Clow | (R.S.) |

FITTINGS (USA Made)

- 1) U.S. Trim Type DI
- 2) Tyler Fitting CI or DI
- 3) Griffin Fitting DI

HYDRANT

- 1) U.S. Metropolitan B.F.
- 2) Eddy BF (Clow)

BASIC PROCEDURES FOR THE INSTALLATION OF DUCTILE AND CAST IRON PIPE

Basic Procedures for the Installation of Ductile and Cast Iron Pipe

For the purposes of this section, the word "pipe" includes ductile and cast iron pipe: where a procedure refers to one of these materials only, it is so specified. It should be noted that experience with ductile iron pipe since the early 1950's has demonstrated its superior resistance to impact, beam loads and ring crushing loads. Therefore, handling and installation procedures, in general, are much less critical for this pipe material. This fact can result in considerable savings in the installed cost of a pipeline project.

Introduction

Proper installation procedures will enhance the long and useful life of both ductile and cast iron pipe. The information presented in this paper may be useful as general guidelines for the installation of these materials. More specific data is available in The Guides for the Installation of Ductile Iron Pipe and Gray Cast Iron Water Mains which are available from CIPRA.

Receiving, Handling and Storage

It is important that all pipe be carefully inspected for damage that may have occurred in transit. Unloading may be accomplished using slings, hooks, pipe tongs or skids. Under no circumstances should pipe be dropped on old automobile tires or other cushions and when handled on skidways, it should not be skidded or rolled against pipe already on the ground. Care should be exercised to avoid injury to the coating or lining; if damage occurs, repairs must be made.

Manufacturers who employ special methods of packaging pipe for shipment will gladly send instructions for unloading.

Proper storage procedures are important and warrant special consideration:

—Suggested maximum allowable stacking heights are available and should be observed; each pipe size should be stacked separately.

—Lubricant for rubber joints should be kept in a sanitary condition as an aid in disinfection of the main.

—Rubber gaskets should be used on a first-in, first-out basis and should be stored in a cool, dark location to avoid deterioration.

The Trench

Trench location is of prime importance in urban areas where water mains are installed to a line and grade established by the engineer to avoid damage to other subsurface utilities. In these areas no excavation should be attempted before obtaining clearance from other utilities.

If a gas service pipe is broken, the gas utility should be notified immediately and an experienced gas service man should supervise repairs.

House sewers must be returned to good condition after installation of the water main. Any installation in the proximity of underground telephone or power conduits should proceed only after notification of the appropriate utility.

Trees, shrubs, lawns, fences, etc. must be protected during construction; where removal is necessary, permission must be obtained and replacement made. Pavement, sidewalks and curbs must be replaced according to local standards.

The required earth cover over pipe varies depending on pipe size and geographical location. Generally a minimum cover of 4 to 5 feet is required for large diameter mains; for small diameter mains, cover varies from 2½ to 4 feet in the southern states to as much as 7 or 8 feet in the northern states because of the depth of frost penetration.

One of the most important requirements of a good trench is the preparation of the trench bottom; it should be true and even in order to insure soil support for the full length of the pipe barrel. In this phase of the excavation, the following should be observed:

—A trench for cast iron pipe passing over a sewer or previous excavation requires compaction to provide support equal to native soil.

—If a sling is used to lower the pipe, an indentation not exceeding 18 inches in length should be made at the middle of the trench bed to facilitate the removal of the sling.

—Soft subgrade requires the addition of crushed stone; in extreme cases, piling may be necessary for proper support.

—Large bell holes are not required for push-on or mechanical joint pipe; however, a small depression is necessary to permit the pipe barrel to lie flat and to allow space for joint assembly.

The following suggested trench widths are sufficient to permit proper pipe installation with room for joint assembly and backfill tamping around the pipe:

TABLE 1
SUGGESTED TRENCH WIDTH

Nominal Pipe Size (Inches)	Trench Width (Inches)	Nominal Pipe Size (Inches)	Trench Width (Inches)
4	28	20	44
6	30	24	48
8	32	30	54
10	34	36	60
12	36	42	66
14	38	48	72
16	40	54	78
18	42		

The trench should never be wider than the width of the pipe.

When rock excavation is necessary, certain precautions must be taken. Any rock encountered must be removed so that it will not be closer than 6 inches to the bottom and sides of pipe in sizes up to 24 inches in diameter and no closer than 9 inches for pipe in sizes 30 inches or larger in diameter. Following rock excavation, a bed of approved material should be placed on the bottom of the trench to the above-mentioned distances, leveled and tamped. A straight-edge may be used for checking the trench bottom to detect high points of rock that may protrude through the cushion.

City, state, or Federal regulations usually govern requirements for blasting; barricade placement and other warning devices for public safety; shoring; storage of excavated material; and protection of underground and surface structures.

If it is determined that soils are corrosive or expansive (some dense clays expand when saturated and have been known to exert as much as 17,500 lbs. of pressure per square foot), special care should be exercised. Economical protection against corrosive soils is available through the use of 8-mil thick, loose polyethylene encasement as outlined in American National Standards Institute (ANSI) Standard A21.5. Because of its high strength, ductile iron pipe is recommended for expansive soil areas.

Installing The Pipe

Laying Conditions

Ductile and cast iron pipe, like any other pipe, are installed with respect to the trench bottom using specific laying or bedding conditions. The following conditions are recommended for cast iron pipe:

LAYING CONDITIONS

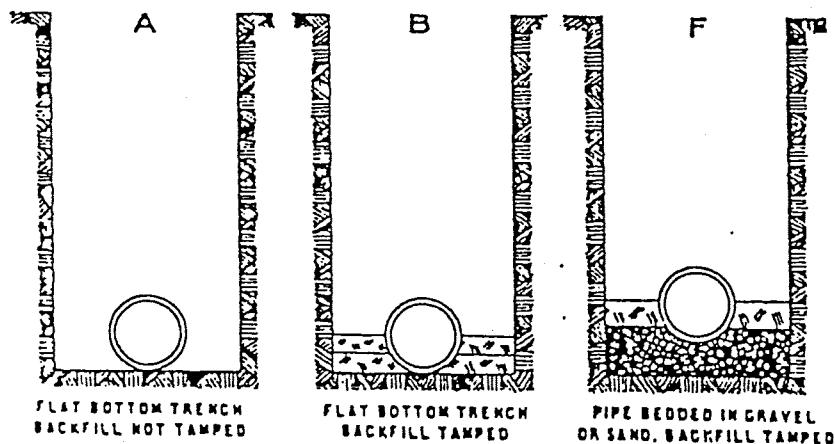


Figure 1

Each laying condition has its merits as well as its relationship to the ability of the pipe to carry loads placed upon it, with Laying Condition B being the most common.

For ductile iron pipe, laying condition types 1, 2, 3, 4 or 5 are recommended. For details see ANSI Standard A21.50 (Section III).

Pipe Placement

Proper equipment and procedures are necessary for safe and efficient pipe placement. Some of the more important considerations are:

--Bell and plain ends must be cleaned to prevent leaking joints and to assure proper seating of the gaskets.

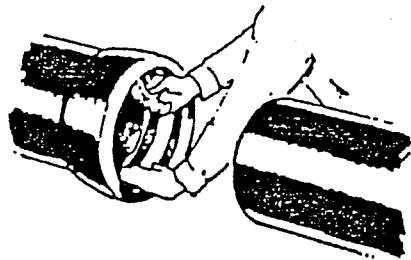
--Before placement in the trench, pipe should be inspected for damage and the inside should be swabbed to remove loose dirt and foreign objects.

--Bells usually face the direction in which the work is progressing. When the main is being laid downhill, the pipes are frequently laid with the bells facing uphill for ease of installation.

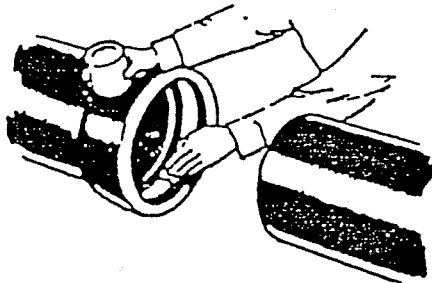
--When laying push-on joint pipe, the correct gasket must be used for the type of joint being installed and the gasket must face the proper direction. Sand or grit must be removed from the gasket groove to assure watertightness.

Following are the steps in push-on joint assembly:

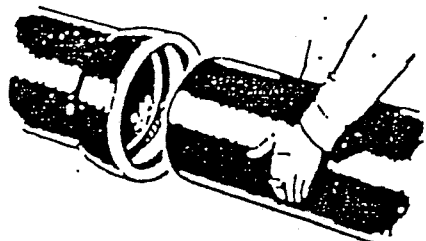
Figure 2



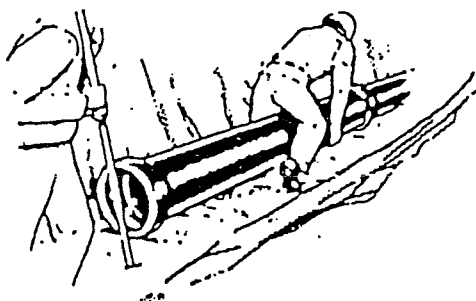
- (1) Clean the groove and bell socket and insert the gasket, making sure that it faces the proper direction and is correctly seated.



- (2) After cleaning any dirt or foreign material from the plain end, apply lubricant in accordance with the pipe manufacturer's recommendations. The lubricant is supplied in sterile cans and every effort should be made to keep it that way.



- (3) Be sure that the plain end is beveled; square or sharp edges may damage the gasket and may cause a leak. Push the plain end into the bell of the pipe. Keep the joint straight while pushing. Make deflection after the joint is made.



- (4) Small pipe can be pushed home with a long bar. Large pipe require additional power, such as a jack, lever puller or backhoe. The supplier will provide a jack or lever pullers on a rental basis. A timber header should be used between the pipe and jack or backhoe bucket to avoid damage to the pipe.

Joints and Fittings

Mechanical or push-on joint fittings can be used with push-on joint pipe. The plain end of the pipe usually is provided with 1 or 2 painted gauge lines which show whether it has been properly positioned in the bell socket after assembly. The pipe manufacturer's instructions as to the location of these lines should be followed.

Pit cast pipe was manufactured in 4 classifications (A, B, C and D), each having a different outside diameter than modern ductile or cast iron pipe. Before making extensions, existing pipe in a system should be measured to determine if transition fittings are required.

When laying mechanical joint pipe, the socket and plain ends should be clean. The assembly of the joint is simple and requires the use of an ordinary ratchet wrench. A torque wrench should be used for the first day or two of construction to accustom the workmen to the proper amount of pressure to apply to the wrench.

TABLE 2
SUGGESTED TORQUE

<u>Bolt Size</u>	<u>Ft. Lbs.</u>
5/8 inch	45-60
3/4 inch	75-90
1 inch	85-100
1 1/4 inch	105-120

Flanged joints are seldom used in underground water mains except for valves and fittings for large meter settings, valve vaults and similar installations. Joint deflection is available in both push-on and mechanical joint pipe. Pipe should be assembled in a straight line both horizontally and vertically before deflection is made. For mechanical joint pipe, the bolts should be partially tightened before the length of pipe is deflected.

Maximum allowable deflections are listed in the following table and should not be exceeded. For design purposes, deflection should be limited to 80% of the values shown in Table 3.

FLUSHING AND DISINFECTING

TABLE 6

CIPRA RECOMMENDED ALLOWABLE LEAKAGE PER 1000-FT. OF PIPELINE*
(GALLONS PER HOUR)

Avg. Test Pressure PSI	NOMINAL PIPE DIAMETER - INCHES																
	2	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54
450	0.32	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82	4.78	5.73	6.69	7.64	8.60
400	0.30	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11
350	0.28	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58
300	0.26	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02
275	0.25	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72
250	0.24	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225	0.23	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	4.73	5.41	6.03
200	0.21	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175	0.20	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150	0.19	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125	0.17	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100	0.15	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

*For Mechanical or push-on joint pipe with 18-ft. nominal lengths. To obtain the recommended allowable leakage for pipe with 20-ft. nominal lengths, multiply the leakage calculated from the above table by 0.9.

If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

joints to prevent movement under test pressure. In city streets, heavy traffic demands may require backfilling after a few lengths of pipe have been laid. The pipeline should be filled slowly and care should be exercised to vent all high points and expel all air. All fittings and hydrants should be properly anchored and all valves completely closed before applying test pressure.

In performing the test, pressure is applied by means of an adequate pump connected to the pipe, bringing the main up to the test pressure, which is recommended as 1.5 times the working pressure at the point of testing. This test pressure should be held for 2 hours. Make-up water should be measured with a meter or by pumping water from a vessel of known volume.

FLUSHING AND DISINFECTING

All new water systems or extensions to existing systems should be thoroughly flushed and disinfected before being placed in service. Public health authorities require disinfection and bacteriological examination to assure freedom from contamination. (Refer to AWWA Standard C601 for Disinfecting Water Mains.)

The flushing velocity should be at least 2.5 fps for small mains. For mains larger than 18 inches in diameter, a lower rate may be used. Table 7 lists required openings to obtain the required velocity of 2.5 fps for flushing and is excerpted from AWWA Standard C601.

REQUIRED OPENINGS—ETC.

(40-psi Residual Pressure)

Pipe Size in.	Flow Required to Produce 2.5-fps Velocity gpm	Orifice Size in.	Hydrant Outlet Nozzles	
			Number	Size in.
4	100	15/16	1	2 1/2
6	220	1 3/8	1	2 1/2
8	390	1 7/8	1	2 1/2
10	610	2 5/16	1	2 1/2
12	880	2 13/16	1	2 1/2
14	1,200	3 1/4	2	2 1/2
16	1,565	3 5/8	2	2 1/2
18	1,980	4 3/16	2	2 1/2

*With 40 psi residual pressure, a 2 1/2 in. hydrant outlet nozzle will discharge approximately 1,000 gpm and a 4 1/2 in. hydrant nozzle will discharge approximately 2,500 gpm.

TABLE 7

Disinfection of mains can be accomplished by the addition of chlorine as a liquid, a hypochlorite solution or hypochlorite tablets. Liquid chlorine is injected into the main under pressure with a portable chlorinator to provide at least 50 ppm available chlorine. To insure that the required concentration is maintained, chlorine residuals should be checked. The chlorinated water solution should remain in the pipe for at least 24 hours, at the end of which period the chlorine concentration should be at least 25 ppm. Final flushing may then be accomplished.

The slug method of chlorination, which is used for large diameter water mains of long length, consists of moving a column of highly concentrated chlorine solution (at least 300 ppm) along the interior of the pipe with at least 3 hours contact with the pipe wall.

The tablet method is generally used for short extensions (no longer than 2,500 feet) of 12-inch and smaller diameter mains. The required number of tablets are placed in the crown of each pipe length and held in place by an approved mastic. The main is then filled with water at a velocity of less than 1 fps and the water is left in the main for 24 hours before flushing. Table 8, excerpted from AWWA Standard C601, indicates the number of tablets required for each size of pipe up to 12 inches in diameter.

**NUMBER OF HYPOCHLORITE TABLETS OF 5-G
REQUIRED FOR DOSE OF 50 Mg/l***

Length of Section Ft.	Diameter of Pipe in.					
	2	4	6	8	10	12
13 or less	1	1	2	2	3	5
18	1	1	2	3	5	6
20	1	1	2	3	5	7
30	1	2	3	5	7	10
40	1	2	4	6	9	14

*Based on 3³/₄ g available chlorine per tablet.

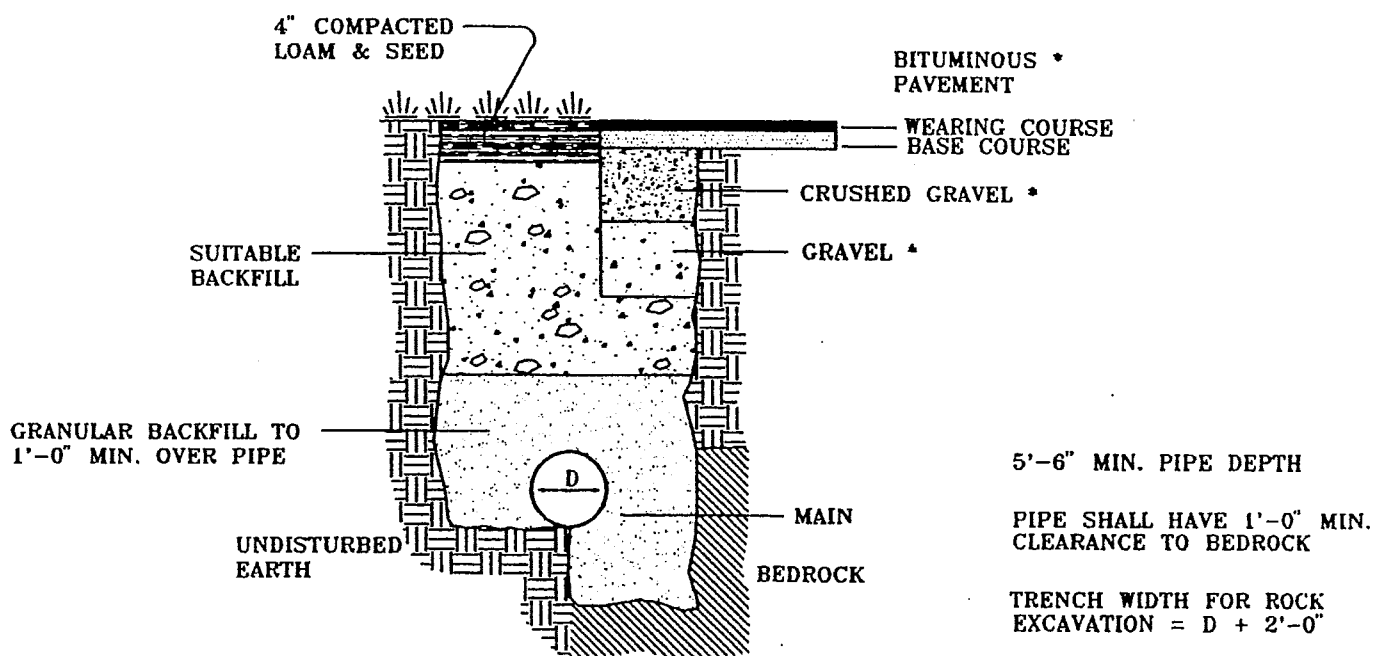
TABLE 8

Repairing Main Breaks

Many devices and materials are available to repair pipe breaks, including mechanical joint split sleeves, bolted repair clamps, bell repair clamps, solid sleeves, mechanical joint bell split sleeves, and repair clamps.

Following the repair of main breaks, proper disinfection procedures are necessary to provide protection from contamination and caution must be exercised to insure that a strong concentration of chlorine does not enter the customer's service lines.

* PER APPLICABLE STATE, CITY OR TOWN SPECIFICATION



TYPICAL TRENCH DETAIL

NOT TO SCALE

6-22-95

REVISED

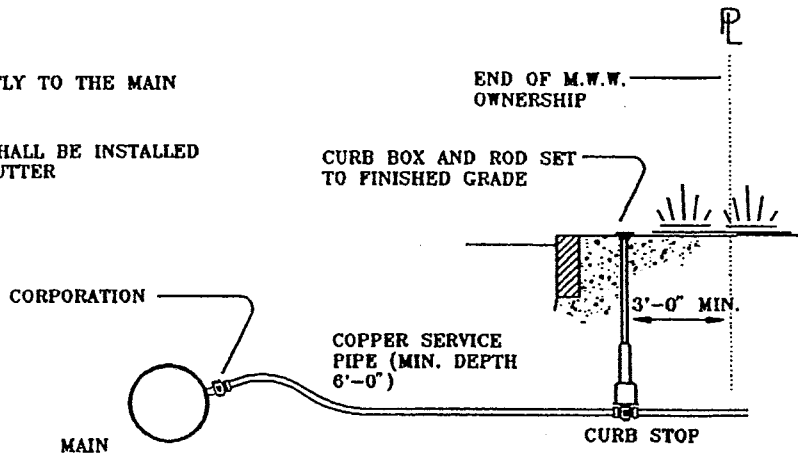
MANCHESTER WATER WORKS
MANCHESTER, NH

STANDARD DETAIL

SD 1

CORPORATIONS SHALL BE TAPPED DIRECTLY TO THE MAIN
IN SIZES UP TO 1" ϕ (INCLUSIVE).

CORPORATIONS 1-1/2" ϕ AND GREATER SHALL BE INSTALLED
USING A TAPPING SADDLE AND SHELL CUTTER



TYPICAL SERVICE CONNECTION

NOT TO SCALE

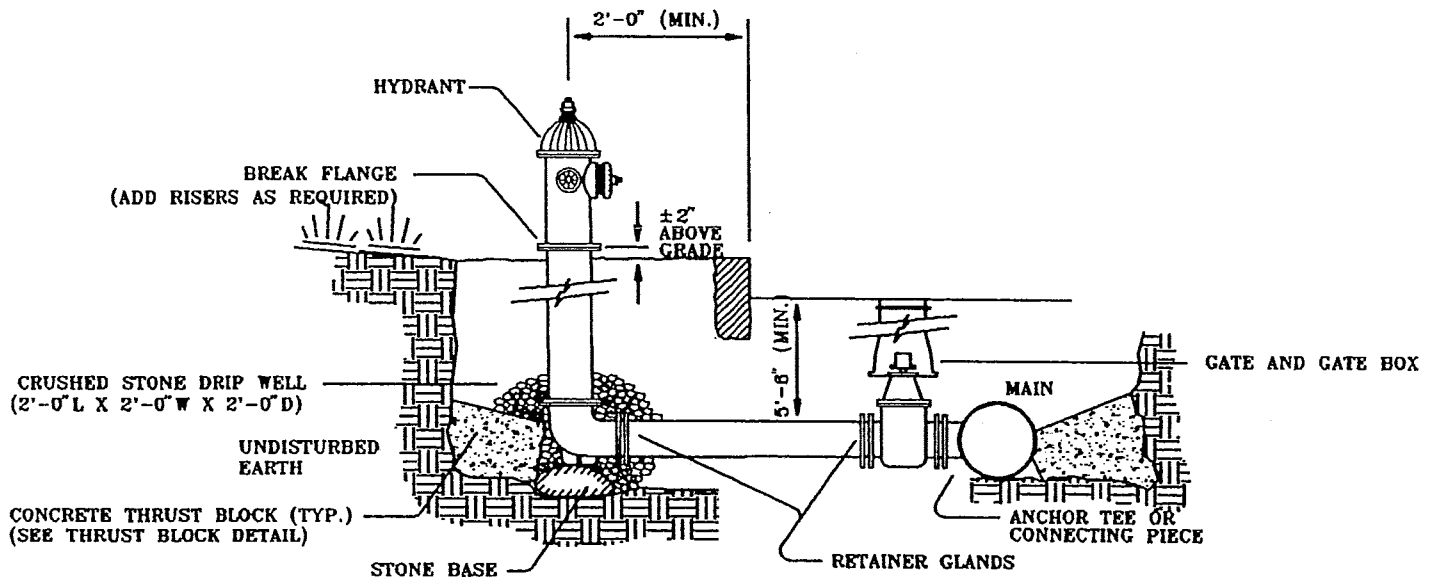
6-22-95

REVISED

MANCHESTER WATER WORKS
MANCHESTER, NH

STANDARD DETAIL

SD2

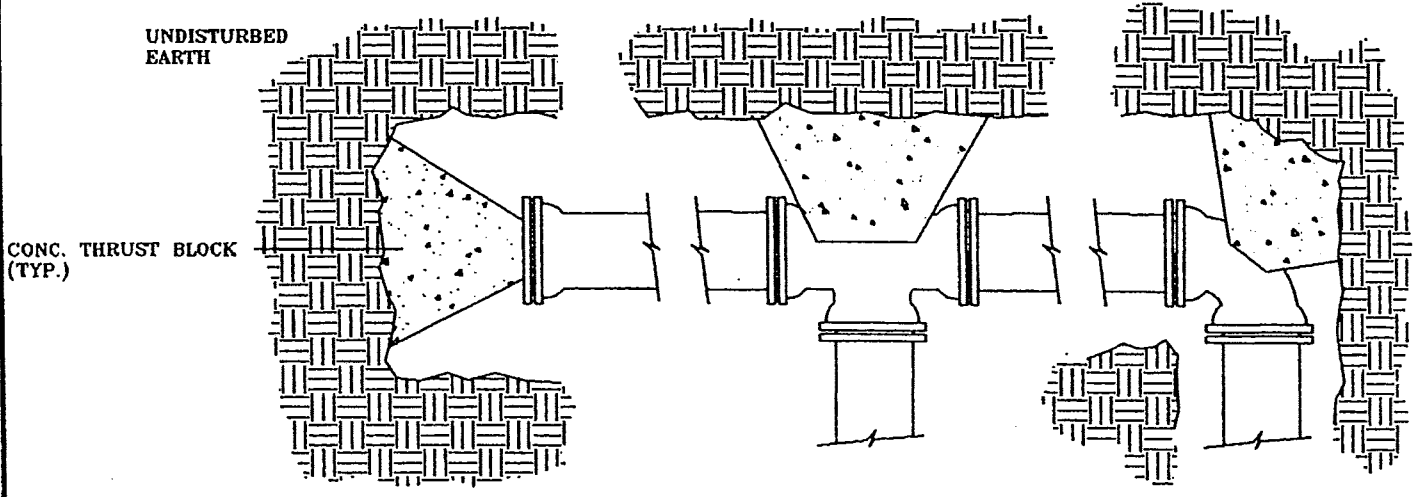


TYPICAL HYDRANT INSTALLATION

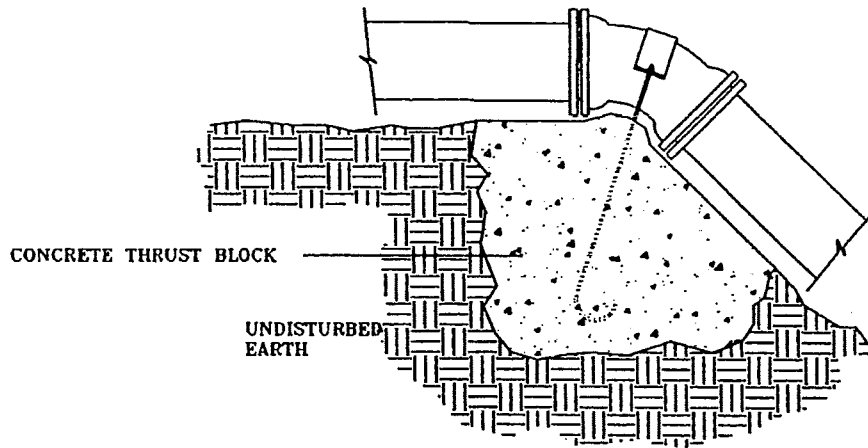
NOT TO SCALE

6-22-95

<p>REVISED</p> <hr/> <hr/> <hr/> <hr/> <hr/>	<p>MANCHESTER WATER WORKS MANCHESTER, NH</p> <p>STANDARD DETAIL</p>	<p>SD3</p>
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PLAN - HORIZONTAL BENDS, TEES AND PLUGS



ELEVATION - VERTICAL BENDS

THRUST BLOCK DIMENSIONS TO BE DETERMINED IN FIELD BY ENGINEER
BASED ON PIPE SIZE, WATER PRESSURE AND SOIL TYPE.

STONE BACKING MAY BE SUBSTITUTED FOR CONCRETE THRUST BLOCKS
PROVIDED THE STONE(S) ARE OF EQUAL SIZE AND BEAR ON UNDISTURBED
EARTH.

USE OF JOINT RESTRAINT SYSTEMS SHALL NOT ELIMINATE THRUST BLOCK
REQUIREMENTS (WHERE POSSIBLE).

TYPICAL THRUST BLOCKS

NOT TO SCALE

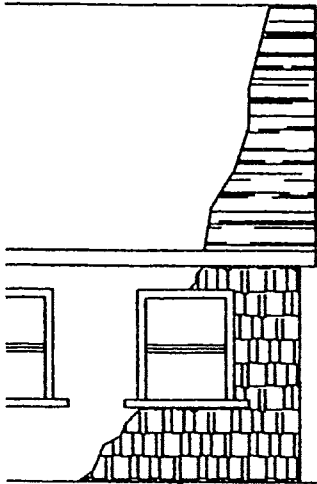
6-22-95

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MANCHESTER WATER WORKS
MANCHESTER, NH

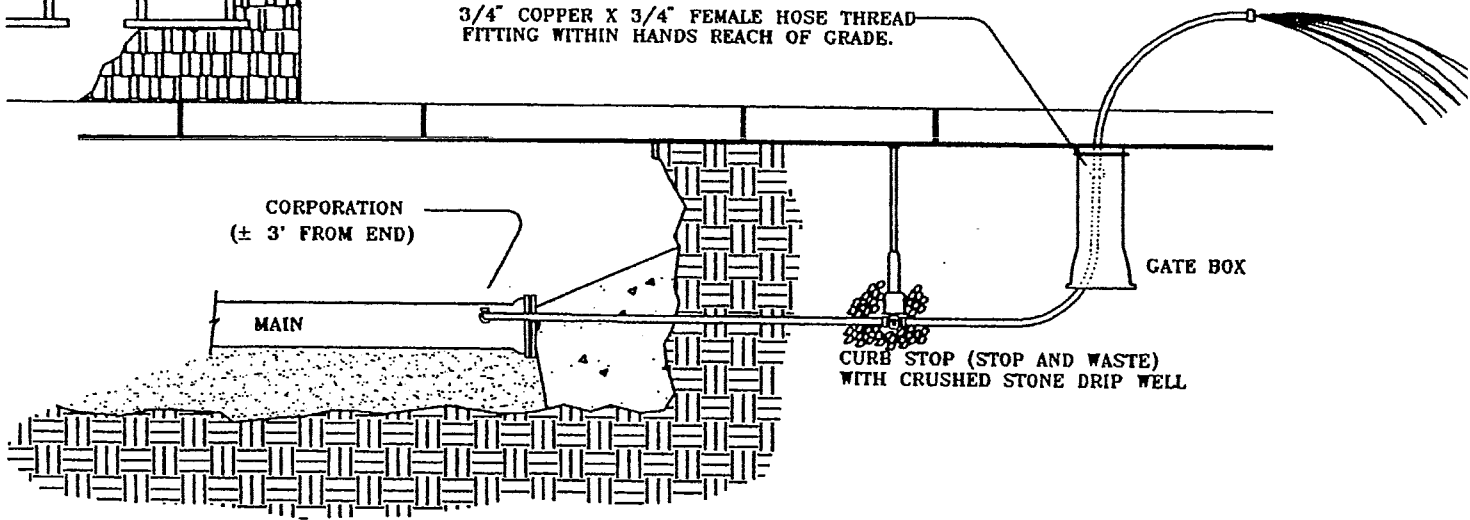
STANDARD DETAIL

SD4



NOTE: A 3/4" BLEEDER SHALL BE INSTALLED ON ALL NEW DEAD END MAINS THAT DO NOT TERMINATE AT A HYDRANT.

3/4" COPPER X 3/4" FEMALE HOSE THREAD FITTING WITHIN HANDS REACH OF GRADE.



PERMANENT BLEEDER

NOT TO SCALE

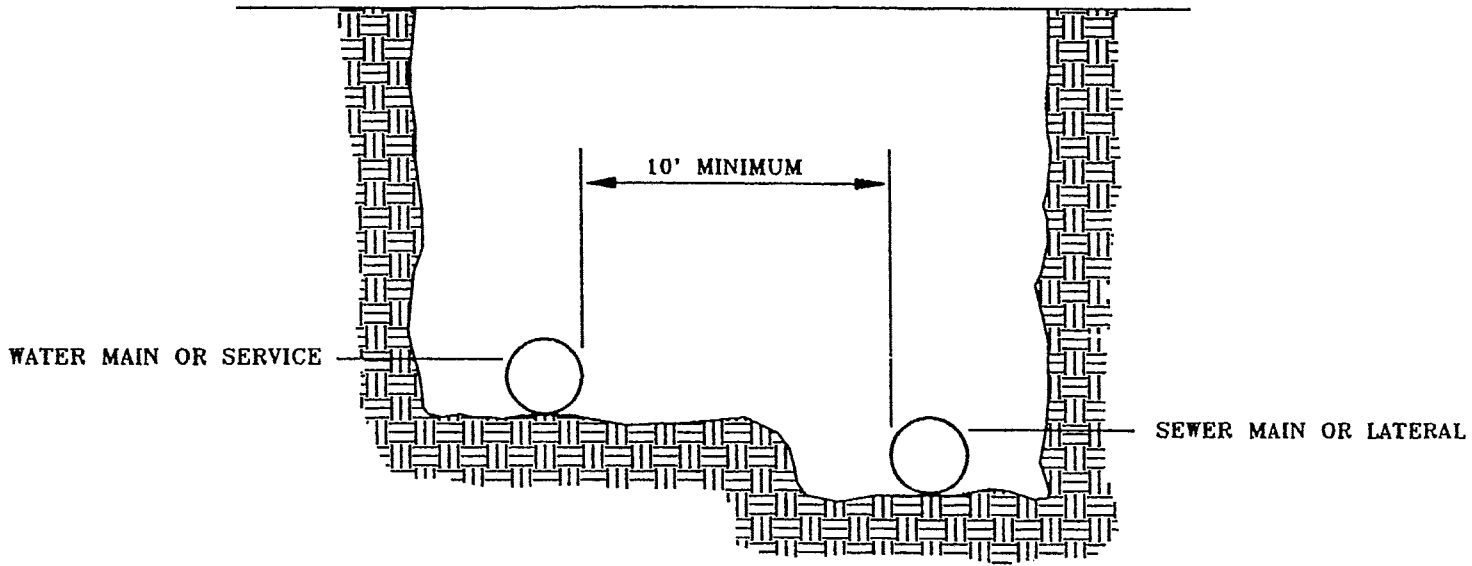
6-22-95

REVISED

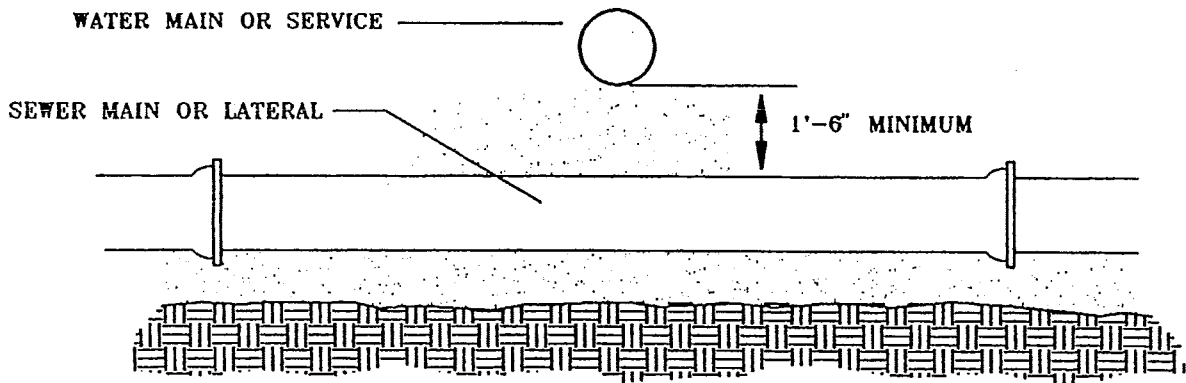
MANCHESTER WATER WORKS
MANCHESTER, NH

STANDARD DETAIL

SD5



PARALLEL INSTALLATION



MAIN CROSSINGS

WATER MAIN/SEWER MAIN SEPARATION

NOT TO SCALE

6-22-95

REVISED

MANCHESTER WATER WORKS
 MANCHESTER, NH
 STANDARD DETAIL

SD6

