Brandon Fire District No. 1

58 Franklin Street
Brandon, VT 05733
(802)247-3311
brandonfdno1@myfairpoint.net

Water System Policy & Construction Standards

APRIL 2007

BRANDON FIRE DISTRICT NO. 1

WATER SYSTEM POLICY
AND
CONSTRUCTION STANDARDS

April 7, 2007
EFFECTIVE DATE

Tom S. Whittaker
Prudential Committee Member

Wayne C. Platt
Prudential Committee Member

Eugene J. Pagano
Prudential Committee Member

PRUDENTIAL COMMITTEE

Vote Date: March 7, 2007

WATER POLICY AND CONSTRUCTION STANDARDS

TABLE OF CONTENTS

WATER SYSTEM REGULATIONS

1. AUTHORITY

This Policy has been duly adopted by the Brandon Fire District No. 1 Prudential Committee, effective April 7, 2007. The Prudential Committee shall act as Water Commissioners, pursuant to Title 24, Chapter 89.

2. DEFINITIONS

A. CURB STOP. The water service valve on a water service pipe which is nearest the water main and is designed to be accessible from the ground surface through a curb box or valve box.

B. DESIGN PROFESSIONAL. A professional Engineer registered or licensed by the State of Vermont.

C. DISCONTINUED WATER SERVICE LINE. A water service line shall be considered discontinued; when the building served by that line is demolished; and, no building or zoning permits for a building requiring water service is filed for a period of one year; or, when a new water service line has been installed to serve a building and use of the old service line has been discontinued.

D. DISTRICT. The word "District" shall refer to the municipality of Brandon Fire District No. 1.

E. FEE. A fee set by the Brandon Fire District No. 1 Prudential Committee.

F. OPERATOR. The person(s) appointed by the Prudential Committee and/or who has primary responsibility for the routine operation, maintenance, record keeping and testing of the water system.

G. PERMITTEE. A person applying for or holding any of the permits described in these regulations.

H. SOURCE PROTECTION AREA. The drainage area contributing water to the Brandon Fire District No. 1 sources as defined in the District's Source Protection Plan.

I. WATER DEPARTMENT. The words "water department" shall refer to the Brandon Fire District No. 1's water department.

J. WATER MAIN. Water mains shall be those water pipes, serving multiple properties and located within the public right of way or otherwise owned by the District.

K. WATER SERVICE LINE. The water pipe from the water main to the building foundation, including the corporation stop and the curb stop. Where there is no foundation, the water service line shall run from the water to the point where it goes into or under the building.

L. WATER SUPPLY. The water sources of the Brandon Fire District No. 1 water system.

M. WATER SYSTEM. All pipes, fittings, valves, meters, pumps, hydrants, tanks and all appurtenances thereto which are physically connected to the Brandon Fire District No. 1 Water system.

N. WATER WORKS. The water system and its supporting facilities, including, but not limited to the wells, well pump stations, water storage tank(s), control valve station(s) and all Fire District owned lands and Right of Way's, associated with the water system facilities.

3. APPLICATION

This policy applies to all parts of the Brandon Fire District No. 1 water system, whether owned by the Brandon Fire District No. 1 or any other person.

4. OPERATOR AS SUPERINTENDENT OF WATER SYSTEM

The Brandon Fire District No. 1 Prudential Committee, acting through the water system operator, shall have the exclusive general management and supervision of the Fire District water works. They may prepare and keep on file as public record, such maps, plans and records as may be necessary to fully and properly show the location of all water system facilities, mains, water services lines, valves, corporation stops and other fixtures and shall turn them over to their successors in office. The Prudential Committee and Operator shall have any and all powers conferred by State or Federal Law or Regulation such as powers relate to the operation of a water system.

5. SERVICE CONNECTIONS TO WATER MAINS

5.01 Performance of Work

Unless otherwise authorized by the Prudential Committee, all water mains shall be tapped and the water service line installed from the main to the curb stop only by the Brandon Fire District No. 1 or its designee as authorized by the Prudential Committee. The cost of said work to be borne by the permittee.

5.02 Permit Required

No person shall attach any pipe or other appurtenance to the Brandon Fire District No. 1 water system, before a permit for such work has been issued by the Prudential Committee.

5.03 Application for Permit/Fees

A. Each application for a permit, with the required fees, shall be filed with the office of Brandon Fire District No. 1 on a form furnished for that purpose.

1. The required fees are:
   a. A PERMIT FEE to cover the administrative costs of processing the permit and;
   b. A CONSTRUCTION FEE, said fee to be applied in the following manner:
      i. Where the Fire District performs the work as described under 5.01, the fee shall constitute an initial payment of that work. In the event the billable cost of the work exceeds the construction fee, the permittee will be billed for the additional amount. In the event that the billable cost of the work is less than the construction fee, the permittee will be refunded the balance; or:
      ii. Where designee(s), authorized by the Prudential Committee and paid directly by the permittee, perform the work, the construction fee shall operate as a cash bond to insure proper work and restoration of Fire District property. Upon completion of the work to the satisfaction of the Prudential Committee, the construction fee shall be refunded to the permittee. If the work is not completed satisfactorily to the Prudential Committee the Fire District shall cause the work to be corrected as necessary, the cost of such correction to be paid from the construction fee with any excess refunded to the permittee and any additional costs billed to the permittee.
      iii. In order to determine the correctness of the work, inspections must be made by the operator. The first inspection shall be made upon completion of the installation, but prior to covering the work. The second inspection shall be made upon restoration of the disturbed area. Inspection of the water meter shall be made before water service is initiated. It is the responsibility for the permittee to coordinate these inspections.
      iv. A schedule of fees shall be attached to the application form, said fees to be set by the Prudential Committee.

5.04 Work Commencing Before Permit Issuance

A. Any person who commences any work on a connection or other work on the water system before obtaining the necessary permit as described

herein shall be subject to a fee equal to twice (2) times the usual permit fee in addition to the required permit fee.

B. If, in the opinion of the Prudential Committee, such unpermitted work constitutes, or may constitute, a hazard to the water supply, additional action may be taken against that person, including but not limited to disconnection of the service or extension and legal action.

6. EXTENSIONS OR ADDITIONS TO THE WATER SYSTEM

6.01 Permit Required

A. Unless otherwise authorized by the Prudential Committee, no person shall attach any pipe or other appurtenance to the Brandon Fire District No. 1 water system, or make any alterations or extensions of, or additions to, the water service line on his or her property without first applying to the Prudential Committee for a permit to do so. No work shall be started until the application has been approved by the Prudential Committee and a permit issued.

6.02 Application for Permit

A. Each application for a permit, with the required fee, shall be filed with the Office of the Brandon Fire District No. 1 on a form furnished for that purpose.

B. The application for a permit shall be accompanied by no fewer than two copies of design construction documents prepared by a Design Professional. These documents shall be drawn to scale with sufficient clarity and detail to demonstrate compliance with the requirements of these regulations and shall be under seal.

C. The Prudential Committee may waive or vary the requirements for filing Design Construction Documents where the work involved is minor, in the sole opinion of the Prudential Committee.

6.03 Permit Issuance

A. The application, design construction documents and other data submitted shall be reviewed by the Prudential Committee. The Prudential Committee may authorize a review by a professional engineer retained by the District. The cost of such professional review shall be in addition to the Permit fee and paid to the Fire District prior to issuance of the Permit. If the Prudential Committee finds that the proposed work conforms to the requirements of these regulations, and that the required fee has been paid, a permit may be issued.

B. In cases where a State Construction Permit is required under the Vermont Water Supply Rule, a copy of the duly issued permit together with copies of the supporting documentation presented to the State in support of that permit application shall be submitted to the Prudential Committee for review prior to the Prudential Committee issuance of the permit.

C. When the Prudential Committee issues the permit, the approved design construction documents shall be marked "APPROVED" and a copy retained by the District. The other copies shall be refunded to the permittee.

6.04 Design Standards

Design standards for construction of an extension or addition to the Brandon Fire District No. 1 water system shall comply with the State of Vermont Water Supply Rule, the Standards attached to these regulation and any special conditions as required by the Prudential Committee.

6.05 Coordination with Other Authorities

The Permit issued by the Prudential Committee shall only indicate compliance with this policy. It does not indicate compliance with the permitting or other approval processes of any other authority having jurisdiction over the work, such as zoning or subdivision regulations or State agencies. It shall be the responsibility of the permittee to insure that all required permits and other approvals are obtained.

6.06 Inspections

A Design Professional or their designated representative, retained by the permittee, shall periodically observe the construction of the water system components to determine if the construction of the water system components is in conformance with the approved design construction documents. All discrepancies shall be brought to the attention of the contractor for correction. Records shall be kept of all inspections and testing, and made available to the District, if requested.

6.07 Record Drawings Construction Documents

A. A Design Professional shall submit two copies of a final report in writing to the Prudential Committee upon completion of the work, certifying as to whether or not the installation complies with the approved design construction documents. If the installation does not fully comply, the report shall clearly indicate the areas of non-compliance. Failure to comply with the approved design construction documents may result in disapproval of the work by the Prudential Committee.

B. The above mentioned report shall be accompanied by two copies of "Record Drawings" construction documents, drawn to scale and certified by a design professional as to their accuracy. These documents shall clearly show the materials and locations of all portions of the work together with measurements from permanent objects (e.g. building corners) to the major components of the installation and the depth or elevations of those components. Where depths are shown, they shall be referenced to a permanent, conveniently located benchmark which shall be clearly shown on the documents.

6.08 Approval

Upon receipt of two sets of "Record Drawings" construction documents satisfactory to the Prudential Committee and subject to any review and field inspections deemed necessary by the Prudential Committee, a Notice of Approval shall be provided to the Permittee. No extension, modification, or addition to the water system shall be used before such approval is granted by the Prudential Committee.

7. SERVICE LINES

7.01 Service Line Requirements

A. No more than one building shall be served by any water service line.

B. Where specific portions of a single building are owned by different persons, (e.g. a condominium building) each portion shall be served by a separate water service connection. This requirement may be waived by the Prudential Committee in cases where, in the board's judgment, the installation of separate services is physically unfeasible, subject to the conditions cited in Section 7.01.C.

C. The requirements specified in Section 7.01.B. may be waived only when, in addition to meeting the physical unfeasibility requirement, a financially responsible organization exists (e.g. a Condominium Association) which will accept the responsibility for the maintenance of the water service and for the payment of all water and sewer charges which are based upon water use. In such cases, the bills will be sent directly to the responsible organization. Not withstanding all real estate furnished with water shall be subject to lien proceedings for nonpayment of bills as provided in Section 17.2 of this Policy.

7.02 Installation

The service line from the water main to the curb stop shall be installed as noted in Section 5 above. The work beyond the water service valve shall be

done by the permittee at his or her expense, to the District's Construction Standards.

7.03 Maintenance Responsibility

A. That portion of the service line from the main to and including the curb stop shall be the responsibility of the District. In the absence of a curb stop, or in the case the curb stop is on private property, the District's responsibility shall extend to the property line. All repairs and required replacements of the service line from the water main to the curb stop or property line are to be performed by the Fire District or its designee as authorized by the Prudential Committee, except that replacements of a water service line with a service pipe of a larger diameter shall be entirely at the expense of the property owner.

B. Repairs and replacements of the remainder of the water service line, from the curb stop or property line to the building, are the responsibility of the property owner. The Fire District will neither perform the work nor pay for same.

C. A permit as described in Section 5 above is required before any repair and/or replacement of the water service line, whether on public or private property, is started. Where all of the work is to be done by the permittee on private property, the construction fee will not be required. Except in cases of emergency, the permittee shall notify the operator at least 3 days before the start of the work in order to allow ample time for the Fire District to mark out its buried utilities, if any, in the area of the work. It shall be the responsibility of the permittee to coordinate with all other utilities or persons affected by the work and to provide the notification to "Dig-Safe" and/or any other utility locating services as required by law, rule or other regulation(s). The Fire District marks out only the utilities belonging to the District. The Fire District does not mark out sewer, storm sewer, telephone, electric, cable TV or any other pipes, cables or conduits.

7.04 Turn-ons and Turn-offs

A. The curb stop to any building shall be operated only by the District. Should a property owner request a turn-on or turn-off, a permit issued by the Prudential Committee, or its designee(s), is required before such operation will be performed. Application for a permit to turn off the water to a building must be made by the property owner or their authorized representative.

B. Not withstanding the above, in the event of an emergency, the operator may turn off or on a water service prior to the issuance of a permit. It

shall be the property owner's responsibility to obtain a permit for that turn-off or turn-on within one business day.

C. A permit fee shall be charged for each turn-on or turn-off which occurs during regular workday hours except that when a turn-off and turn-on occur for the same service within forty-eight hours and both are during regular business hours only one fee shall be charged.

D. A turn-off or turn-on which occurs outside of the regular workday hours shall be billed to the property owner as overtime work, if applicable.

7.05 Frozen Water Service Lines

A. Each person served by the water system shall take reasonable precautions to prevent his or her water service from freezing. If, through no negligence on the part of the water user, the service pipe freezes, 50% of the cost of thawing the service shall be paid by the District. This cost sharing shall be limited to once per winter and shall not apply to those persons who have been advised to take precautions as described in Section 7.06 below.

B. The Fire District shall not be liable for any property damage due to thawing of service lines.

7.06 Protection From Freezing

A. When, in the opinion of the Prudential Committee, extended cold weather increases the risk of water main or service line freezing, the Prudential Committee may authorize or request certain water uses to let water run in order to minimize such risk. The Prudential Committee shall keep a list of such users. When so authorized, the water bill for that usage period, if based on metered service, will be adjusted to reflect the historic usage for that period for the accounts on the aforementioned list.

B. Water users who have reason to believe that their service is in danger of freezing may apply to the Prudential Committee for authorization to let the water run as noted above.

C. No adjustments of billing will be made for water left running to prevent freezing of any pipes other than the water service line. (e.g. interior plumbing)

8. DISCONTINUED WATER SERVICE LINES

8.01 Disconnection Required

All discontinued water service connections shall be disconnected from the water main and capped. The work shall be done only by the Brandon Fire District No. 1 or its designee as authorized by the Prudential Committee. The cost of said work to be borne by the permittee.

8.02 Permit Required

The disconnection requires a permit from the Prudential Committee.

9. INSPECTIONS

9.01 Right to Inspect

Any duly authorized employee or agent of the Brandon Fire District No. 1 may, at reasonable hours and with proper notification, enter any premises supplied with water to inspect pipes, meters, fixtures, and other appurtenances which are used in connection with the water meter. It shall be the duty of every person supplied water by the system to answer inquiries made by the Operator in regard to the quality, quantity, purposes and manner in which the water is used on the premises.

9.02 Emergency Disconnection

If the Prudential Committee or Operator has reason to believe that a situation exists on a property that could cause an imminent hazard to the water system, the water service for that property may be turned off, without notice, until which time the hazard does not exist.

10. WATER METERS

10.01 Meter Replacement

A. Water for all purposes, other than fire protection systems, is provided from the Fire District to water users only through metered connections. No buildings will be provided water service without installation of sufficient water meter(s) to accurately measure water consumption.

10.02 Installation of Meter

A. Subject to the exception listed below, each new water service which is not devoted exclusively to fire protection shall be metered. The property owner shall provide an accessible, secure, frost-free location for the water meter. In cases where such a location cannot be provided, water for that property will be metered in an underground meter vault, constructed to the Fire District's standards.

B. Water meter assemblies shall be purchased by the permittee from the Fire District, or, with the Fire District's approval, purchased from a supplier provided the meter and accessories meet the District's standards.

C. It shall be the responsibility of the property owner to provide and install valves necessary to isolate the water meter before the water meter is installed. Either one or two interior valves will be required, depending upon the size of pipe and the complexity of the plumbing system.

D. Each water meter shall be sealed by the Fire District and inspected by the Fire District prior to use.

10.03 Location of Water Meters

A. Water meters shall generally be located inside the customer's building unless a location is not physically available for adequate installation and maintenance, in the Fire District's opinion. If no location is available, the meter shall be located in a meter vault, approved by the District.

B. If the water service line is greater than 200 feet in length, the water meter shall be located in a meter pit at the curb stop in order to account for water service leakage.

10.04 Protection of Water Meter

A. It shall be the property owner's responsibility to protect the water meter from damage, including damage from freezing. This provision also applies to meters in meter vaults.

10.05 Tampering with or Obstructing Water Meter

A. No person shall tamper with, bypass, remove the meter seal or any part of the meter itself or in any way injure any water meter or any of its appurtenances.

B. No person shall construct or place anything in any manner to obstruct or hinder free access to any water meter or water meter register.

C. The property owner shall be responsible for the protection of the water meter and its seal from tampering, removal or injury.

10.06 Penalty for Water Meter Tampering

A. First Offense: The account holder shall be billed a penalty in the amount of twice the historic water bill over the period of tampering at the current water rates. In no case shall the period of tampering be considered as being less than one billing period.

B. Additional Offense: The billing procedure will be changed from a metered account to a flat rate account with the number of occupants to be considered as being two times the number of bedrooms, in the case of a residence; and/or the usage considered to be the estimated usage as shown in the Vermont State Environmental Protection rules for non-residential users, to be billed at the current metered rates for water, sewer and sewer treatment.

11. WATER MAINS AND APPURTENANCES - OPERATION, REPAIRS AND REPLACEMENT

The operation, repair, replacement and maintenance of all water mains, valves, and other appurtenances of the water system shall be done only by the Brandon Fire District No. 1 or it's designee as authorized by the Prudential Committee. The costs of such work on portions of the water system owned by the Fire District shall be paid by the District. The costs of such work on portions of the water system owned by any other person shall be the responsibility of that person. Nothing herein shall prohibit the Fire District from recovering the costs of repairs or replacement and/or other damages resulting from the actions of any other person from the person.

12. LAWN SPRINKLERS: Lawn sprinklers shall not be converted into fountains or jets, or be allowed to run to waste, but must be kept closed except when in use for sprinkling as intended.

13. USE OF WATER FOR UNAUTHORIZED PURPOSE: No person shall give away, resell or use any water from the Fire District water works, for any other purpose than that for which payment has been made; nor allow the water to be wasted from fixtures or leaking service lines out of repair or otherwise. The Prudential Committee or Operator may turn off the water to the premises of any person who shall violate any of the provisions of this section, and such offender shall be deprived of the use of the water until he/she shall have paid to the Fire District a fee for turning off and another fee for turning on the water and shall have made all necessary repairs.

14. TURN-OFF FOR REPAIRS OR DROUGHT; NOTICE TO USERS: The Prudential Committee or Operator shall have the right to turn off water for the purpose of making extensions, alterations or repairs, or on account of any accident to the water system, or in case of violation of these regulation or neglect to pay the service rates when due, and in case of drought or threatened quality or scarcity of water, to diminish or stop the supply without any claim for abatement or damage for loss of water. When the Prudential Committee or Operator shall have cause to turn off the supply of water on any line for repairs, they shall make a reasonable attempt to notify the water consumers on the line of pipe to be turned off, stating as nearly as possible the length of time such supply will be turned off; provided, however, in the case of sudden breaks or other emergency, the water may be turned off without notice.

15. FIRE HYDRANTS

15.01 Inspection and Maintenance

The Prudential Committee shall have an examination made of the fire hydrants belonging to the District, from time to time, and keep them in working order at all times, except when turned off for repairs; and shall cause all defects therein to be repaired without delay.

15.02 Notice to Fire Department of Hydrant Turn-offs

Notice, in advance if possible, shall be given to the Brandon Fire District No. 1 Fire Department in the event the supply of water to a fire hydrant is disconnected. Notice shall also be given to the Fire Department when the hydrant is again in working order.

15.03 Permission to Draw Water from Hydrants

No person shall operate any fire hydrant or draw water there from, except under the direction of the Prudential Committee or Operator. This shall not apply to use of hydrants in an emergency by the Fire Department or other duly authorized municipal fire department.

15.04 Privately Owned Fire Hydrants

Persons owning private fire hydrants served by the Brandon Fire District No. 1 water system will be governed in all cases by these regulations, including Section 15.3 above, "Permission to Draw Water from Hydrants". Reasonable requests for testing private hydrants or pipes will be granted on application to the Prudential Committee. All such hydrants and other appurtenances shall be open to inspection by agents of the Fire District at all times, and may be opened by an insurance inspector to ascertain if the water is on and the hydrants or pipes are in working order. Notice of such opening shall be given to the Prudential Committee within 24 hours in advance by any such insurance inspector.

15.05 Testing of Fire Hydrants

A. Permit Required: No person shall test a fire hydrant, whether public or private for fire flow determination or any other purpose, without first applying to the Prudential Committee for a permit to do so. No testing shall be conducted until the application has been approved by the Prudential Committee and a permit issued.

B. Conduct of Test/Report

1. Permittee is to coordinate time and date of flow test with the water department at least one week prior to test.

2. While every effort will be made to honor commitments, permittee is advised that any scheduled flow test may be postponed or cancelled by the water department without notice in the event of an emergency affecting the water system.

3. Permittee is to perform the flow test and provide all necessary equipment.

4. Operation of public hydrants is to be by Fire District personnel only.

5. Hydrant flow tests shall be allowed only when the air temperature is above 40 degrees F. unless otherwise specifically approved by Prudential Committee.

6. A copy of the flow test results shall be provided to the office of the Prudential Committee upon completion of the test.

16. TAMPERING, ETC. WITH PROPERTY BELONGING TO BRANDON FIRE DISTRICT NO. 1

No person shall damage, disturb, remove, or in any way injure any hydrant, valve, valve box or cover, meter, stopcock, stop box or cover, pipe, tool, apparatus, fixture, building, machinery or fence belonging to the Fire District water department, nor place anything in such a manner as to obstruct or hinder free access to any valve, hydrant or meter.

17. WATER RATES/BILLING

17.01 Establishment of Water Rates

The Prudential Committee shall establish rates to be paid for the use of water supplied by the Fire District water works including connection and disconnection as applicable.

17.02 Water Bills

A. All delinquent water bills become a lien upon real property, pursuant to 24 VSA, Section 3306. Fees shall be determined pursuant to the Uniform Water and Sewer Disconnect, Chapter 129 of Title 24, Section 5151 of the Vermont Statutes Annotated.

B. All water services shall be billed to the owner of the property served, and all bills shall be due and payable upon presentation. The bills must be

paid within thirty (30) days, and shall be rendered on a regular basis as authorized by the Prudential Committee.

C. All service is subject to disconnection under the terms of Chapter 129 of Title 24 of the Vermont Statutes Annotated (Uniform Water Sewer Disconnect) as amended from time to time. Charges for disconnection and reconnection shall be in accordance with the limits allowed by law.

D. Bills for water service are due and payable to the Fire District Treasurer when received as indicated on the statement and shall be considered delinquent when unpaid 30 days following the due date on statement.

Water service may be discontinued: 1) by reason of nonpayment of water bills; 2) to eliminate a health hazard; 3) for violation of any special order restricting water use, 4) as specified elsewhere in this policy, and/or; 5) for fraudulent use of water.

If the customer requests a hearing, one shall be held within five business days of the request to determine if water service will continue to be denied, or if to be restored, then under what conditions. Service, once discontinued, shall not be restored until the reason for discontinuance of service has been eliminated.

Before service is discontinued for delinquency of payment, the Fire District shall follow the procedure set forth in 24 V.S.A. Chapter 129.

Notice for payment request and shut-off will be mailed at least 14 days in advance of shut-off date. Shut-off on account of delinquency of water rate payment will not be made on a day immediately preceding a Saturday, a Sunday, or a state or federal holiday.

17.03 Estimated Bills

In a case where, for whatever reason, a reliable water meter reading has not been obtained and an effort has been made by the meter reader to obtain such reading, an estimated billing for the period will be sent to the account holder. The estimated bill will be based upon the historical usage at the property in question and shall have the effect of an actual billing insofar as collection procedures are concerned.

17.04 Responsibility of Owners for Tenants

Property owners shall be so far responsible for the water rates of tenants as that new tenants will not be entitled to a supply until all arrearages are paid. When water is supplied to more than one party through a single tap, the water may be shut off in case of nonpayment to the Fire District.

18.CONTROL OF CROSS CONNECTIONS AND BACKFLOW

18.01 Responsibility

The Brandon Fire District No. 1 shall be responsible for the protection of the public potable water distribution system from the contamination or pollution due to the backflow of contaminants or pollutants through the water service connection. If, in the judgment of the Fire District an approved backflow prevention assembly is required at the consumer's water service connection; or, within the consumer's private water system for the safety of the water system, the Fire District or its designated agent shall give notice in writing to said consumer to install such an approved backflow prevention assembly(s) at a specific location(s) on his premises. The consumer shall install such an approved backflow prevention assembly(s) at the consumer's own expense within the time schedule required by the notice; and, failure, refusal or inability on the consumer to install, have tested and maintained said assembly(s) shall constitute grounds for discontinuing water service to the premises until such requirements have been satisfactorily met.

Water System

The water system shall be considered as made up of two parts: The Fire District's owned system and the Consumer's system.

The Fire Districts' system shall consist of the supply facilities and distributions system; and shall include all those facilities of the water system under the complete control of the Fire District, up to the point where the consumer's system begins. While the Fire District is ultimately responsible for water quality to the "last tap" on the municipal system, the last tap shall be considered the last point on the system where water enters into a building and is registered at a water meter.

The supply shall include all components of the facilities utilized in the production, treatment, storage, and delivery to the consumer's system.

The distribution system shall include the network of conduits used for the delivery of water from the source to the consumer's system.

The consumer's system shall include those parts of the facilities beyond the termination of the Fire District's distribution system, which are utilized in conveying potable water to points of use. For the purpose of this Policy, the consumers system shall begin at the downstream side of the curb stop or gate valve and proceed and end at the upstream side of the water meter, then begin again on the downstream side of the water meter.

18.02 Policy

The consumer's system shall be open for inspection at all reasonable times to authorized representatives of the Brandon Fire District No. 1 for the purposes of inspection, observation, measurement, sampling, testing and maintenance, and to determine whether unprotected cross-connections or other structural or sanitary hazards, including violations of these regulations exist. If a property owner, resident or occupant denies the Fire District or other duly authorized employees of the Fire District access after reasonable notice has been provided to the property owner, resident or occupant, the Fire District may direct disconnection on forty-eight (48) hours written notice to the owner, resident or occupant. Once water service has been disconnected it will not be restored until access has been provided and the Fire District has been paid all applicable charges. When a backflow condition becomes known, the Fire District shall deny or immediately discontinue service to the premise by providing for a physical break in the service line until the consumer has corrected the condition(s) in conformance with the Rules and Regulations of the Brandon Fire District No. 1 relating to water supplies and the regulations adopted pursuant thereto. Subject to these Rules and Regulations, the Fire District shall have the authority to terminate any water service connection to any facility where cross connections are found to be in non-compliance. If necessary, water service shall be disconnected for failure to test or maintain backflow prevention devices in a manner acceptable to the Fire District. If it is found that the backflow prevention device has been removed or bypassed or otherwise rendered ineffective, water service shall be discontinued unless corrections are made immediately.

An approved backflow prevention assembly shall also be installed on each service line to a consumer's water system at or near the property line or immediately inside the building being served; but, in all cases, before the first branch line leading off the service line wherever the following conditions exist:

a) In the case of premises having an auxiliary water supply which is not or may not be of safe bacteriological or chemical quality and which is not acceptable as an additional source by the Fire District, the public water system shall be protected against backflow from the premises by installing an approved backflow prevention assembly in the service line commensurate with the degree of hazard.

b) In the case of premises on which any industrial fluids or any other objectionable substance is handled in such a fashion as to create an actual or potential hazard to the public water system, the public system shall be protected against backflow from the premises by installing an approved backflow prevention assembly in the service line commensurate with the degree of hazard. This shall include the handling of process waters and waters originating from the water purveyor's system which have been subject to deterioration in quality.

c) In the case of premises having (1) internal cross-connections that cannot be permanently corrected or protected against, or (2) intricate plumbing and piping arrangements or where entry to all portions of the premises is not readily accessible for inspection purposes, making it impracticable or impossible to ascertain whether or not dangerous cross-connections exist, the public water system shall be protected against backflow from the premises by installing a backflow prevention assembly(s) in the service line.

d) Installation of the residential dual check devices on a retrofit basis on existing service lines will be instituted at a time deemed necessary by the Fire District.

The type of protective assembly required under subsections a, b, and c above shall depend upon the degree of hazard, which exists as follows:

a) In the case of any premises where there is auxiliary water supply as started in subsection (a) above of this section and is not subject to any of the following rules, the public water system shall be protected by an approved air gap or an approved reduced pressure principle backflow prevention assembly.

b) In the case of any premises where there is water or substance that would be objectionable but not hazardous to health, if introduced into the public water system, the public water system shall be protected by an approved double check valve backflow prevention assembly.

c) In the case of any premises where there is any material dangerous to health, which is handled in such a fashion as to create an actual or potential hazard to the public water system, the public water system shall be protected by an approved air gap or an approved reduced pressure principle backflow prevention assembly. Examples of premises where these conditions will exist include sewage treatment plants, sewage pumping stations, chemical manufacturing plants, hospitals, mortuaries and plating plants.

d) In the case of any premises where there are unprotected cross-connections, either actual or potential, the public water system shall be protected by an approved air gap or an approved reduced pressure principle backflow prevention assembly at the service connection.

e) In the case of any premises where, because of security requirements or other prohibitions or restrictions, it impossible or impractical to make a complete in-plant cross-connection survey, the public water system shall be protected by an approved air gap or an approve reduced pressured principle backflow prevention assembly on each service to the premise.

Any backflow prevention assembly required herein shall be a make, model and size approved by the Fire District. The term "Approved Backflow Prevention Assembly" shall mean an assembly that has been manufactured in full conformance with the standards established by the American Water Works Association entitled:

AWWA/ANSI C510-92[1] Standard for Double Check Valve Backflow Prevention Assemblies;

AWWA/ANSI C511-92[1] Standard for Reduced Pressure Principle Backflow Prevention Assemblies;

And, have met completely the laboratory and field performance specification of the foundation for Cross-Connection Control and Hydraulic Research for the University of Southern California (USC FCCCHR) established in:

Specifications of Backflow Prevention Assemblies- Section 10 of the most current edition of the *Manual of Cross-Connection Control*.

All domestic backflow prevention devices, with the exception of residential dual check valves, shall be installed and repaired in accordance with local, state, and federal regulations, which may require persons performing repairs to hold a professional license and certification, except for backflow prevention devices installed on fire protection systems. A licensed fire sprinkler contractor is responsible for all work conducted on a fire protection system, including the installation, maintenance and repair of backflow prevention devices.

It shall be the duty of the consumer at any premise where reduced pressure backflow prevention assemblies are installed to have a field test performed by a certified backflow prevention assembly tester upon installation and at least twice per year. It shall be the duty of the consumer at any premise where double check valve assemblies are installed to have a field test performed by a certified backflow prevention assembly tester upon installation and at least once per year. It shall be the duty of the consumer at any premise where pressure vacuum breakers are installed to have a field test performed by a certified backflow prevention assembly tester upon installation and at least once per year. In those instances where the Superintendent deems the hazard to be great enough he may require field tests at more frequent intervals. These tests shall be at the expense of the water user and shall be performed by the Brandon Fire District No. 1 or its duly authorized agent. These assemblies shall be repaired, overhauled or replaced, and retested at the expense of the consumer whenever said assemblies are found to be defective. Records of such tests, repairs and overhaul, if performed by non-Fire District personnel, shall be made available to the Fire District within fourteen (14) days of completion of the test.

All presently installed backflow prevention assemblies which do not meet the requirements of this section but were approved devices for the purposes described

herein at the time of installation and which have been properly maintained, shall, except for the testing and maintenance requirements stated within these rules be excluded from the requirements of these rules so long as the Fire District is assured that they will satisfactorily protect the water's purveyor's system. Whenever the existing device is moved from the present location or requires more than the minimum maintenance or when the Fire District finds that the maintenance constitutes a hazard to health, the unit shall be replaced with an approved backflow prevention assembly meeting the requirements of this section.

18.03 Approved Backflow Prevention Devices

Approved backflow prevention devices shall be located so as to provide containment protection, and may be supplemented with the installation of in-plant protection backflow protection devices.

Only backflow devices approved by the Fire District shall be used.

All approved devices shall allow for accurate testing so as to allow verification of their performance.
In general, protection shall be provided by an air gap or a Fire District approved RPZ, or DCV with the manufacturer approved inlet and outlet control valves and four test cocks as a complete unit, installed in a horizontal alignment, unless otherwise approved by the Department.

The Fire District reserves the right to prohibit the use of any cross connection protection devices if the Fire District determines that such device is found, after subsequent review, to be defective or to have performed inadequately in the field.

No person shall remove or contract with another person for the removal of any required backflow protection device without obtaining the approval of the Fire District for the removal of said device first.

If an RPZ, DCV, or PVB cannot be removed from service for maintenance and testing, then a second device of the same type shall be installed in parallel so as to permit inspection and repair of either unit.

The assembly should be sized hydraulically, taking into account both the volume requirements of the service and the head loss of the assembly. Refer to manufacturers head loss curves.

Every backflow prevention device up to two inches (2") shall be installed with full port ball type shutoff valves approved by the manufacturer.

All RPZ, DCV, and PVB assemblies shall meet the standards established by at least one of the following organizations:

ASSE

AWWA
USC Specifications

18.04 Acceptable Devices for Types of Hazards

Only the following types of backflow prevention devices shown below shall be used for the containment of on-premise hazards for low and high hazard situations respectively:

Low Hazard	High Hazard
1. Air gap	1. Air gap
2. Atmospheric vacuum breaker (Where bacteria hazards aren't present)	2. Reduced pressure/ backflow device
3. Pressure vacuum breaker	3. Or combination of the above
4. Double check valve assembly	
5. Reduced pressure backflow device	
6. Or combination of the above	

Any domestic, commercial, institutional, and fire protection service line, including each line of a multiple service line, and a multi family building serving more than two units shall be equipped with an approved backflow device or an approved air gap separation on each line. All other connections to the water main, including standpipes leading to elevated tanks, temporary ferules, hose connections, and irrigation systems shall be equipped with approved backflow prevention devices.

Approved backflow prevention devices shall be located so that protection of all cross connections is achieved with a minimum number of devices.

An approved backflow assembly shall be installed to any premise where multistoried (more than two stories) buildings such as a hotel, apartment house, offices, etc. are operated or maintained. An approved air gap or RPZ shall be installed where there is a potential health, contamination, or system hazard. A DCV shall be installed where there is only a pollutional hazard.

A backflow prevention device shall not be installed in locations where the device is subject to corrosive fumes, grit, sticky, or abrasive liquids. The device shall be protected against mechanical abuse. All devices shall be installed so they are easily accessible for testing and repair, and inspection.

Each backflow preventer installed in a building shall be located in a room or structure that is well lighted, properly drained, and not subject to flooding.

All assemblies shall be adequately supported and/or restrained to prevent lateral movement. Pipe hangers, braces, saddles, stanchions, piers, etc., shall

be used to support the device and should be placed in a manner that will not obstruct the function or access to the relief valve.

18.05 Backflow Prevention Assembly Installations

A. Reduced Pressure Principal Backflow Preventers (RPZ)

All RPZ assemblies shall be installed in accordance with the manufacturer's specifications and the following Department requirements:

1. All RPZ assemblies must be purchased and installed with the manufacturer's approved full port inlet and outlet control valves and four (4) test cocks as a complete package unit.
2. This assembly shall be installed a minimum of twelve inches (12") from the floor to the lowest part of the device, and a maximum of sixty inches (60") above the surrounding ground or floor to the top of the device. A minimum of twelve inches (12") of clear space shall be maintained above the assembly to allow for servicing check valves and for operation of shut-off valves.
3. The assembly shall be installed a minimum of twelve inches (12") away from the nearest wall. Also, the manufacturer must state if the device has been approved for use in either the horizontal or vertical flow up or down configuration.
4. Brass ¼" adapters shall be installed on each test cock of the device.
5. The water service line must be thoroughly flushed before installing the assembly.
6. If continuous, uninterrupted water service is desired, two smaller RPZ assemblies may be installed in parallel. When the RPZ's are used in parallel, the total rated capacity of the assemblies must equal or exceed the capacity of the main feed line. A bypass around the RPZ is not permitted.
7. The assembly must be sized hydraulically to avoid excessive pressure loss.
8. An RPZ must be installed above ground in an outdoor installation, with a minimum twelve-inch (12") clearance. An approved on-site constructed or approved pre-manufactured shelter must be installed to provide additional protection against freezing and vandalism.
9. Where possible, an approved RPZ assembly shall be installed within a building on the service connection after but close to the meter. In certain cases, a backflow prevention assembly may be installed at an alternative location such as outdoors or at the discharge side of a booster pump. The device shall be protected from freezing, flooding,

and vandalism. Access for routine testing and maintenance shall be provided. RPZ's shall not be installed in pit locations.

10. Drinking and domestic water lines, lines for safety showers, and lines for eye wash units must be taken off the upstream side of RPZ assemblies for those devices installed as in-plant protection.
11. There shall be no outlet, tee, tap, or connection of any kind to or from the supply line between the meter and the backflow prevention device.
12. If the device is to be used on a hot water line, a device approved for use at the elevated temperature must be used.
13. The drain to the relief port must have an approved air gap separation between the port and drain line, at least twice the internal diameter of the discharge line. A drain, capable of handling the maximum flow from the relief port shall be provided. RPZ's should be located in a location where water spillage is not objectionable.
14. While not effective in all cases, the installation of a soft seated check valve assembly immediately ahead of the RPZ will often hold the pressure constant to the assembly in times of fluctuating pressure supply. This fluctuating pressure supply could cause nuisance dripping and potential fouling of the assembly if left without a soft-seated check valve.
15. Provisions may have to be made by the owner to provide for thermal expansion within his closed loop system, i.e. the installation of thermal expansion devices and/or pressure relief valves.

In any of the above installation criteria, the owner must be made aware of the potential for water damage in the event of a discharge.

B. Approved Air Gap (AG)

An air gap is an unobstructed separation through free atmosphere between the lowest opening from any pipe or outlet supplying water to a tank, plumbing fixture, or other device from the flood-level rim of the receptacle. The air gap is the most reliable means of backflow protection.

1. The air gap must be installed with a minimum separating distance of at least two times the diameter of the water supply pipe (measured vertically above the flood level rim of the receptacle). In no case however, shall the separation be less than one inch.
2. The separation distance must be measured from the lowest point on the pipe or outlet supplying water to a receptacle.

C. Double Check Valve Assembly (DCV)

All DCV assemblies shall be installed in accordance with the manufacturer's specifications and the following Department requirements:

1. All DCV assemblies must be purchased and installed with the manufacturer's approved full port inlet and outlet control valves and four (4) test cocks as a complete package unit.
2. This assembly shall be installed a minimum of twelve inches (12") from the floor to the lowest part of the device, and a maximum of sixty inches (60") above the surrounding ground or floor to the top of the device. A minimum of twelve inches (12") of clear space shall be maintained above the assembly to allow for servicing check valves and for operation of shut-off valves.
3. The assembly shall be installed a minimum of twelve inches (12") away from the nearest wall. Also, the manufacturer must state if the device has been approved for use in either the horizontal or vertical flow up or down configuration.
4. Brass ¼" adapters shall be installed on each test cock of the device.
5. The water service line must be thoroughly flushed before installing the assembly.
6. All domestic service lines tapped from sprinkler services for commercial and/or industrial buildings shall have a DCV installed as a minimum backflow preventer device.
7. If continuous, uninterrupted water service is desired, two smaller DCV assemblies may be installed in parallel. When the DCV's are used in parallel, the total rated capacity of the assemblies must equal or exceed the capacity of the main feed line. A bypass around the DCV is not permitted.
8. The assembly must be sized hydraulically to avoid excessive pressure loss.
9. Preferably all DCV assemblies should be installed above ground, but may be installed below ground level in a pit or chamber designed to prevent flooding. If the DCV is installed in a pit the following guidelines shall be followed:
   a) There shall be no outlet, tee, tap, or connection of any kind to or from the supply line between the meter and the backflow prevention device.
   b) The device shall be protected against freezing. Access for routine testing and maintenance shall be provided.
   c) If a drain in the pit is absolutely necessary there shall be no connection between the drain and sewer or appurtenance, which permits the passage of polluted water into the pit.

10. Where possible, an approved DCV assembly shall be installed within a building on the service connection after but close to the meter. In certain cases, a backflow prevention assembly may be installed at an alternative location such as outdoors or at the suction side of a booster pump. The device shall be protected from freezing, flooding, and vandalism. Access for routine testing and maintenance shall be provided.

    a) Drinking and domestic water lines, lines for safety showers, and lines for eye wash units must be taken off the upstream side of RPZ assemblies for those devices installed as in-plant protection.

    b) There shall be no outlet, tee, tap, or connection of any kind to or from the supply line between the meter and the backflow prevention device.

    c) Provisions may have to be made by the owner to provide for thermal expansion within his closed loop system, i.e. the installation of thermal expansion devices and/or pressure relief valves.

D. Pressure Vacuum Breaker Assembly (PVB)

All PVB assemblies shall be installed in accordance with the manufacturer's specifications and the following Department requirements:

1. The critical installation level shall be no less than twelve inches (12") above the highest point use or downstream piping for pipe applied applications and one inch (1") for equipment mounted/deck mounted applications. They shall be used only where drainage is provided.
2. PVB assemblies must not be installed where the device is subject to corrosive fumes or dust.
3. Brass ¼" adapters shall be installed on each test cocks of the device.
4. PVB's shall be tested annually.

E. Residential Dual Check (DC)

All Residential Dual Check assemblies shall be installed in accordance with the manufacturer's specifications and the following Fire District requirements:

1. All residential buildings will be required to install a residential dual check device immediately downstream of the water meter.
2. The owner shall be made aware that the installation of a residential dual check valve results in a potential closed plumbing system within his residence. As such, provisions may have to be made by the owner

to provide for thermal expansion within his closed loop system, i.e. the installation of thermal expansion devices and/or pressure relief valves.

3. Typically, residential dual check valves are not testable, therefore not subject to annual or semiannual testing requirements.

F. Vacuum Breakers

A hose bibb vacuum breaker should be installed on all outlets having a hose thread connection. It is screwed directly on to the sill cock. Freezing conditions require the draining feature.

An atmospheric vacuum breaker shall be located beyond the last control valve prior to the first outlet. All vacuum breakers shall be installed at an elevation at least six-inches (6") above the highest outlet. All atmospheric vacuum breakers shall be installed so that they are not subject to backpressure or continuous operating pressure of more than twelve (12) hours duration. All AVB's shall be installed in such a fashion that they will not be subject to corrosion that may render them inoperable.

G. Irrigations Systems

An approved backflow assembly shall be installed on each service to premises on which there is an irrigation system.

1. An approved air gap or RPZ shall be installed where there is an actual or potential health hazard caused by the installation of facilities for injecting under pressure fertilizers, fungicides, pesticides, soil conditioners and other noxious or objectionable substances through the irrigation system.
2. An approved air gap or DCV shall be installed where there is an actual or potential cross connection, which may adversely or unreasonably affect the aesthetic qualities of the domestic water supply.
3. A dual check assembly shall be installed on the irrigation line at the location of the separate water meter for the irrigation line at residential settings if there are none of the actual or potential hazards listed in #1 above.
4. Alternatively, a pressure vacuum breaker may be installed on the irrigation system according to the above requirements and manufactures specifications if there are none of the actual or potential hazards listed in #1 above, and if the device is not subject to backpressure from pumps or elevated piping. The owner must protect the device from freezing and maintain the device as required.

H. Strainers

The Fire District strongly recommends that all new and retrofit installations of reduced pressure principle devices and double check valve backflow preventers include the installation of strainers located immediately upstream of the backflow device. Installations of backflow preventers after water meters with existing strainers may not require the installation of another strainer. The installation of strainers will preclude the fouling of backflow devices due to both foreseen and unforeseen circumstances occurring to the water supply system such as water main repairs, water main breaks, fires, periodic cleaning and flushing of mains, etc. These occurrences may "stir up" debris within the water main that will cause fouling of backflow devices installed without the benefit of strainers.

I. Fire Protection Systems

Devices and valves installed on fire protection systems including dual check backflow preventers for residential fire sprinkler systems shall be listed by Underwriters Laboratory (UL), unless otherwise approved by the head of the local fire department.

All new or modified fire systems with or without a Siamese connection, shall have installed as a minimum, an approved DCV. Based upon the degree of hazard, an RPZ may be required. The DCV or RPZ shall be installed on the line leading into the fire system.

An RPZ is required on all new or modified fire sprinkler system with or without a Siamese connection if chemicals are added to the fire sprinkler system. The RPZ shall be installed on the line leading into the fire system.

J. Pit Installations

Primarily due to considerations for access, safety, and gravity drainage, no devices shall be installed in pits except as specifically approved by the Fire District in cases of unique circumstances.

Where pit installations are proposed, however, they shall be designed with the following standards:

1. Pits or vaults shall be watertight, flood free, and maintained free from standing water by means of either a sump and pump or suitable drain. Such a pump or drain shall not connect to a sanitary sewer, nor permit flooding of the pit or vault by reverse flow from its point of discharge.
2. Drainage capacity shall be sized to accommodate both intermittent and catastrophic failure of the relief valve. All drainage from RPZ's must be gravity drains.

3. Sump pumps are not allowed unless they are sized to accommodate the maximum discharge rate and connected to emergency power supplies.
4. The pit opening and manhole cover must be at least 36" in diameter.
5. The foothold inserts must be a maximum 12" apart, and must be installed so that the top foothold is within 12" of the manhole cover and the bottom foothold is within 12" of the bottom of the pit floor.
6. The pit floor shall be pitched to the drain.
7. If built in a roadway, the top of the pit must be adequately enforced.
8. Pits must have crane access for installing and removing large assemblies, if required.
9. Pits must have adequate ground cover to prevent freezing.
10. Surface grading must divert runoff away from the entranceway.

K. Protective Enclosures

1. Floor elevation must be at least six inches (6") above finish grade.
2. Must provide adequate clearances around the device to access test cocks, shut off valves, check valves and relief valve.
3. Require electric heaters or heat trace wire for any water service used year round.
4. Require provisions for natural or artificial light.
5. Require full gravity drains according to the drainage requirements.
6. Require security measures such as locking doors and panels, flow alarms or flow indicator lights, power indicator lights, etc.

18.06 Facilities and Equipment Requiring Backflow Prevention Assemblies

The following is a list of the types of facilities, which are considered as possible cross connection hazards, and the required backflow device assembly for each:

Type of Device to be Used	AG	RPZ	DCV	PVB
A. Medical Facilities				
1. Hospitals		X	X	
2. Clinics		X	X	
3. Laboratories		X	X	
4. Veterinary Hospitals/Clinics			X	X
5. Nursing and Convalescent Homes			X	X
6. Physical Therapy Clinics			X	X
7. Morgues			X	X
8. Mortuaries		X	X	
9. Autopsy Facilities			X	X
10. Embalmers		X	X	
11. Dental Offices			X	X
12. Medical offices with radiographic, physical therapy, and/or lab facilities			X	X
B. Treatment Plants				
1. Sewerage		X	X	
2. Waste Water		X	X	
3. Industrial Waste			X	X
4. Pumping Stations			X	X
C. Commercial Manufacturing/Storage				
1. Automotive Plants		X	X	
2. Aircraft/Missile Plants			X	X
3. Beverage Bottling Plants		X	X	
4. Breweries/Distilleries		X	X	
5. Chemical Plants		X	X	
6. Car Wash Facilities	X	X		
7. Dairies and Cold Storage Plants		X	X	X
8. Dye Works	X	X		
9. Irrigation Systems	X	X	X	X
10. Laundries	X	X	X	
11. Meat Packing Plants		X	X	
12. Metals manufacturing Plants		X	X	
13. Paper/Paper Product Plants		X	X	
14. Petroleum or Gas Processing Plants			X	X
15. Photographic Film Processing Plants		X	X	
16. Plating Plants		X	X	
17. Power Plants	X	X		
18. Radioactive Handling Plants		X	X	
19. Rubber Plants		X	X	
20. Sand, Gravel, Concrete, or Asphalt Plants			X	X
21. Swimming Pools		X	X	X
22. Technical Schools, Colleges, Universities		X	X	X
23. Solar Energy/Heating Systems			X	X

	AG	RPZ	DCV	PVB
24. Temporary Services using Hydrants		X	X	X
25. Waterfront Facilities		X	X	
26. Where a Cross Connection is Maintained		X	X	
27. Food Processing		X	X	
D. Buildings				
1. With Sewerage Ejectors		X	X	
2. With Water Booster pump and/or Storage Tank	X	X		
3. Supermarkets		X	X	X
4. Restaurants	X	X	X	
5. Schools, Research Facilities, Any Building With Laboratories		X	X	
6. Buildings with Fire Service		X	X	X
7. Warehouses used for Hazardous Material Storage		X	X	
8. Factories	X	X	X	
9. Shopping Malls		X	X	X
10. Multi Family	X	X	X	
11. Multi Story	X	X	X	
E. Miscellaneous Equipment and Facilities				
1. Domestic Water Booster Pumps		X	X	
2. Food and Drug Processing		X	X	X
3. Hydraulic Equipment		X	X	
4. Sinks with Hose Threads	X	X		X
5. Submerged Inlets		X	X	
6. Valved Outlets or Fixtures With Hose Attachments	X	X	X	X
7. High and Low Pressure Boilers		X	X	
8. Reservoirs- Cooling Tower Recirculating Systems		X	X	X
9. Premises Where inspection Is Prohibited			X	X
10. Commercial Dishwashers		X	X	X
11. Soap Injector			X	X
13. Steam Generating Plant		X	X	
14. Tank Truck- Lawn Care, Sweeper		X	X	X
15. Water Cooled Equipment		X	X	
16. Boilers			X	
17. Heat Exchangers with added chemicals			X	
18. Solar heating systems with added chemicals				X

Fire Protection Systems

1. Class 1

Direct connection from public water system mains only; no pumps, tanks, or A backflow prevention assembly does not have to be installed on existing

reservoirs, no physical connection from any other water supplies, no antifreeze or other additives of any kind; all sprinkler drains discharge to atmosphere, dry wells, or other safe outlets. The system may or may not have fire department connections.	systems installed prior to April 1, 2003, provided that the fire protection system is registered with the Department, equipped with a UL listed alarm check valve that is maintained in accordance with NFPA 25 and has not undergone substantial modification. Alarm check maintenance records must be available for inspection by the Department. All new or modified fire systems shall have installed as a minimum, an approved DCV. Based upon the degree of hazard, an RPZ may be required. The DCV or RPZ shall be installed in the line leading into the fire system.
2. Class 2 Same as Class 1 except the booster pumps may be installed in the connections from the street mains. These systems may or may not have fire department connections.	A backflow prevention assembly does not have to be installed on existing systems installed prior to April 1, 2003, provided that the fire protection system is registered with the Department, equipped with a UL listed alarm check valve that is maintained in accordance with NFPA 25 and has not undergone substantial modification. Alarm check maintenance records must be available for inspection by the Department. All new or modified fire systems shall have installed as a minimum, an approved DCV. Based upon the degree of hazard, an RPZ may be required. The DCV or RPZ shall be installed in the line leading into the fire system.
3. Class 3 Direct connection from public water mains plus one or more of the following: elevated storage tanks, fire pumps taking suction from above ground covered reservoirs or tanks, and pressure tanks.	RPZ or DCV contingent on evaluation of auxiliary supply and on-site system.
4. Class 4 Directly supplied from public water system mains, similar to Class 1 and 2 with an auxiliary water supply dedicated to fire department use and available to the premises, such as a non-potable water source located within 1,700 feet of the fire	RPZ on evaluation of auxiliary supply and on-site system.

department connection.

5. Class 5 Directly supplied from public water system mains, and interconnected with auxiliary supplies, such as pumps taking suction from reservoirs exposed to contamination, or rivers or ponds; driven wells; mills or other industrial water systems; or where antifreeze or other additives are used.	RPZ or air gap contingent on evaluation of auxiliary supply and on site system.
6. Class 6 Combined industrial and fire protection systems supplied from the public water mains only, with or without gravity storage or pump suction tanks.	RPZ contingent upon evaluation of site water system.
7. Class 7 Residential fire protection systems for one and two family detached dwellings and manufactured homes only.	Non-testable and flow through systems should be used whenever possible. Dual check valves are authorized when only food grade antifreeze is used with no additional additives. If non-grade antifreeze is utilized, the system may be classified as a Class 5.

19. OTHER PENALTIES

In addition to any enhanced billing authorized herein, the Selectboard may, by policy, provide additional penalties for violation of any of the provisions of these Regulations.

20. SEVERABILITY

The declaration of invalidity of any section, term or provision of these regulations shall not affect any other section, term or provision.

CONSTRUCTION SPECIFICATIONS AND STANDARD DETAILS

The attached standards shall generally be applied to work associated with the Brandon Fire District No. 1 water works unless otherwise waived by the Prudential Committee. Variations or deviation from these standards may be allowed following review by a qualified engineer, selected and retained by the District, for the specific application. However, it is the District's intention, to the extent practical, to establish the standard of materials and workmanship provided in these Standards.

INDEX OF SPECIFICATIONS

INDEX OF STANDARD DETAILS

SECTION 02232 - PROTECTION AND REPAIR OF PROPERTY

PART 1.00 - GENERAL

1.01 WORK INCLUDED
- A. All labor, materials, equipment and services necessary for protection and repair of property, as shown or specified.

1.02 REFERENCE STANDARDS
(Not Used)

1.03 SUBMITTALS
(Not Used)

1.04 QUALITY ASSURANCE
(Not Used)

PART 2.00 - PRODUCTS

2.01 MATERIALS
(Not Used)

PART 3.00 - EXECUTION

3.01 NOTIFICATION
- A. For the location of existing underground utilities, the following notifications shall be made by the Permittee prior to start of construction:
  1. "Dig Safe": 1-888-344-7233 or 8-1-1.
  2. Other utilities not contracted with "Dig Safe" may include, but are not limited to, local water, wastewater and stormwater authorities.
  3. Municipality owned utilities.
- B. The Permittee is responsible for location of all utilities, including primary and secondary services.
- C. For planned interruption of existing water services, written notification shall be given to Brandon Fire District No. 1 forty-eight (48) hours prior to the interruption.

3.02 PROTECTION AND REPAIR OF PROPERTY
- A. Protection, restoration and repair of property by the Permittee shall be included in all work authorized by the Fire District.
- B. The Permittee shall be fully responsible and shall take all necessary precautions to protect all personnel, property, structures, buildings, trees, shrubs, plantings, gardens, fences, signs, guy wires, lawns, buried and overhead utilities, pipes, culverts, roads, streets, driveways, curbs, swales, rip-rap, sidewalks, paths, utility poles, light poles, property markers, mailboxes, manholes and covers, catch basins and grates, retaining walls, guideposts/rails and other features.

C. If gravel, silt or other debris caused by the Permittee ‘s operation is deposited into existing facilities, structures, pipes or other site features, the sediment shall be thoroughly removed and the item completely cleaned, at no cost to the Fire District.
D. If damage is caused to facilities or equipment, it shall be repaired or replaced at no cost to the Fire District.
E. Items removed for construction shall be replaced in their original locations, unless directed otherwise by the Fire District, at no cost to the Fire District.
F. Items not specified elsewhere in these Specifications that have been damaged during or removed for construction, shall be replaced “in kind.”

3.03 PROTECTION AND REPAIR OF SURVEY AND BOUNDARY MARKERS

A. Temporary benchmarks, control points and reference points shall be maintained and preserved throughout construction. If disturbed or destroyed, they shall be reestablished by the Permittee, at no cost to the Fire District.
B. Boundary markers, pins, pipes or monuments shall be protected and preserved throughout construction. If disturbed or destroyed, they shall be reestablished by a Licensed Land Surveyor hired by the Permittee, at no cost to the Fire District.

3.04 TREE AND SHRUB PROTECTION

A. Any tree or shrub which will not, in the opinion of the Fire District, hinder construction or landscaping, shall be preserved and protected.
B. The Permittee shall construct a temporary barricade at the drip line of any trees or shrubs designated to be preserved and as indicated on the drawings, to prevent damage to any portion of the tree or shrub. The Permittee shall take special care in setting barricade posts to not damage tree or shrub roots.
C. The Permittee shall not permit stockpiling of material or debris within the barricaded area, nor permit the earth surface to be changed in any way.
D. The Permittee shall use necessary care to protect the roots, trunks and branches of all trees or shrubs not designated to be removed.
E. If necessary to avoid undermining a tree or shrub during construction, trees designated to remain shall be protected with temporary shoring or sheeting. All temporary shoring or sheeting shall be removed when no longer necessary.

3.05 TRIMMING OF TREES OR SHRUBS TO REMAIN

A. If necessary to trim selected trees or shrubs to allow the construction, the Permittee shall use proper tools and skilled workmen to achieve neat severance of tree or shrub limbs with the least possible damage to the tree or shrub. Cut limbs shall be appropriately sealed.
B. If necessary to trim roots of selected trees or shrubs to allow the construction, the Permittee shall apply wet burlap to prevent drying of the severed root. Cut roots shall be appropriately sealed.

3.06 PROTECTION AND REPAIR OF UTILITIES

A. The Fire District and Dig Safe may not be able to depict all utilities or exact positions of all utilities that may exist on the site.
B. The Permittee shall provide his own detection equipment for accurately locating buried utilities. The Permittee shall locate underground utilities in the work area by probing and/or other means as required.
C. If utilities are to remain, the Permittee shall provide adequate means of protection during earthwork operations.
D. Should unmapped piping or other utilities be encountered during excavation, the Permittee shall consult with the utility Fire District immediately for directions. The Permittee shall cooperate with utility companies in keeping respective service and facilities to the satisfaction of the utility Fire District.
E. The Permittee shall not intentionally interrupt utilities unless permitted in writing by the utility Fire District, and then only after arranging to provide temporary utility service to necessary facilities or users.
F. Utilities damaged during construction shall be repaired and/or replaced with equal or better quality material as directed by the impacted utility.
G. Repairs shall be inspected by the impacted utility prior to being backfilled. Repair of utilities and inspection by the utility shall be included in the Contract price at no cost to the Fire District.

3.07 REPAIR OF WASTEWATER AND STORMWATER PIPE

A. The Fire District and Town of Brandon shall be notified immediately if a wastewater or stormwater pipe is damaged during construction.
B. Wastewater or stormwater pipes damaged during construction shall be immediately repaired.
C. Wastewater or stormwater pipes damaged during construction shall be replaced for a minimum distance of two feet (2') beyond either side of the damage, with a section of same size and material pipe, at no cost to the Fire District or Town.
D. Wastewater or stormwater pipes damaged during construction and crossing water pipes shall be repaired in accordance with the water/sewer crossing notes on the Standard Details, at no cost to the Fire District or Town.
E. Connections shall be made with approved couplings. Adequate pipe bedding and compaction is mandatory under pipe repairs to prevent settlement.

3.08 REPAIR OF WATER MAINS AND SERVICES

A. The Permittee shall become familiar with the location of water valves and curb stops, prior to the start of work, to facilitate emergency shutdown and repairs.
B. The Fire District shall be notified immediately if a water main or service is damaged during construction.
C. Water mains damaged during construction shall be immediately repaired or replaced for a minimum distance of two feet (2') beyond either side of the damage, with a section of same size and material pipe, with approved couplings, and at no cost to the Fire District. Adequate pipe bedding and compaction is mandatory under pipe repairs to prevent settlement.
D. Water services damaged during construction shall be immediately repaired

or replaced for a minimum distance of two feet (2') beyond either side of the damage, with a section of same size Type K copper water pipe, with approved compression fittings, couplings and adapters, and at no cost to the Fire District. Adequate pipe bedding and compaction is mandatory under pipe repairs to prevent settlement.

3.09 REPAIR OF LAWNS, GRASSES AND OTHER PLANTINGS

A. Lawns and other grass areas shall be restored as required in Specification Section 02930.
B. Plantings or gardens damaged or destroyed during construction shall be replaced “in kind”.

3.10 REPAIR OF CURB AND SIDEWALK

A. Curb and sidewalk shall be restored as required in Specification Section 03301.
B. Curb and sidewalk dimensions and type shall match existing, unless indicated otherwise on the drawings.

3.11 REPAIR OF BITUMINOUS CONCRETE SURFACES

A. Bituminous concrete surfaces including roads, streets, driveways, paths and walks shall be restored as required in Specification Section 02511.

3.12 FENCE, MAILBOX AND SIGN REMOVAL AND RESETTING

A. Fences, mailboxes and signs in the way of construction shall be removed and reset in their original locations after construction in the immediate area has been completed, or prior to the end of the work day, whichever is sooner.
B. Mailboxes shall be reset in accordance with USPS regulations.
C. Mailboxes may be permanently relocated if acceptable to the property owner, Fire District, and meeting USPS regulations.
D. Mailboxes may be permanently relocated if they present a pedestrian or vehicle hazard, as determined by the Fire District, and meeting USPS regulations.
E. Fences, mailboxes and signs damaged during construction shall be replaced Ain kind@ at no cost to the Fire District.

3.13 GUIDEPOSTS/RAILS REMOVAL AND RESETTING

A. Guideposts/rails in the way of construction shall be removed and reset in their original locations after construction in the immediate area has been completed or prior to the end of the work day, whichever is sooner.
B. Guideposts/rails damaged during construction shall be replaced Ain kind@ at no cost to the Fire District.

3.14 REPAIR OF CULVERTS

A. Culverts damaged during construction shall be immediately repaired or replaced with the same size and type of culvert.
B. Connections shall be made with approved couplings for the size and type of pipe.

C. Adequate pipe bedding and compaction is mandatory under pipe repairs to prevent settlement.

3.15 PROTECTION FROM WEATHER

A. In the event of temporary suspension of the Project, or during inclement weather, the Permittee shall, and will cause his contractors to, protect the Project, work and materials against damage or injury from the weather. If in the opinion of the Fire District, the Project, work or materials are damaged or injured by reason of failure on the part of the Permittee to protect the Project, work or materials, such damaged items shall be removed and replaced at the expense of the Permittee.

END OF SECTION 02232

SECTION 02300 - EARTHWORK

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. Excavating
B. Pipe Bedding and Envelope
C. Trenching
D. Trench Backfilling
E. Structure Bedding
F. Structure Backfilling
G. Filling
H. Grading
I. Subgrade preparation
J. Geotextiles
K. Embankments
L. Subbase
M. Base
N. Compaction
O. Dewatering
P. This Section does not include Earthwork related to buildings, footings, foundations.

1.02 REFERENCE STANDARDS

A. State of Vermont, Agency of Transportation (VTrans), AStandard Specifications for Construction,@ latest version.
B. ASTM Standard Test Method D1557 for Laboratory Compaction Characteristics of Soil Using Modified Effort.
C. ASTM Standard Test Method D2992 for Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).
D. AASHTO Test T96 for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
E. ASTM Standard Classification D2487 of Soils for Fire Districting Purposes (Unified Soil Classification System).
F. AASHTO Standard M145 - Recommended Practice for Classification of Soils
G. State of Vermont, Agency of Natural Resources, Environmental Protection Rules- Chapter 1.
H. ASTM Standard Test Method D 4632 for Grab Tensile Strength of Geotextiles.
I. ASTM Standard Test Method D 3786 for Mullen Burst Strength of Geotextiles.
J. ASTM Standard Test Method D 4533 for Trapezoidal Tear Strength of Geotextiles.
K. ASTM Standard Test Method D 4833for Puncture Strength of Geotextiles.
L. ASTM Standard Test Method D 4355 for UV Deterioration of Geotextiles.
M. ASTM Standard Test Method D 4751 for Apparent Opening Size of Geotextiles.

N. ASTM Standard Test Method D 4491 for Flow Rate of Geotextiles.

1.03 SUBMITTALS

A. The Permittee shall submit supplier's certified laboratory gradation curves and moisture-density compaction curves (modified proctor) for each imported material to be used on the project.

B. The Permittee shall submit representative samples of each imported material to be used on the project, if requested by the Fire District.

C. The Permittee shall submit certified laboratory gradation curves, moisture-density compaction curves (modified proctor) and ASTM D2487 Soil Classification or AASHTO M145 Soil Classification for each on-site material proposed for Fill or Backfill on the project.

D. The Permittee shall submit representative samples of each on-site material proposed for Fill or Backfill on the project, if requested by the Fire District.

E. The Permittee shall submit manufacturers' data for Subgrade Stabilization/Separation Fabric, Filter Fabric, Slope Stabilization Fabric and Erosion Control Fence.

1.04 QUALITY ASSURANCE

A. The Permittee shall allow the Fire District's testing agency to perform field quality control testing, including, but not limited to, in place compaction testing of Subgrade and each layer of Embankment, Subbase, Base, or Fill, at the discretion of the Fire District. The Permittee shall proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

B. When testing agency reports that any area has not achieved the required degree of compaction, the Permittee shall remove and replace, or uniformly moisten or scarify and aerate to obtain optimum moisture content, and then recompact and retest until specified compaction is obtained. Reworking, replacement of material, recompacting and retesting will be done at no expense to the Fire District.

C. Unless modified by the Fire District, compaction tests will be performed at the following frequencies:

1. Pipe Bedding and Structure Bedding: one test for each 150 feet or less of trench length.
2. Initial Backfill/Envelope: at least one test for each 150 feet or less of trench length.
3. Trench or Structure Backfill: at least one test for each 150 feet or less of trench length and/or at least one test per vertical foot of trench depth.
4. Subgrade: at least one test for every 2,000 square feet or less of Subgrade.
5. Embankment, Subbase or Base: at least one test for every 2,000 square feet or less, and/or at least one test per vertical foot of depth.
6. Gravel Roadway and Driveway, Gravel Shoulder, or Gravel Sidewalk: at least one test for every 2,000 square feet or less, and/or at least one test per vertical foot of depth.

7. Fill: at least one test for every 2,000 square feet or less of Fill, and/or at least one test per vertical foot of depth.

D. Do not place materials on surfaces that are muddy, frozen or contain frost or ice.

E. Protect newly graded areas from traffic, freezing and erosion. Keep free of trash and debris.

F. Repair and reestablish, to specified tolerances, areas where completed or partially completed surfaces become eroded, rutted, settled or where they lose compaction due to subsequent construction operations or weather conditions.

G. Where settling occurs, the Permittee shall remove finished surface treatment, backfill with appropriate Base material, compact and replace surface treatment, all at no expense to the Fire District. Restore appearance, quality and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

H. The Permittee's contractor shall be thoroughly trained and experienced in the skills and equipment required for Earthwork.

I. The Permittee shall protect Earthwork materials and areas before, during and after installation. In the event of damage, the Permittee shall immediately make all repairs and replacements necessary to the approval of the Fire District and at no cost to the Fire District.

J. Upon direction of the Fire District, the Permittee shall remove and/or rework all areas which do not meet the requirements of this Section. The Permittee shall perform all remedial measures at no cost to the Fire District.

1.05 DEFINITIONS

A. Backfill: materials used to fill an Excavation
   1. Initial Backfill/Envelope: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Trench Backfill: Backfill placed over Initial Backfill/Envelope to fill a trench Excavation.

B. Base Course: layer placed between the Subbase Course and either bituminous concrete pavement, curb, sidewalk, or other surface treatment.

C. Bedding: layer placed over the excavated Subgrade in a trench before placement of pipe or structure.

D. Borrow: imported materials from off-site sources.

E. Embankment: layer placed between Subgrade and Subbase.

F. Excavation: removal of material encountered above Subgrade elevations.

G. Fill: soil material used to raise existing grades in lawn and grass areas.

H. Onsite material: soil material stockpiled from Excavations.

I. Rock: refer to Section 02301.

J. Structures: precast concrete wastewater and stormwater manholes, catch basins, storage tanks, pump stations and septic tanks.

K. Subbase Course: layer placed between the Embankment and Base Course, or between Subgrade and Base course if no Embankment.

L. Subgrade: surface or elevation remaining after completing excavation; surface below Embankment or below Subbase or Bedding, if no

Embankment.

PART 2.00 - PRODUCTS

2.01 BORROW MATERIALS

A. General

1. All Borrow materials shall be obtained from approved sources and be reasonably free from structurally weak pieces, thin or elongated pieces, silt, loam, topsoil, clay, organic or other deleterious material.
2. All Borrow materials shall be uniformly graded from coarse to fine.

B. Bank Run Sand

1. Shall conform with Section 703.03 of the VTrans Standard Specifications for Construction.
2. Bank Run Sand shall meet the following gradation requirement:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
2 inches	100
1½ inches	90-100
½ inch	70-100
No. 4	60-100
No. 100	0-20
No. 200	0-8

C. Bank Run Gravel

1. Shall conform with Section 704.04 of the VTrans Standard Specifications for Construction.
2. The percent of wear of the gravel shall not be more than 50 when tested in accordance with AASHTO T 96.
3. The maximum size stone particle shall not exceed two thirds the thickness of the layer being placed, or a maximum of eight inches in largest dimension, whichever is smaller.
4. Bank Run Gravel shall meet the following gradation requirement:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
No. 4	20-60

No. 100	0-12
No. 200	0-6

D. Coarse Crushed Gravel
1. Shall conform with Section 704.05 of the VTrans Standard Specifications for Construction.
2. The percent of wear of the gravel shall not be more than 40 when tested in accordance with AASHTO T 96.
3. At least 30 percent, by weight, of the material coarser than the No. 4 sieve shall have at least one fractured face.
4. Coarse Crushed Gravel shall meet the following gradation requirement:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
4 inches	95-100
No. 4	25-50
No. 100	0-12
No. 200	0-6

E. Fine Crushed Gravel
1. Shall conform with Section 704.05 of the VTrans Standard Specifications for Construction.
2. The percent of wear of the gravel shall not be more than 40 when tested in accordance with AASHTO T 96.
3. At least 30 percent, by weight, of the material coarser than the No. 4 sieve shall have at least one fractured face.
4. Fine Crushed Gravel shall meet the following gradation requirement:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
2 inches	100
1½ inches	90-100
No. 4	30-60
No. 100	0-12
No. 200	0-6

F. Plant Mixed Gravel
1. Shall conform with Section 704.03 of the VTrans Standard

Specifications for Construction.

2. Shall consist of clean, hard, crushed stone or crushed gravel, mixed at the plant to give a specific gradation.
3. When the Plant Mixed Gravel is composed of crushed stone or crushed gravel, the percent of wear of the aggregate shall not be more than 35 when tested in accordance with AASHTO T 96. When the Plant Mixed Gravel is composed of crushed igneous rock, the percent of wear of the aggregate shall not be more than 50 when tested in accordance with AASHTO T 96.
4. When crushed gravel is used for the aggregate, at least 50 percent, by weight, of the material coarser than the No. 4 sieve shall have at least one fractured face.
5. The aggregate fractions shall be uniformly combined in such proportions that the resulting Plant Mixed Gravel gradation conforms to the following:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
1¾ inches	100
1½ inches	95-100
1 inch	60-85
¾ inch	50-70
½ inch	40-60
No. 4	20-40
No. 8	15-30
No. 200	0-4

G. Surface Course Gravel

1. Shall conform with Section 704.12 of the VTrans Standard Specifications for Construction.
2. The percent of wear of the gravel when tested in accordance with AASHTO T 96 shall not be more than 40 for material used as Surface Course or not more than 50 for material used as Shoulders.
3. Surface Course Gravel shall meet the following gradation requirement:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
1½ inches	100
1 inch	90-100

No. 4	45-65
No. 100	0-15
No. 200	0-12

H. "Sur-Pak" Gravel
1. "Sur-Pak" Gravel shall meet the following gradation requirement:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
¾ inch	100
½ inch	95-100
⅜ inch	80-95
No. 4	50-70
No. 8	30-50
No. 16	20-40
No. 30	15-35
No. 50	10-30
No. 100	5-20
No. 200	2-10

I. Dense Graded Crushed Stone
1. Shall conform with Section 704.06 of the VTrans Standard Specifications for Construction.
2. The percent of wear of the crushed stone shall not be more than 40 when tested in accordance with AASHTO T 96. The percent of wear shall not be more than 50 if crushed igneous rock is used.
3. Dense Graded Crushed Stone shall meet the following gradation requirement:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
3½ inches	100
3 inches	90-100
2 inches	75-100
1 inch	50-80

½ inch	30-60
No. 4	15-40
No. 200	0-6

J. Crushed Stone

1. Shall conform with Section 704.02of the VTrans Standard Specifications for Construction.
2. When the aggregate is composed of crushed stone, the percent of wear of the aggregate shall not be more than 35 when tested in accordance with AASHTO T 96. When the aggregate is composed of crushed igneous rock, the percent of wear of the aggregate shall not be more than 50 when tested in accordance with AASHTO T 96.
3. ¾ inch Crushed Stone shall meet the following gradation requirement:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
1 inch	100
¾ inch	90-100
⅜ inch	20-55
No. 4	0-10
No. 8	0-5

4. 1½ inch Crushed Stone shall meet the following gradation requirement:

Sieve No.	Percentage by Weight Passing Square Mesh Sieve
1¾ inches	100
1½ inches	90-100
1 inch	20-55
¾ inch	0-15
⅜ inch	0-5

K. Rip-Rap

1. Stone for rip-rap shall be unhewn, rough quarry stone, as nearly rectangular in section as practicable. The stones shall be hard, sound and resistant to the action of water and weathering. Blast rock may only be used for rip-rap if approved by the Fire District. Rip-rap shall

be of the following types:

a. Heavy Rip-Rap - the individual stones shall have a depth equal to the thickness of the course of rip-rap. At least 75 percent of the volume of the rip-rap, complete in place, shall consist of stones that have a minimum volume of 16 cubic feet.

b. Light Rip-Rap - the individual stones shall have a depth equal to the thickness of the course of rip-rap. The rip-rap, complete in place, shall consist of stones that have a minimum volume of 2 cubic foot.

2. Rounded, unfractured or smooth rocks or quarry screenings or tailings shall not be acceptable rip-rap.

L. Topsoil: refer to Specification Section 02930

M. Category I Imported Fill: shall conform to all the requirements for Category I Onsite Material.

2.02 ONSITE MATERIAL

A. Category I Onsite Material

1. ASTM D2487 Soil Classification Groups GW, GP, GM, SW, SP and SM, or a combination of these group symbols, (See Table below).
2. AASHTO M145 Soil Classification Groups A-1, A-2-4, A-2-5, and A-3, or a combination of these group symbols, (See Table below).

B. Category II Onsite Material

1. ASTM D2487 Soil Classification Groups GC, SM-SC, SC, ML, CL, MH and CH, or a combination of these group symbols, (See Table below).
2. AASHTO M145 Soil Classification Groups A-2-6, A-2-7, A-4, A-5, A-6 and A-7, or a combination of these group symbols, (See Table below).

C. Unsuitable Onsite Material

1. ASTM D2487 Soil Classification Groups ML-CL, OL, OH and PT, or a combination of these group symbols, (See Table below).
2. AASHTO M145 Soil Classification Group A-8, (See Table below).
3. Debris, waste, frozen materials, clumps, vegetation, roots, stumps, peat, topsoil, boulders, pavement, concrete, muck, rocks over eight inches in dimension and other deleterious material.
4. Unsuitable Onsite Materials include Category I and Category II Onsite Materials which the Permittee is unable to compact to specified densities.

D. Suitable Blast Rock

1. Shall consist of hard, angular blasted rock broken into various sizes. The longest dimension of the stone shall vary from one inch to eight inches, and at least 50 percent of the volume of the stone shall have a least dimension of four inches. The least dimension of the stone shall be greater than a of the longest dimension.

2. Suitable Blast Rock shall be reasonably well graded from the smallest to the maximum size stone so as to form a compact mass without voids when in place.
3. Shall be free from structurally weak pieces, silt, topsoil, clay, organic or other deleterious material.

E. Table of ASTM D2487 Soil Classification Groups:

Group Symbol	Description	Range of max. dry densities, lbm/cf	Range of optimum moisture content, %
GW	well-graded, clean gravels, gravel-sand mixtures	125-135	11-8
GP	poorly-graded, clean gravels, gravel-sand mixtures	115-125	14-11
GM	silty gravels, poorly graded gravel-sand silt	120-135	12-8
GC	clayey gravels, poorly-graded gravel-sand-clay	115-130	14-9
SW	well-graded clean sands, gravely sands	110-130	16-9
SP	poorly-graded clean sands, sand-gravel mix	100-120	21-12
SM	silty sands, poorly-graded sand-silt mix	110-125	16-11
SM-SC	sand-silt-clay mix with slightly plastic fines	110-130	15-11
SC	clayey sands, poorly-graded sand-clay mix	105-125	19-11
ML	inorganic silts and clayey soils	95-120	24-12
ML-CL	mixture of organic silt and clay	100-120	22-12
CL	inorganic clays of low-to-medium plasticity	95-120	24-12
OL	organic silts and silt-clays, low plasticity	80-100	33-21
MH	inorganic clayey silts, elastic silts	70-95	40-24
CH	inorganic clays of high plasticity	75-105	36-19
OH	organic and silty clays	65-100	45-21

F. Table of AASHTO M145 Soil Classification Groups:

	Granular materials (35% or less passing No. 200 sieve)							silt-clay materials (35% or more passing No. 200 sieve)				
	A-1		A-3	A-2				A-4	A-5	A-6	A-7	A-8
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7					
Sieve Analysis: % passing												
No. 10	50											
No. 40	30 max.	50 max.	51 min.									
No. 200	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.	
Characteristics of												

fraction passing No.40											
liquid limit		non-	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	
plasticity index	6 max.	plastic	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min.	peat,
Usual types of Significant Constituents	stone fragments gravel and sand	fine sand	silty or clayey gravel and sand				silty soils		clayey soils		highly organic soils

2.03 SATISFACTORY PIPE BEDDING AND INITIAL BACKFILL/ENVELOPE MATERIALS SHALL BE ONE OF THE FOLLOWING, AS APPLICABLE:

A. For ductile iron pipe:
   1. Dry trench bottom: Sand, Crushed Gravel, or Crushed Stone
   2. Wet trench bottom: Crushed Stone.

B. For SDR 35 PVC pipe: Crushed Stone.

C. For SCH40 and SCH80 PVC pipe: Crushed Stone.

D. For C900 PVC pipe:
   1. Dry trench bottom: Sand, Crushed Gravel, or Crushed Stone.
   2. Wet trench bottom: Crushed Stone.

E. For CL160 PVC pipe:
   1. Dry trench bottom: Sand, Crushed Gravel, or Crushed Stone.
   2. Wet trench bottom: Crushed Stone.

F. For CL200 PVC pipe:
   1. Dry trench bottom: Sand, Crushed Gravel, or Crushed Stone.
   2. Wet trench bottom: Crushed Stone.

G. For reinforced concrete pipe:
   1. Dry trench bottom: Sand, Crushed Gravel, or Crushed Stone.
   2. Wet trench bottom: Crushed Stone.

H. For solid wall polyethylene pipe:
   1. Dry trench bottom: Sand, Crushed Gravel, or Crushed Stone.
   2. Wet trench bottom: Crushed Stone.

I. For corrugated polyethylene pipe: Crushed Stone.

J. For corrugated metal pipe: Crushed Stone.

K. For copper pipe: Sand.

2.04 SATISFACTORY STRUCTURE BEDDING MATERIALS SHALL BE ONE OF THE FOLLOWING, AS APPLICABLE:

A. Below precast concrete wastewater manholes, catch basins, stormwater manholes, storage tanks, septic tanks and pump stations: Crushed Stone.

2.05 SATISFACTORY TRENCH BACKFILL AND STRUCTURE BACKFILL MATERIALS SHALL BE ONE OF THE FOLLOWING, AS APPLICABLE:

A. Below <u>any</u> surface treatment other than Lawn and Grass areas <u>or</u> when top edge of excavation is within five horizontal feet of any surface treatment other than Lawn and Grass areas (including, but not limited to, bituminous concrete pavement, curb, sidewalk, or other surface treatment):
   1. Bank Run Sand, Bank Run Gravel, Coarse Crushed Gravel, Fine Crushed Gravel, Dense Graded Crushed Stone,

2. Suitable Blast Rock - only if thickness of Initial Backfill/Envelope is doubled, at no cost to the Fire District.
3. Category I Onsite Materials,
4. Category I Imported Fill.

B. Below Lawn and Grass areas:
1. Bank Run Sand, Bank Run Gravel, Coarse Crushed Gravel, Fine Crushed Gravel, Dense Graded Crushed Stone,
2. Suitable Blast Rock - only if thickness of Initial Backfill/Envelope is doubled, at no cost to the Fire District.
3. Category I Onsite Materials,
4. Category II Onsite Materials,
5. Category I Imported Fill.

2.06 SATISFACTORY FILL MATERIALS SHALL BE ONE OF THE FOLLOWING, AS APPLICABLE:

A. Below Lawn and Grass Areas:
1. Bank Run Sand, Bank Run Gravel, Coarse Crushed Gravel, Fine Crushed Gravel, Dense Graded Crushed Stone,
2. Suitable Blast Rock,
3. Category I Onsite Materials,
4. Category II Onsite Materials,
5. Category I Imported Fill.

B. Below ALL other areas: refer to Embankment Materials or Subbase Materials.

2.07 SATISFACTORY EMBANKMENT MATERIALS SHALL BE ONE OF THE FOLLOWING:

A. All Embankments: Bank Run Gravel, Coarse Crushed Gravel, Dense Graded Crushed Stone, Suitable Blast Rock.

2.08 SATISFACTORY SUBBASE MATERIALS SHALL BE ONE OF THE FOLLOWING, AS APPLICABLE:

A. Below Bituminous Concrete Pavement: Bank Run Gravel, Coarse Crushed Gravel or Dense Graded Crushed Stone.

B. Below Cast in Place Concrete Curb: Bank Run Gravel, Coarse Crushed Gravel or Dense Graded Crushed Stone.

C. Below Cast in Place Concrete Sidewalk: Bank Run Gravel, Coarse Crushed Gravel or Dense Graded Crushed Stone.

D. Below Granite Curb: Bank Run Gravel, Coarse Crushed Gravel or Dense Graded Crushed Stone.

E. Below Gravel Roadway and Driveway: Bank Run Gravel, Coarse Crushed Gravel or Dense Graded Crushed Stone.

F. Below Gravel Shoulder: Bank Run Gravel, Coarse Crushed Gravel or Dense Graded Crushed Stone.

G. Below Gravel Sidewalk: Bank Run Gravel, Coarse Crushed Gravel or Dense Graded Crushed Stone.

2.09 SATISFACTORY BASE MATERIALS SHALL BE ONE OF THE FOLLOWING, AS APPLICABLE:

A. Below Bituminous Concrete Pavement: Fine Crushed Gravel, Plant Mixed Gravel.
B. Below Cast in Place Concrete Curb: Fine Crushed Gravel, Plant Mixed Gravel.
C. Below Cast in Place Concrete Sidewalk: Fine Crushed Gravel, Plant Mixed Gravel.
D. Below Granite Curb: Fine Crushed Gravel, Plant Mixed Gravel.
E. Below Gravel Roadway and Driveway: Fine Crushed Gravel, Plant Mixed Gravel.
F. Below Gravel Shoulder: Fine Crushed Gravel, Plant Mixed Gravel.
G. Below Gravel Sidewalk: Fine Crushed Gravel, Plant Mixed Gravel.

2.10 SATISFACTORY SURFACE TREATMENT MATERIALS SHALL BE ONE OF THE FOLLOWING, AS APPLICABLE:

A. Existing surfaces: if not indicated to be replaced otherwise, all disturbed surfaces shall be replaced with materials matching existing, including special finishes, colors, textures or material types.
B. Bituminous Concrete Pavement: refer to Section 02511.
C. Cast In Place Concrete Curb: refer to Section 03301.
D. Cast In Place Concrete Sidewalk: refer to Section 03301.
E. Granite Curb: refer to Section 03301.
F. Gravel Roadway and Driveway: Surface Coarse Gravel.
G. Gravel Shoulder: Surface Course Gravel.
H. Gravel Sidewalk: “Sur-Pak” Gravel.
I. Lawn and Grass areas: refer to Section 02930.

2.11 GEOTEXTILES

A. Subgrade Stabilization Fabric: Shall be Mirafi® 500X woven polypropylene geotextile, meeting the following minimum standards:

Grab Tensile Strength	0.89 kN
Mullen Burst Strength	2756 kPa
Trapezoidal Tear Strength	0.33 kN
Puncture Strength	0.40 kN
UV Deterioration	70% of Strength
Apparent Opening Size	0.300 mm
Flow Rate	200 l/min/m^2

B. Filter Fabric: Shall be Mirafi® 140N non-woven polypropylene geotextile, meeting the following minimum standards:

Grab Tensile Strength	0.53 kN

Mullen Burst Strength	1654 kPa
Trapezoidal Tear Strength	0.22 kN
Puncture Strength	0.31 kN
UV Deterioration	70% of Strength
Apparent Opening Size	0.212 mm
Flow Rate	5500 l/min/m^2

C. Erosion Control Fence: Shall be prefabricated Mirafi® Silt Fence.
D. Slope Stabilization Fabric: Shall be of the type indicated on the Drawings.

PART 3.00 - EXECUTION

3.01 PROTECTION
A. Protect buildings, structures, utilities, pipelines, sidewalks, plantings, pavement, and other facilities from damage caused by settlement, lateral movement, undermining, washout, subsidence due to lowering of groundwater and other hazards created by earthwork operations. The Permittee shall be responsible for any repairs or remedial work necessary, at no cost to the Fire District.
B. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil bearing water runoff or airborne dust.
C. Provide all necessary excavation and trench support systems, materials and equipment necessary to comply with all Local, State and Federal Standards. Excavation and trench support systems shall be kept in place and maintained until no longer required.

3.02 LAYOUT
A. Provide all qualified personnel and calibrated equipment necessary to establish and maintain all necessary controls for line, grade, elevation and location.
B. Preserve all monuments, pins, pipes and rods. If disturbed or lost, the Permittee shall immediately have them replaced or reset by a Licensed Surveyor, at no cost to the Fire District.
C. The Permittee shall be responsible for accurate placement of all work to the locations and elevations shown on the approved Drawings.

3.03 DEWATERING
A. Prevent surface water and groundwater from entering excavations, from ponding on prepared Subgrade, Embankment, Subbase, Base or Fill, and from flooding Project site and surrounding area.
B. Provide all necessary pumps, well points and other equipment and materials necessary for control and removal of surface and groundwater.
C. Protect all surfaces from softening, undermining, washout and damage by rain or water accumulation. Reroute surface water runoff away from

excavated areas. Do not use excavated trenches as temporary drainage ditches.

D. Install a dewatering system(s) to keep Subgrade dry and convey groundwater away from excavations. Maintain until dewatering is no longer required.

3.04 EXCAVATING

A. Excavate to grades, depths, elevations and dimensions as shown on Drawings, or as required, within a tolerance of plus or minus one inch.

B. Do not disturb Subgrade.

3.05 UNAUTHORIZED EXCAVATIONS

A. Fill unauthorized excavations with Bedding, Embankment or Subbase materials, as appropriate, at no cost to the Fire District.

3.06 STORAGE OF MATERIAL

A. Stockpile material without intermixing. Place, grade, and shape stockpiles to drain surface water.

B. Cover stockpiles to prevent windblown dust if necessary.

C. Provide necessary erosion control measures to prevent migration of stockpiled materials.

D. Stockpile materials away from edge of excavations. Do not store within drip line of trees to remain.

3.07 DISPOSAL OF UNSUITABLE ONSITE MATERIAL, SURPLUS ONSITE MATERIAL AND WASTE MATERIAL

A. Remove Unsuitable Onsite Material, surplus Onsite Material, waste material, trash and debris and legally dispose of it off the Fire District's property.

B. If surplus material disposal site(s) are indicated on the Drawings, the Permittee shall transport materials to designated areas. Spread or stockpile materials as directed.

3.08 TRENCHING

A. Excavate to indicated grades, depths, elevations and dimensions and to uniform widths to provide a working clearance on each side of pipe or Structure.

B. Excavate trenches to required depth below pipe or Structure elevation to allow proper depth and width of Bedding course.

3.09 PIPE BEDDING AND STRUCTURE BEDDING

A. Place required Bedding material to depth and width indicated. Shape Bedding course to provide continuous support for bells, joints and barrels of pipes, fittings and Structures.

B. If the Fire District determines that unsatisfactory or unstable Subgrade exists, continue excavation and replace with additional Bedding material.

C. Compact Bedding material to density specified in Schedule below.

3.10 PIPE AND STRUCTURE INITIAL BACKFILL/ENVELOPE

A. Place required Initial Backfill/Envelope material to depth and width indicated. Provide proper haunching and support for bells, joints and barrels of pipes and fittings. Bring Initial Backfill/Envelope material evenly up on sides and along full length of piping or Structure. Do not damage or displace pipe or Structure.
B. Compact Initial Backfill/Envelope material to density specified in Schedule below.

3.11 TRENCH BACKFILLING AND STRUCTURE BACKFILLING

A. Place required Trench Backfill and Structure Backfill material in lifts evenly along full length of piping and evenly on all sides of Structure. Do not damage or displace pipe or Structure.
B. Compact each lift of Trench Backfill and Structure Backfill material to density specified in Schedule below.
C. As trench or excavation support system is removed, do not disturb Trench Backfill and Structure Backfill material.
D. Install warning tape directly above pipe at depth indicated on Drawings.
E. Continue backfilling and compacting to bottom of Embankment, Subbase or Base, as applicable.

3.12 SUBGRADE PREPARATION

A. Notify the Fire District when excavations have reached required Subgrade.
B. Subgrade shall be crowned or sloped to shed groundwater as indicated on the approved Drawings, or directed by the Fire District.
C. Proof roll Subgrade with loaded ten-wheel dump truck to identify soft, spongy or unstable areas or areas of excess yielding or shoving. Do not proof roll wet or saturated Subgrade. If the Fire District determines that unsatisfactory soil is present, continue excavation and replace with additional Bedding, Embankment or Subbase material, as appropriate.
D. Reconstruct Subgrade damaged by freezing temperatures, frost, rain, accumulated water or construction traffic or activities, as directed by the Fire District, at no cost to the Fire District.

3.13 SUBGRADE STABILIZATION/SEPARATION GEOTEXTILE INSTALLATION

A. Install specified Subgrade Stabilization/Separation Fabric on prepared Subgrade according to manufacturer's instructions. Fabric shall be rolled out flat and tight with no folds.
B. Fabric shall be overlapped a minimum of two feet at all seams.
C. Fabric shall be properly anchored as necessary.
D. Do not allow traffic or equipment to travel on fabric.
E. Protect fabric from damage and weather.
F. Any torn or damaged areas shall be replaced or overlaid with new sections of fabric. All seams at replacement sections shall be overlapped a minimum of three feet.

3.14 EMBANKMENT INSTALLATION

A. Place required Embankment material in lifts on prepared Subgrade, evenly

across width and length.

B. Compact each lift of Embankment material to density specified in Schedule below.

C. Continue placing and compacting Embankment material in lifts to grades, elevations, thickness, dimensions, cross slope and cross section shown on the Drawings.

3.15 SUBBASE

A. Place required Subbase material in lifts on prepared Embankment, or Subgrade if no Embankment, evenly across width and length.

B. Compact each lift of Subbase material to density specified in Schedule below.

C. Continue placing and compacting Subbase material in lifts to grades, elevations, thickness, dimensions, cross slope and cross section shown on the Drawings.

3.16 BASE

A. Place required Base material in lifts on prepared Subbase, or Subgrade if no Subbase, evenly across width and length.

B. Compact each lift of Base material to density specified in Schedule below.

C. Continue placing and compacting Base material in lifts to grades, elevations, thickness, dimensions, cross slope and cross section shown on the Drawings.

3.17 FILLING AND GRADING

A. Place required Fill material in lifts on prepared Subgrade evenly across width and length.

B. Compact each lift of Fill material to density specified in Schedule below.

C. Continue filling and compacting in lifts to grades, elevations and dimensions shown on the Drawings.

D. The Permittee shall provide positive drainage at all finish surfaces.

3.18 SLOPE STABILIZATION GEOTEXTILE INSTALLATION

A. Install Slope Stabilization Fabric at locations shown on Drawings.

B. Follow manufacturer's guidelines for installation, overlapping and anchoring.

3.19 SURFACE TREATMENT INSTALLATION

A. Existing surfaces: unless indicated to be replaced otherwise, all disturbed surfaces shall be replaced to existing or better condition, location and elevation.

B. Bituminous Concrete Pavement: refer to Section 02511.

C. Cast In Place Concrete Curb: refer to Section 03301.

D. Cast In Place Concrete Sidewalk: refer to Section 03301.

E. Granite Curb: refer to Section 03301.

F. Gravel Roadway and Driveway, Gravel Shoulder, Gravel Sidewalk:

1. Place required material in lifts on prepared Subbase, or Base if no Subbase, evenly across width and length.
2. Compact each lift of material to density specified in Schedule below.
3. Continue placing and compacting material in lifts to grades,

elevations, thickness, dimensions, cross slope and cross section shown on the Drawings.

G. Lawn and Grass areas: refer to Section 02930.

3.20 SCHEDULE OF REQUIRED COMPACTION

A. Material shall be compacted with appropriate equipment, at the optimum moisture content, to the following percentage of the maximum dry density of the material determined by ASTM Standard Method D1557 (modified proctor):

1. Pipe Bedding and Initial Backfill/Envelope Materials: 95%.
2. Trench Backfill and Structure Backfill Materials:
   a. Below any surface treatment other than Lawn and Grass areas or when top edge of excavation is within five feet of any surface treatment other than Lawn and Grass areas (including, but not limited to, bituminous concrete pavement, curb, sidewalk, or other surface treatment): 90%.
   b. Below Lawn and Grass areas: 85%.
3. Fill Materials:
   a. Lawn and Grass Areas: 85%.
   b. All other areas: refer to Embankment Materials or Subbase Materials.
4. Embankment Materials: 95%.
5. Subbase Materials: 95%.
6. Base Materials: 95%.
7. Gravel Roadways and Driveways: 90%
8. Gravel Shoulders: 90%
9. Gravel Sidewalks: 90%

B. Jetting is not an acceptable method of compaction.

END OF SECTION 02300

SECTION 02301 - ROCK REMOVAL

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. Furnishing all labor, equipment, materials, and services, and performing operations required to remove rock as specified, utilizing controlled blasting techniques such that resulting ground vibrations are consistently maintained below the maximum levels specified.

B. Protecting new and existing facilities, workers, Brandon Fire District No. 1, and the general public from damage or injury from improper handling of explosives, flyrock, and excessive ground vibrations.

C. Furnishing, installing, and implementing an audible warning system to indicate impending blasting and familiarizing workers, Fire District, and the general public with the system implemented.

D. Conducting blasting monitoring as required to excavate rock utilizing the blast monitoring procedures and equipment specified and provide monitoring reports to the Fire District.

E. The Permittee shall obtain and pay for all permits, insurance and licenses required to complete the work of this Section, at no cost to the Fire District.

F. Conducting and documenting the required pre-blast and post-blast surveys.

1.02 REFERENCE STANDARDS

A. Federal Mine Safety and Health Administration Safety Standards for Explosives.

B. The Permittee shall comply with all applicable laws, rules, ordinances, codes, permits, and regulations of the Federal Government, the State of Vermont, and the municipality, governing the transportation, storage, handling, and the use of explosives. All labor, materials, equipment, and services necessary to make the blasting operations comply with such requirements shall be provided without cost to the Fire District.

C. The Permittee shall comply with the following regulations:

1. Vermont Occupational Safety and Health Administration (VOSHA) Safety and Health Standards for Construction.
2. Codes for the manufacture, transportation, storage, and use of explosives and blasting agents.

D. The Vermont Fire Prevention and Building Code (latest edition) from the Vermont Labor and Industry Specifications, with reference to the NFPA 495 Explosive Material Code (latest edition).

E. In case of conflict between regulations or between regulations and Specifications, the Permittee shall comply with the strictest applicable code, regulation, or Specifications.

1.03 SUBMITTALS

A. Advance Submittals:

1. The Permittee shall submit the following information to the Fire District at least one (1) week prior to commencing drilling and blasting

operations:

a. "Pre-Blast Survey"
   i. The Permittee shall have prepared, by an independent consultant satisfactory to the Fire District, a "Pre-Blast Survey" of all existing structures and utilities on the site and within 500 feet of the site. Said survey shall address the structural integrity of all existing structures and utilities. Upon completion of blasting operations, the Permittee shall have prepared, by the same independent agency, a survey addressing the structural integrity of the same structures and utilities.
b. Blaster's Insurance Certificates.
c. Methods of matting or covering of the blast area.
d. Written evidence of the licensing, experience, and qualifications of the blasters who will be directly responsible for the loading of each shot and for firing it.
e. Details of an audible advance signal system to be employed at the job site as a means of informing workers, Fire District, and the general public that a blast is about to occur.
f. List of instrumentation that the Permittee proposes to use to monitor vibrations.
g. Recent calibration certificate(s) (within previous six (6) months) for the entire proposed blast monitoring instrumentation. Calibration shall be over the required frequency response ranges specified for blast monitoring instrumentation and to a standard traceable to the National Bureau of Standards.
h. Submit a shop drawing indicating the location(s), limits, and details of initial test blast(s) proposed by the Permittee to define the relation between charge weight per delay and peak particle velocity level.

B. Progress Submittals:

1. Within 24 hours following each blast, the Permittee shall submit to the Fire District a Blast Monitoring Report. Payment shall be withheld if Blast Monitoring Reports are not supplied. Each Blast Monitoring Report shall include all of the following applicable items:
   a. Report of Blast Monitoring including observer identification, location, time, date, charge weight per delay, total charge weight per blast, monitor instrumentation location and information, particle velocity readings.
   b. Blast Monitoring Location Plan.
   c. General Blast Round Design Data including blast pattern, charge weights, and distributions, other pertinent information, and location.
   d. Copy of strip chart from seismograph with calibration and monitoring record marked with the date, time, and location of the blast as well as the monitoring location. Copy shall be

legible.

2. Prior to changing the blast round designs, the Fire District shall be informed in writing as to the nature of the change and the reasons therefore.
3. In the event that the Permittee's design round results in ground vibrations which exceed the blasting limit criteria specified in this Section, the Permittee shall immediately revise the round design appropriately.
4. Review by the Fire District of blast designs and techniques shall not relieve the Permittee of responsibility for the accuracy, adequacy, and safety of the blasting, exercising proper supervision and field judgement, and producing the results within the blasting limits required by these Specifications.
5. The Permittee shall report to the Fire District in writing all blasting complaints received by the Permittee within 24 hours of receipt. The Permittee shall provide the following information: complainant, date and time received, date and time of blast complained about, and a description of the circumstances which led to the complaint.

1.04 QUALITY ASSURANCE

A. The Permittee's contractor shall be thoroughly trained and experienced in the skills and equipment required for the work.
B. The Permittee shall protect materials before, during and after work. In the event of damage, the Permittee shall immediately make all repairs and replacements necessary to the approval of the Fire District and at no cost to the Fire District.
C. Upon direction of the Fire District, the Permittee shall rework all rock removal items that do not meet the requirements of this Section. The Permittee shall perform all remedial measures at no cost to the Fire District.
D. Permittee Qualifications
   1. The term "blaster" and "Permittee" shall include, in this specification section, a qualified professional licensed blasting Permittee with a minimum of 5 years experience in the design, review, evaluation, and actual field experience in blasting operations. The blaster shall assign an experienced, qualified Superintendent to be on the job site at all times to review the blasting operations and direct such changes in the blasting operation to meet the requirements of these Specifications. The Superintendent shall have a minimum of 5 years of experience in field blasting work.
   2. All blasting shall be conducted by persons qualified and experienced in drilling and controlled blasting procedures for rock excavation of the types required. Persons responsible for blasting shall be licensed blasters in the State of Vermont and shall have had acceptable experience in similar excavations in rock and controlled blasting techniques. The Permittee must submit a list of previous similar projects the Contractor has completed. Drillers shall have demonstrated proficiency in collaring and drilling holes precisely.

E. Blasting Limit Criteria:
   1. Peak Particle Velocity Limits:
      a. The blaster shall conduct all blasting in such a manner that the resulting peak particle velocity does not exceed 2.0 inches per second at the ground line adjacent to any existing structures in the vicinity of the project.
      b. If circumstances, project conditions, surrounding structures or facilities require a lower peak particle velocity threshold, the blaster shall alter their methods to meet such limit without cost to the Fire District.
   2. The blaster shall conduct alI blasting in such a manner that conforms to chapter 8 of the NFPA 495 titled "Ground Vibrations, Airblast, Flyrock". The more stringent (i.e., lower peak particle velocity) of the two criteria (Section 8-1.1 and Section 8-1.2) cited in this standard shall apply. These vibration criteria shall also apply to all mechanical methods of rock removal (e.g., hoe-ramming).

F. Blasting Monitoring:
   1. The Permittee shall monitor and record peak particle velocity resulting from all blast rounds fired for the project.

G. Blast Monitoring Reports:
   1. Following each blast, a Blast Monitoring Report shall be submitted to the Fire District within 24 hours of the blast as specified.

H. Blast Monitoring Instrumentation:
   1. All instrumentation shall be in proper working order for each monitored blast.

1.05 DEFINITIONS RELATING TO THIS SPECIFICATION

A. Controlled blasting: Shall be considered to mean excavation in rock in which the various elements of the blast, including hole size, position, alignment, depth, spacing, burden, charge size, distribution, and delay sequence are carefully controlled to fracture the rock so as to allow excavation of the rock to the desired lines with a relatively uniform surface and minimum overbreak and fracture of rock beyond the design excavation limits and to maintain resulting ground vibrations within specified limits.

B. Earth: All excavated materials not defined as rock.

C. Flyrock: Fractured rock or soil propelled through the air resulting from blasting if not prevented by use of blasting mats.

D. Geophone or vibration transducer: A sensor used to monitor ground vibrations (particle velocity components).

E. Overbreak: The excess amount of rock removed by and/or resulting from blasting outside, below or beyond payment limits.

F. Peak particle velocity: The maximum of any one of the three mutually perpendicular ground motion velocity components of a vibration measured in directions vertical, radial, and perpendicular to the vibration source.

G. Rock: Material which is geologically classified as intact bedrock or boulders, and requires systematic drilling and blasting for removal. Rock does not include boulders or loose rock fragments less than two (2) cubic yards in

volume.

H. Seismograph: An instrument used to record the magnitude and frequency of ground vibrations sensed by a geophone.

PART 2.00 - PRODUCTS

2.02 EXPLOSIVES

A. All explosive material shall be of high quality, properly stored and handled to prevent damage by water, heat or weather. Any Aduds" are to be immediately removed from the project by the blaster.

PART 3.00 - EXECUTION

3.02 JOB CONDITIONS

A. Blasting:

1. Blasting shall NOT be permitted between the hours of 5:00P.M. and 8:00A.M., and all day Saturday, Sunday, and legal holidays.
2. The Permittee shall provide suitable advanced warning prior to detonating a blast.

B. Vibration Control:

1. The Permittee shall monitor vibrations for all blast(s) during the course of the work.
2. Blasting operations shall be controlled to conform with the requirements in this Section.
3. If the data indicates that these requirements are not being met, the Permittee shall take whatever measures are necessary, including reducing the size of the charge, reducing the length of advance, covering, or matting blasts, to reduce vibrations to below the maximum permissible levels specified.
4. The Permittee shall install a signal system between the location of the blasting switch and the monitoring instrument locations so instrument operators may be notified immediately prior to detonation. The signal system shall be relocated whenever the instruments are moved.
5. The Permittee shall maintain peak particle velocities within the specified limits, and minimize damage to rock left in place. Modifications to blasting and excavation methods required to meet these requirements shall be undertaken at no cost to the Fire District.
6. All necessary blasting shall be done before any concrete or masonry work, to avoid damage to Agreen@ cement. All blasting necessary for pipelines shall be done so as not to damage previously installed components.

3.03 SAFETY PRECAUTIONS

A. Special Hazards:

1. The Permittee shall take all special precautions in handling, storage, and wiring necessary to prevent accidental detonation of charges by

natural (e.g. thunderstorms) or man made (e.g. power lines, transmitters) sources.

B. Clearing the Danger Area Before Blasting:
   1. No blasting shall be permitted until all personnel in the danger area have been removed to a place of safety. A loud, audible, warning system shall be sounded before each blast. The Permittee shall familiarize all personnel on the project, the Fire District, and the general public with the implemented system. The danger area shall be patrolled before each blast to make certain that it has been completely cleared and guards shall be stationed to prevent entry until the area has been cleared by the blaster following the blast.

C. Explosives shall be stored, handled, and employed in accordance with federal, state, and local regulations and in accordance with N.F.P.A codes.

D. No explosives, caps, detonators, or fuses shall be stored on the site during non-working hours unless a permit has been obtained from the State and Municipality and submitted to the Fire District.

E. The Permittee and Contractor shall be responsible for determining any other safety requirements unique to blasting operations on this particular site so as not to endanger life, property, utility services, any existing or new facilities, or any property adjacent to the site.

F. The Permittee shall be completely responsible for all damages resulting from the blasting operations and shall, as a minimum, take whatever measures are necessary to maintain peak particle velocities within the specified limits, and to minimize damage to rock left in place. Modifications to blasting and excavation methods required to meet these requirements shall be undertaken at no cost to the Fire District.

G. Immediately after each blast, the sidewalls of rock excavations shall be scaled to dislodge loose or shattered rock liable to fall. Previously excavated portions shall also be routinely tested and scaled.

H. No requirement of, or omission to require, any precautions under this contract shall be deemed to limit or impair any responsibility or obligations assumed by the Permittee under or in connection with a project; and the Permittee shall at all times maintain adequate protection to safeguard the public and all persons engaged in the work, and shall take such precautions as will accomplish such end, without undue interference to the public. The Permittee shall be responsible for and pay for any damage to adjacent facilities resulting from work executed for his/her project.

3.04 MONITORING PROCEDURE

A. Mount, place, and locate instrumentation to monitor the most critical and/or closest facility in the blasting area, in the probable shock wave path.

B. Alignment of the axis of vibration measurement:
   1. Axis 1: Vertical
   2. Axis 2: Horizontal, radial direction to the blast location.
   3. Axis 3: Horizontal, perpendicular to the radial direction.

C. Set the strip chart(s) speed in accordance with instrumentation manufacturer's recommendations.

D. Make a calibration strip chart before blast detonation in accordance with instrumentation manufacturer's recommendations.
E. Clearly label the strip chart with calibration levels, control settings, location, time, and date of blast.
F. Coordinate closely with the blaster such that the strip chart is advancing at the time the blast is detonated.
G. During the measurement period, observe instrumentation to ensure that recorded vibrations correspond to blasting and not some other source.

3.05 EXCESS ROCK EXCAVATION

A. If rock is overbroken or excavated beyond the project limits, the excess excavation, whether resulting from overbreak or other causes, shall be backfilled as noted below, at no cost to the Fire District.
B. In pipe trenches, excess excavation shall be filled with material of the same type, placed and compacted in the same manner, as specified for the bedding.
C. In excavations for structures, excess excavation shall be filled with material of the same type, placed and compacted in the same manner, as specified for the structure base.
D. If the rock beyond or below the payment limits is overbroken, “humped” or causes damage or potential damage to the existing surfaces (i.e. sidewalk, road, etc.) due to drilling or blasting operations of the Permittee, the shattered rock shall be removed and the excavation shall be backfilled as previously specified. All such removal and backfilling shall be done at no cost to the Fire District.
E. If the rock beyond or below the normal depth is shattered due to drilling or blasting operations of the Permittee, and the Fire District considers such rock to be unfit for foundations or bedding, the shattered rock shall be removed and the excavation shall be backfilled as previously specified. All such removal and backfilling shall be done at no cost to the Fire District.

3.06 PREPARATION OF ROCK SURFACES

A. When rock surface is to remain and to be incorporated into the Project, the Permittee shall remove all dirt and loose rock and shall clean the surface of the rock. The designated area shall be observed to determine whether seams or other defects exist, and if the rock is competent.
B. The surfaces of rock foundations shall be left sufficiently rough to bond to masonry, concrete or embankment, as applicable. If necessary, benches or steps shall be excavated.
C. Before any masonry, concrete or embankment is built on or against the rock, the rock shall be completely freed from all vegetation, dirt, sand, clay, earth, boulders, scale, loose fragments, cracked rock, ice, snow and other objectionable substances.

3.07 DRILLING AND BLASTING OF SOLID ROCK ROAD SUBGRADE

A. A. Blasted rock road subgrade shall be shattered to a depth of four (4) feet below road subgrade elevation to eliminate water pockets. The area of blasted rock road subgrade shall extend sufficiently beyond the beginning and end of cut areas. Any rock that protrudes above the road subgrade

elevation shall be removed to the subgrade elevation.

3.08 DISPOSAL OF EXCAVATED ROCK

A. Refer to the Earthwork specification regarding reuse of excavated rock.

B. Surplus excavated rock shall be disposed of by the Permittee at a suitable location.

END OF SECTION 02301

SECTION 02510 - WATER PIPING

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. Water mains, services and fittings.
B. Fire hydrants and flushing hydrants.
C. Gate valves and post indicator valves.
D. Testing of water piping.

1.02 REFERENCE STANDARDS

Information and requirements contained in this Specification are based on the most recent version of the following standards:

A. AWWA/ANSI Standard C104/A21.4 for Cement-Mortar Lining for Ductile Iron Pipe and Fittings.
B. AWWA/ANSI Standard C110/A21.10 for Ductile Iron Fittings.
C. AWWA/ANSI Standard C111/A21.11 for Rubber Gasket Joints for Ductile Iron Pipe and Fittings.
D. AWWA/ANSI Standard C150/A21.50 for the Thickness Design of Ductile Iron Pipe.
E. AWWA/ANSI Standard C151/A21.51 for Ductile Iron Pipe, centrifugally cast.
F. AWWA/ANSI Standard C153/A21.53 for Ductile Iron Compact Fittings.
G. AWWA/ANSI Standard C600 for Installation of Ductile Iron Water Mains and their Appurtenances.
H. AWWA/ANSI Standard C500 for Gate Valves for Water and Sewerage Systems.
I. AWWA Standard C509 for Resilient-Seated Gate Valves for Water and Sewerage Systems.
J. AWWA/ANSI Standard C550 for Protective Epoxy Interior Coatings for Valves and Hydrants.
K. AWWA/ANSI Standard C502 for Dry Barrel Fire Hydrants.
L. AWWA Standard C651 for Disinfecting Water Mains.
M. AWWA Standard C800 for Underground Service Line Valves and Fittings.
N. ASTM Standard Specification B88 for Seamless Copper Water Tube.
O. AWWA Standard C900 for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch.
P. AWWA Standard C905 for Polyvinyl Chloride (PVC) Pressure Pipe, 14-inch through 36-inch.
Q. AWWA Standard C901 for Polyethylene (PE) Pressure Pipe and Tubing, ½-inch through 3-inch.
R. AWWA Standard C906 for Polyethylene (HDPE) Pressure Pipe and Fittings, 4-inch through 54-inch
S. ASTM Standard Specifications 1248 and 3350 for PE3408 High Density Polyethylene (HDPE) Pressure Pipe, with a cell classification of 345434C.
T. ASTM Standard Specification D2241 for SDR21 (CL200) Polyvinyl Chloride (PVC) Pressure Pipe.
U. ASTM Standard Specification D1784 for SDR21 (CL200) Polyvinyl Chloride

(PVC) Resin Compound.

V. ASTM Standard Specification D1869 and F477 for SDR21 (CL200) Polyvinyl Chloride (PVC) Rubber Gaskets.

W. NSF standards for all materials used in the production of potable water pipe.

1.03 SUBMITTALS

A. The Permittee shall submit manufacturers' certified data for each pipe type to be used on the Project, including: dimensions, specifications of pipe material, gasket material, pipe class/pressure rating, coatings and linings.

B. The Permittee shall submit manufacturers' certified data for each type of fitting, valve, post indicator valve, hydrant, flushing hydrant, tapping sleeve, corporation and curb stop to be used on the Project, including: dimensions, specifications of fitting material, gasket material, class/pressure rating, coatings, linings, joint restraints and appurtenances.

1.04 QUALITY ASSURANCE

A. The Permittee shall be thoroughly trained and experienced in the skills and equipment required for installation and testing of water piping and appurtenances.

B. The Permittee shall protect water piping materials before, during and after installation. In the event of damage, the Permittee shall immediately make all repairs and replacements necessary to the approval of the Fire District and at no cost to the Fire District.

C. Upon direction of the Fire District, the Permittee shall remove, replace and/or rework all water piping that does not meet the requirements of this section. The Permittee shall perform all remedial measures at no cost to the Fire District.

D. Water System Pressure and Leakage Testing.

1. Brandon Fire District No 1 or its authorized representative shall witness all testing.
2. The maximum length of pipe to be pressure and leakage tested at one time shall not exceed 1,200 feet.
3. Temporary provisions (caps, plugs, valves, etc.) shall be provided and installed as necessary to allow sections of differing pipe types to be isolated and tested independently, due to differing testing methodologies.
4. Provisions shall be made to provide all necessary temporary, valves and piping to allow proper expulsion of air and connection of test equipment at no additional cost to the Fire District.
5. Flush all piping and exhaust all air from the test section prior to performing pressure and leakage testing.
6. Provide proper temporary or permanent (as applicable) thrust restraints for all system components.
7. Pneumatic (compressed air or gas) testing shall not be allowed, under any circumstances, due to the severe explosive risk danger.
8. Test equipment shall have pressure relief valves so that water system components are not over-pressurized.

9. The pressure and leakage test shall include all services and branch lines. The Permittee shall provide temporary "tails" as necessary to allow air to be bled from each service or branch to above grade. After the system has passed the necessary tests and prior to weather below freezing temperatures, the Permittee shall dig up each service, and as appropriate for the project, either connect the new service to the existing service, or turn off the curb stop and install a short stub of service piping out of the curb stop with a compression cap, minimum 5½ feet below grade.
10. The pressure and leakage tests shall be performed as a combined hydrostatic test with duration of two hours at 150% of the normal operating pressure in the piping at the lowest elevation or 200 psi, whichever is greater. The test pressure shall not exceed manufacturer's recommendations for any portion of the system.
11. No water system components within the test section will be accepted if the test pressure cannot be maintained within 5 psi of the required pressure for the entire test period. During the test period, the Permittee may repeatedly pump up the test section to maintain the test pressure within 5 psi of the required test pressure, however the total volume of water added shall be logged to compare against the allowable leakage defined below.
12. Leakage is defined as the quantity of water that must be supplied into the piping to maintain the test pressure after the pipe has been filled with water and the air expelled. The total volume of water added to bring the pressure back up to the test pressure shall be compared to the allowable leakage, even if the pressure drop is less than 5 psi during the test period.
13. No water system components within the test section shall be accepted if the leakage is greater than that determined by the formula:

    $L = (SD/P)/(133{,}200)$.

    L = the allowable leakage in gallons per hour
    S = the length of pipe being tested
    D = the nominal diameter of the pipe in inches
    P = the average test pressure in psi (gauge)
14. The test section must pass both the pressure test and the leakage test.
15. The Permittee shall make all repairs or replacements necessary to obtain passing test results, at no additional expense to the Fire District.

E. Water System Pressure and Leakage Testing (HDPE pipe only)

1. Brandon Fire District No 1 or its authorized representative shall witness all testing.
2. The maximum length of pipe to be pressure and leakage tested at one time shall not exceed 1,200 feet.
3. Temporary provisions (caps, plugs, valves, etc.) shall be provided and installed as necessary to allow sections of differing pipe types to be isolated and tested independently, due to differing testing methodologies.

4. Provisions shall be made to provide all necessary temporary, valves and piping to allow proper expulsion of air and connection of test equipment at no additional cost to the Fire District.
5. Flush all piping and exhaust all air from the test section prior to performing pressure and leakage testing.
6. Provide proper temporary or permanent (as applicable) thrust restraints for all system components.
7. Pneumatic (compressed air or gas) testing shall not be allowed, under any circumstances, due to the severe explosive risk danger.
8. Test equipment shall have pressure relief valves so that water system components are not over-pressurized.
9. The pressure and leakage test shall include all services and branch lines. The Permittee shall provide temporary "tails" as necessary to allow air to be bled from each service or branch to above grade. After the system has passed the necessary tests and prior to weather below freezing temperatures, the Permittee shall dig up each service, and as appropriate for the project, either connect the new service to the existing service, or turn off the curb stop and install a short stub of service piping out of the curb stop with a compression cap, minimum 5½ feet below grade.
10. The HDPE pipe hydrostatic leak test procedure consists of filling, an initial expansion phase, a test period, and depressurizing.
11. Fill the restrained test section completely with water.
12. Initial Expansion Phase – Gradually pressurize the test section to test pressure, and maintain test pressure for the three (3) hour expansion phase. During the initial expansion phase, polyethylene pipe will expand slightly. Additional water will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase,
13. Immediately following the initial expansion phase, monitor the amount of make-up water required to maintain within 5 psi of the required test pressure for the two (2) hour test period.
14. The pressure and leakage test shall be performed as a combined hydrostatic test with duration of two hours at 150% of the normal operating pressure in the piping at the lowest elevation. The test pressure shall not exceed manufacturer's recommendations for any portion of the system.
15. No water system components within the test section will be accepted if the test pressure cannot be maintained within 5 psi of the required pressure for the entire test period. During the test period, the Permittee may repeatedly pump up the test section to maintain the test pressure within 5 psi of the required test pressure, however the total volume of water added shall be logged to compare against the allowance for expansion under test pressure defined below.
16. The maximum test duration is eight (8) hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section. If the test is not completed due to

leakage, equipment failure, or for any other reason, depressurize the test section completely, and allow it to relax for at least eight (8) hours before pressurizing the test section again.

17. Leakage is defined as the quantity of water that must be supplied into the piping to maintain the test pressure after the pipe has been filled with water and the air expelled, after the expansion period. The total volume of water added to bring the pressure back up to the test pressure shall be compared to the allowance for expansion under test pressure, even if the pressure drop is less than 5 psi during the test period.
18. No water system components within the test section shall be accepted if the total volume of water added to bring the pressure back up to the test pressure is greater than allowance for expansion under test pressure determined from the table below:

Table of Allowance for Expansion Under Test Pressure (HDPE Pipe)

Nominal Pipe Size (in.)	2-Hour Test (Gal/100 ft. of pipe
2	0.11
3	0.15
4	0.25
6	0.60
8	1.0
10	1.0
12	2.3
14	2.7
16	3.3
18	4.3
20	5.5
22	7.0
24	8.9

19. The test section must pass both the pressure test and the leakage test.
20. The Permittee shall make all repairs or replacements necessary to obtain passing test results, at no additional expense to the Fire District.

F. Bacteriological Testing

1. After disinfection and final flushing, but before the water system components are activated, the first set of samples shall be taken from each sampling point on the new system. After 24 hours, the second set of samples shall be taken from each sampling point on the new system. The system shall <u>not</u> be flushed between the samples. Two consecutive samples, taken 24 hours apart, must be taken from each sampling point on the new system. Each sample shall be tested by an approved laboratory and determined to be absent of coliform bacteria. If one of the tests fails, the sequence shall be repeated until two (2)

consecutive passing tests are obtained from each sampling point.

2. There shall be one sampling point for every 1,200 feet of new water main, including one sampling point from each end of the main and a minimum of one sampling point from each branch.
3. Sample collection, delivery, preservation and holding times shall comply with the requirements of the laboratory, in accordance with Health Department and AWWA standards.
4. One sample shall be taken where the project involves building services only.
5. The Permittee is responsible for sample collection, delivery, analysis and all fees. If deemed necessary by the District, the Fire District shall be allowed to take custody and deliver samples to the laboratory.

PART 2.00 - PRODUCTS

2.01 WATER PIPING

A. Unless otherwise approved by Brandon Fire District No. 1, all water mains shall be Class 52 double cement lined ductile iron pipe. All water services shall be Type K copper tubing or Class 52 ductile iron pipe.

B. Ductile Iron (DI) Water Pipe meeting the referenced standards and the following requirements, as applicable:
   1. Pipe shall be Class 52, ductile iron O.D.
   2. Pipe shall be double cement mortar lined and seal coated.
   3. Pipe shall be coated on the outside with bituminous coating.
   4. Pipe joints shall be push-on bell and spigot type with rubber gaskets, where a different joint type is not indicated on the Drawings.
   5. Pipe Joints shall be Restrained Mechanical Joint (MJ) type with "Mega-Lug Series 1100"® mechanical joint restraint glands as manufactured by EBAA Iron Sales, Inc., "Uni-Flange Series 1400 Wedge Action" ® mechanical joint restraints glands as manufactured by Ford Meter Box co., "Tuf Grip" ®, mechanical joint restraints as manufactured by Tyler Union or approved equal, with T-bolts and rubber gaskets, where indicated on the Drawings.
   6. Pipe Joints shall be "Field Lock"® Gasket System restrained push-on bell and spigot joint type, as manufactured by U.S. Pipe & Foundry Co., equivalent product manufactured by Tyler Union, or approved equal, where indicated on the Drawings or in this Specification.
   7. Pipe shall be furnished in 18 to 20 foot laying lengths.
   8. Pipe shall be installed with two bronze conductivity wedges per joint for pipe diameters of 3 inches through 12 inches, and three bronze conductivity wedges for pipe diameters greater than 14 inches.
   9. Pipe shall be manufactured by Atlantic States Pipe Company, Clow, U.S. Pipe, Griffin, McWane Pipe Company, or approved equal.

C. HDPE C-906 Water Pipe shall meet reference standards and the following requirements, as applicable.
   1. Pipe shall be DR 9 (200 psi)
   2. Pipe shall be "Bluestripe AWWA" with the same outside diameter as

ductile iron pipe.
3. Pipe joints shall be butt fusion type.
4. Pipe shall be furnished in 40 foot laying lengths.
5. Pipe shall be manufactured by CSR Polypipe, Flying W, Driscopipe, or approved equal.

D. HDPE C-901 Tubing Pipe shall meet the reference standards and the following requirements, as applicable.
1. Pipe shall be rated for a working pressure of 200 psi.
2. Pipe shall be supplied in copper tubing size (CTS) outside diameter.
3. Pipe shall be furnished in coils.
4. Pipe joints shall be made with McDonald "McQuick Q Series", Mueller "110", or approved equal, compression fittings. Insert stiffeners are required for compression connections.

E. Copper Tubing Pipe shall meet the referenced standards and the following requirements, as applicable:
1. Tubing shall be soft tempered, Type "K", Copper.
2. Pipe shall be supplied in copper tubing size (CTS) outside diameter.
3. Pipe shall be furnished in coils.
4. Pipe joints shall be made with McDonald "McQuick Q Series", Mueller "110", or approved equal compression fittings.

F. Each pipe length shall be clearly marked with the manufacturer's name or trademark, nominal pipe size, material designation, pressure class, dimensional ratio (DR), quality control code and AWWA/ASTM designations.

G. Pipe Joint Restraints shall be furnished and installed for the required number of joints back from each fitting, as required by the drawings and details, regardless of the pipe material type.
1. For ductile iron pipe, Pipe Joint Restraints shall be "Field Lock Gasket System" ® restrained push-on type, as manufactured by U.S. Pipe & Foundry Co., equivalent product manufactured by Tyler Union, or approved equal.

2.02 FITTINGS

A. Ductile Iron fittings shall be Class 350 compact style with restrained mechanical joints with tee bolts as recommended by the manufacturer. Fittings, glands and gaskets shall be of appropriate style and size for the pipes being connected.

B. Fittings shall be double cement mortar lined and seal coated.

C. Fittings shall be coated on the outside with bituminous coating.

D. All mechanical joint fittings for DI and PVC pipe shall have "Mega-Lug"® mechanical joint restraints as manufactured by EBAA Iron Sales, Inc., "Uni-Flange Wedge Action" ® mechanical joint restraints as manufactured by Ford Meter Box Co., "Tuf Grip" ®, mechanical joint restraints as manufactured by Tyler Union, or approved equal, of the proper style for the pipe type being restrained.

E. All mechanical joint fittings for HDPE pipe shall be connected to the HDPE pipe with a butt fusion HDPE restrained mechanical joint adaptor of the

proper style for the pipe and fitting type being joined.

F. All mechanical joint fittings for only existing cast iron pipe shall have "Grip Ring"® mechanical joint restraints as manufactured by Romac Industries, Inc., equivalent product manufactured by Griffin Pipe, or approved equal, of the proper style for the pipe type being restrained.

G. All couplings shall be restrained mechanical joint solid sleeves with ductile iron long body and ductile iron glands. Sleeves, glands and gaskets shall be of appropriate style and size for the pipes being connected.

2.03 GATE VALVES

A. All Gate Valves shall be epoxy coated, resilient wedge type, with non-rising stem, Waterous model AFC 2500, Mueller 2360 Series, Kennedy Ken-Seal II, or approved equal, with restrained mechanical joints.

B. Valves shall be bubble tight, zero leakage at a minimum working pressure of 200 psi.

C. All gate valves shall be counterclockwise (left) open with a two-inch square operating nut. Opening directional arrow shall be cast into the valve body.

D. Gate Valves shall have stainless steel (304) nuts and bolts.

E. An operating rod extension shall be provided where the valve depth exceeds six feet.

F. Buried valves shall be equipped with an adjustable, flanged, 5¼ inch diameter, cast iron valve box with a flush cover marked "WATER". The box shall enclose the valve operating nut and stuffing box. Box length shall be adequate to allow a minimum of four inches of overlap of sections with top extended to final grade.

G. Regardless of any named manufacturer, all water main valves shall be "No-Lead". "No-Lead" shall mean that the gate valve shall have a weighted average lead content of less than 0.25%. In addition, all gate valves shall be in compliance with Vermont's Lead in Consumer Products Law "No-Lead" provisions of Act 193.

2.04 FIRE HYDRANTS

A. All Hydrants shall be Mueller Centurion Figure A-423 with two 2½ inch and one 4½ inch nozzles with National Standard Thread.

B. Hydrants shall open counterclockwise.

C. All hydrants shall drain, unless otherwise instructed by the Fire District.

D. Permittee shall provide hydrant assembly height appropriate for bury depth of main. Finish grade shall be within three inches of manufacturers recommended bury line.

E. Permittee shall provide and install all other components for a complete hydrant installation, including hydrant tee, gate valve, valve box, connecting pipe and retainers.

F. Hydrants shall have stainless steel nuts and bolts.

G. Hydrants shall be factory painted "Red" conforming with NFPA standards. Permittee shall apply one field finish coat of enamel paint, after hydrant installation. Before applying finish coat, Permittee shall properly clean and wire brush hydrant to remove all rust and dirt. Finish coat shall have a

minimum thickness of 2.5 mils. with no bare spots or dripping.

H. Permittee shall provide a hydrant flag assembly; Pollardwater.com No. P69111, with each hydrant.

2.05 FLUSHING/AIR RELEASE HYDRANTS

A. All Flushing Hydrants shall be MainGuard Model No. 77 with one 2½ inch nozzle with National Standard Thread and a 2-inch female iron pipe inlet. Flushing Hydrants shall open counterclockwise (left).

B. All flushing hydrants shall be full draining and manufactured as flushing hydrants. Flushing hydrants shall have cast iron risers with traffic breakaway flange with brass working parts. Flushing hydrants shall be factory painted "RED".

C. Permittee shall provide hydrant assembly height appropriate for bury depth of main. Finish grade shall be within three inches of manufacturer's recommended bury line.

D. Flushing Hydrants shall have stainless steel (304) nuts and bolts.

E. Flushing Hydrants shall be installed with isolation curb stop.

F. Flushing Hydrants shall be provided with a locking cover over the operating nut.

G. Flushing Hydrants shall be fully serviceable without excavating.

H. Flushing Hydrants shall be factory painted "Red" conforming with NFPA standards. Permittee shall apply one field finish coat of enamel paint, after hydrant installation. Before applying finish coat, Permittee shall properly clean and wire brush hydrant to remove all rust and dirt. Finish coat shall have a minimum thickness of 2.5 mils., with no bare spots or dripping.

2.06 POST INDICATOR VALVE ASSEMBLIES

A. Post Indicator Valve Assemblies (PIV) shall be listed by Underwriter's Laboratories (UL) and approved by Factory Mutual Research.

B. Post Indicator Valves shall open counterclockwise (left).

C. Gate Valves for PIV assemblies shall comply with section 2.03, and be compatible with the Post Indicator.

D. Permittee shall provide PIV assembly height appropriate for bury depth of valve. Finish grade shall be within one inch of manufacturer's recommended bury line.

E. Each PIV shall be provided with an operating handle and lock.

F. Indicator Posts shall be ductile iron, heavy pattern type and fully enclose all working parts from the weather and damage.

G. Indicator Posts shall have two large window openings fitted with heavy clear plexiglass or lexan. Aluminum target plates with the words "OPEN" and "SHUT" in large, raised letters shall be located directly behind each window in a position appropriate to the valve position.

H. Post Indicator Valves shall be factory painted "Red" conforming with NFPA standards. Permittee shall apply one field finish coat of enamel paint, after PIV installation. Before applying finish coat, Permittee shall properly clean and wire brush PIV to remove all rust and dirt. Finish coat shall have a minimum thickness of 2.5 mils., with no bare spots or dripping.

2.07 TAPPING SLEEVES

A. Tapping sleeve shall be suitable for direct taps on pressurized water mains.

B. Tapping sleeves shall be furnished with a test port, and shall be pressure tested by the tapping Contractor prior to backfill. The test shall be witnessed by the Fire District.

C. Tapping sleeves shall be:

1. Stainless steel, Model "3490MJ Power MJ" as manufactured by Powerseal Pipeline Products Corp., Romac Industries SST, or approved equal, with a mechanical joint gate valve that complies with Section 2.03.
    a. Stainless steel tapping sleeve shall have mechanical joint outlet. Stainless steel tapping sleeve with flanged outlet shall not be acceptable.
    b. Stainless steel tapping sleeve shall have end rings/shoulders to prevent lateral blowout of gasket.
    c. All materials of construction and hardware shall be stainless steel (304) construction.

2.08 CORPORATIONS

A. Corporations shall be open left, full flow, ball valve type as manufactured by McDonald, Mueller, Cambridge Brass, or approved equal.

B. Corporations shall have AWWA threads on the inlet and McDonald "McQuick Q Series", Mueller "110", or approved equal compression fitting on the outlet.

C. Services larger than 2-inch shall be installed utilizing an in-line tee (see Section 2.02 FITTINGS).

D. Corporations tapped into any pipe type other than ductile iron CL 52 shall utilize a service saddle with double stainless steel straps, of the appropriate style for the pipe type. Service saddles with U-bolt type straps are unacceptable.

E. Regardless of any named manufacturer, all corporations shall be No-Lead. No-Lead shall mean that the brass alloy used to manufacture the corporation shall have a lead level equal to or less than 0.1%. In addition, all corporations shall be in compliance with NSF-61, Section 8.

2.09 CURB STOPS

A. Curb stops shall be open left, full flow, ball valve type as manufactured by McDonald, Mueller, Cambridge Brass, or approved equal.

B. Corporations shall have McDonald "McQuick Q Series", Mueller "110", or approved equal compression fittings on the inlet and outlet.

C. Services larger than 2-inch shall utilize gate valves (see Section 2.03 GATE VALVES).

D. Curb Stops shall be equipped with a sliding adjustable, cast iron curb box with a two-hole cover or Mueller pentagon plug type marked "WATER". Where box is located in paved or concrete areas, cover shall be pentagon plug type. The box shall be arch-type so as to enclose the curb stop and rest on a

concrete base pad and not transfer force to the service or curb stop. Boxes for curb stops larger than 1 inch shall have a heavy foot piece. Box length shall be adequate to allow a minimum of four inches of overlap of sections with top extended to final grade.

E. A 30-inch stainless steel stationary operating rod shall be affixed to the key of the curb stop with a stainless steel cotter pin.

F. Regardless of any named manufacturer, all curb stops shall be No-Lead. No-Lead shall mean that the brass alloy used to manufacture the corporation shall have a lead level equal to or less than 0.1%. In addition, all corporations shall be in compliance with NSF-61, Section 8.

2.10 UTILITY TRACER WIRE AND ACCESSORIES

A. Tracer wire shall be #12 AWG, steel core soft drawn wire with a blue 30-mil high molecular weight, high density polyethylene jacket with a tensile strength of 380 lbs. (for direct burial applications) or 1,150 lbs. (for directionally drilled applications) as manufactured by Copperhead Industries, Inc., equivalent product manufactured by Performance Wire and Cable, or approved equal.

B. The wire jacket shall read: “12 AWG – SOLID TRACER WIRE – 30-MIL HDPE – 30 VOLT” or “12 AWG – SOLID HORIZONTAL DIRECTIONAL DRILL TRACER WIRE – 45-MIL HDPE – 30 VOLT”, as applicable, at a minimum of every two linear feet.

C. Tracer wire connections shall be “DryConn” Direct Bury Lugs as manufactured by Copperhead Industries, Inc., equivalent product manufactured by Performance Wire and Cable, or approved equal.

D. Tracer wire access boxes shall be Valvco, Inc. Figure TWAB, equivalent product manufactured by Tyler Union, or approved equal. Tracer wire access boxes shall be spaced a maximum distance of 500 linear feet apart.

2.11 PRODUCT STORAGE AND HANDLING

A. Handle and transport pipe and fittings to insure they are in sound, undamaged condition and to prevent damage to coating and lining, in accordance with manufacturer’s instructions.

B. Furnish slings, straps and other devices to support pipe and fittings when lifted. Do not drop or drag pipe or fittings from trucks onto the ground or into the trench.

C. Examine all pipe and fittings before installing. Defective or damaged materials shall be rejected.

D. Pipe or fittings with damaged coatings and/or linings shall be rejected.

E. Cracked or chipped pipe or fittings shall be rejected.

F. If defective pipe or fittings are discovered after installation, the Permittee shall remove and replace the defective piece(s) at no cost to the Fire District.

PART 3.00 - EXECUTION

3.01 GENERAL

A. Refer to Section 02300 for excavating, bedding, envelope, backfilling and

compaction requirements.

B. When cutting of pipe is required, the cutting shall be done with power saws. Cut ends shall be smooth and at right angles to the pipe. Cut pipe ends shall be beveled and de-burred on interior and exterior.

3.02 INSTALLATION

A. Water mains, building services, and appurtenances shall be installed according to the approved Drawings.

B. Pipe shall be laid accurately to the lines and grades indicated on the approved Drawings.

C. Pipe shall be fully supported along its length. "Point contact" at fittings, joints or along the pipe length is not allowed.

D. All field cut pipe ends shall be chamfered to avoid damage to the gasket and facilitate assembly.

E. Push-on bell and spigot type joints shall be assembled per the manufacturer's recommendations.

F. Deflection of push-on joint pipe shall not exceed manufacturer's recommended limits.

G. Restrained Mechanical Joints shall be assembled per the manufacturer's recommendations.

H. Butt fusion joints shall be assembled per the manufacturer's recommendations.

I. Install two or three (depending on pipe diameter) bronze conductivity wedges, installed at "3-o'clock, 9-o'clock and 12-o'clock", per manufacturer's recommendations at all ductile iron pipe joints.

J. All fittings shall be adequately supported to prevent undo strain on the pipe, fittings, gaskets and bolts.

K. All hydrants, valves and curb stops shall be set plumb and in compliance with the Drawings.

L. Valve and curb boxes shall be installed plumb with the covers level with final grades.

M. Restrained Pipe Joints shall be installed for the required number of joints back from each fitting, as required by the Drawings and details. Plant batched, poured in place, concrete thrust blocks shall be provided at all directional changes of the main, when restrained pipe joints cannot be used (i.e. connections to existing systems) in compliance with the Drawings. Thrust Blocks shall not be backfilled within ½ hour of being poured to allow sufficient time for setting of the concrete. Onsite mixed concrete, such as "Sakrete", is <u>not</u> acceptable.

N. When pipe laying is not in progress, the open ends of the pipe shall be closed with a water tight plug.

O. Where water mains or building services cross within two feet of drainage pipe or site conditions do not allow the minimum 52 foot cover, the Permittee shall install two inches thick, two foot wide, of rigid insulation, suitable for direct burial, for frost protection.

P. Cover of less than 5½ feet, shall be approved by the Fire District prior to pipe installation. Under no circumstances shall water mains or building services

have less than four feet of cover over the top of the pipe. Insulation shall be installed six inches above the pipe on compacted envelope material with care taken to not damage the sheets during trench backfill and compaction.

Q. Where water mains or building services are required to cross wastewater piping, the installation shall comply with the following requirements:
   1. Water and sewer pipes shall have a minimum vertical clearance of 18 inches.
   2. Water and sewer pipe joints shall be located as far apart as possible.
   3. The Permittee shall provide structural support for exposed water and sewer lines.

R. The minimum horizontal clearance between water and sanitary sewer piping is 10 feet, and the minimum horizontal clearance to storm sewers is 5 feet.

S. In the event that the minimum vertical or horizontal clearances between water and sewer piping cannot be maintained, the sewer piping must be upgraded and tested to water pipe standards.

3.03 FLUSHING

A. All Water Piping shall be flushed at a minimum velocity of 2.5 feet per second. All pipes shall be flushed prior to Leakage and Pressure Testing, Disinfection and Bacteriological Testing.

B. Care shall be taken to protect property from erosion or other damage during flushing operations.

C. The flushing operation shall include all services. The Permittee shall provide temporary "tails" as necessary to flush through each service to above grade. After the system has passed the necessary tests and prior to weather below freezing temperatures, the Permittee shall dig up each service, and as appropriate for the project, either connect the new service to the existing service, or turn off the curb stop and install a short stub of service piping out of the curb stop with a compression cap, minimum of 5½ feet below grade.

3.04 DISINFECTION

A. At a point not more than ten feet downstream from the beginning of a new main, water entering the main shall be dosed with chlorine, fed at a constant rate, such that the entire volume of water will have a concentration of not less than 25 mg/l free chlorine. Chlorine levels shall be confirmed with a test kit, however, the following table is provided as a general guide to estimate the volume of chlorine required.

PIPE SIZE (IN.)	1% CHLORINE SOLUTION (GAL.)
4	0.16
6	0.36
8	0.65
12	1.44

Chlorine required to produce 25 mg/l concentration in 100 feet of pipe, by pipe diameter.

B. Disinfection operations shall not cease until the entire main is filled with heavily chlorinated water.

C. The disinfection operation shall include all services. The Permittee shall provide temporary "tails" as necessary to disinfect each service to above grade. After the system has passed the necessary tests and prior to weather below freezing temperatures, the Permittee shall dig up each service, and as appropriate for the project, either connect the new service to the existing service, or turn off the curb stop and install a short stub of service piping out of the curb stop with a compression cap, minimum of 5½ feet below grade.

D. The Chlorinated water shall be retained for a minimum of 24 hours, during which all curb stops, valves and hydrants in the treated section shall be operated to ensure disinfection of appurtenances. The water in all portions of the main shall have a minimum residual of 10 mg/l of free chlorine after 24 hours.

E. The Permittee shall prevent the introduction of heavily chlorinated water into any active portions of the water distribution system.

F. At the end of the 24 hour period, the main shall be flushed with water from the distribution system until the discharge chlorine concentration is equal to that of the system or 1 mg/l free chlorine.

G. The Permittee shall comply with all laws relevant to the discharge of chlorinated water. Water discharged directly or indirectly to water bodies shall not have a chlorine level greater than 0.1 ppm. Water bodies shall include all rivers, streams, creeks, brooks, reservoirs, ponds, lakes, springs, wetlands, and any body of surface water, artificial or natural.

H. The Permittee shall supply all necessary de-chlorination equipment, materials, chemicals and labor necessary to reduce the chlorine level prior to discharge.

I. Any required permits for the discharge of chlorinated water (local or State), are the responsibility of the Permittee.

END OF SECTION 02510

SECTION 02511 - BITUMINOUS CONCRETE PAVEMENT

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. Bituminous concrete pavement for roadways, parking areas, driveways, aprons, sidewalks, pathways, curbs, overlays, replacement of disturbed pavement and associated preparatory work.

B. Painted and durable pavement lines and markings.

1.02 REFERENCE STANDARDS

A. Where referenced, the Permittee shall adhere to the latest version of the State of Vermont Agency of Transportation (VTrans), "Standard Specifications for Construction".

B. Manual of Uniform Traffic Control (MUTCD), latest version, published by U.S. DOT FHWA, ATSSA, AASHTO, ITE.

1.03 SUBMITTALS

A. The Permittee shall submit separate project mix designs according to the reference standards for each pavement type to be used on the project, including all calculations, data and information necessary for mix evaluation, placement review and testing. The Permittee shall secure the Fire District's review for the mix design a minimum of 72 hours prior to the start of paving operations.

B. The Permittee shall submit manufacturer's data and secure the Fire District's review for asphalt cement tack coat, overlay fabric, pavement paint, durable markings, and all other necessary materials prior to the start of paving operations.

C. Where an imprinted surface treatment is indicated on the plans, the Permittee shall submit the name and address of the authorized applicator, copy of the proposed pattern, manufacturer's name and complete data for any proposed admixtures and surfacing materials, including a color chart for the Fire District's selection.

1.04 QUALITY ASSURANCE

A. The Permittee's Contractor shall be thoroughly trained and experienced in the skills and equipment required for placement and finishing of bituminous concrete pavement.

B. The Permittee's Contractor shall protect bituminous concrete pavement materials before, during and after installation. In the event of damage, the Permittee shall immediately make all repairs and replacements necessary to the approval of the Fire District and at no cost to the Fire District.

C. Testing to verify density of the compacted pavement shall be done with a nuclear density gauge according to the reference standards. Minimum density of the compacted pavement shall be as indicated in Section 406 of the reference standard.

D. The Permittee's Contractor shall keep a record at the project site showing

time and location of each segment of pavement placed, together with mix delivery slips certifying the contents of each load of pavement. One copy of all such records shall be furnished to the Fire District.

E. The surface may be tested by the Fire District using a 16 foot straight edge at selected locations parallel with the centerline. Any variations exceeding 3/16 of an inch between any two contacts shall be satisfactorily eliminated. A ten foot straight edge may be used on a vertical curve. On parking surfaces or other paved areas that have no crown, the surface shall be tested parallel to the drainage slope of the area. Under no circumstances shall standing water or puddling be allowed.

F. Compacted pavement thickness shall be within ⅛ inch of the thickness specified.

G. Finish surfaces of pavement shall be smooth, uniform, and free of voids, cracks, holes, loose or contaminated areas or other irregularities.

H. Upon direction of the Fire District, the Permittee shall cut out and/or rework all surfaces which do not meet the requirements of this Section. The Permittee shall perform all remedial measures at no cost to the Fire District.

PART 2.00 - PRODUCTS

2.01 MATERIALS

A. Aggregate for bituminous concrete pavement shall conform to Section 704.10 of the referenced standard.

B. Asphalt cement for bituminous concrete pavement shall be performance grade PG58-28 and shall conform to Section 702 of the referenced standard.

C. Bituminous concrete pavement shall be of the thickness and type indicated on the approved Drawings or required by the Fire District. The materials shall be combined and graded to meet the compositions of Section 406 of the referenced standard, for heavy duty bituminous concrete pavement, 75 blows per side.

D. Asphalt cement tack coat shall be emulsified asphalt type RS-1 conforming to Section 702 of the referenced standard.

E. Bituminous joint sealer shall conform with Section 707.04 of the referenced standard.

F. Pavement overlay fabric shall be Mirafi® “Mirapave 400" non-woven geotextile, or equal.

G. Pavement paint shall conform with Section 708.08 of the referenced standard, of the color indicated on the Drawings.

H. Durable pavement markings shall conform with Section 708.10 and Section 646 of the referenced standard, of the color, type and size indicated on the Drawings.

PART 3.00 - EXECUTION

3.01 PREPARATION

A. The existing pavement surface shall be cleaned with power brooms and washers as necessary to allow proper adhesion of the tack coat and

bituminous concrete pavement. All loose pieces, objects and debris shall be removed.

B. Any cracks larger than ¼ inch in an existing surface shall be thoroughly cleaned and filled with bituminous joint sealer, to the full depth of the existing pavement, in accordance with Section 417 of the reference standard.

C. The existing bituminous concrete pavement shall be sprayed with emulsified asphalt tack coat before placement of the bituminous concrete pavement. Tack coat is required for all overlays and before placement of the top course when the top course is not immediately placed over the base course.

D. The tack coat shall be applied under pressure at the rate of 0.01 to 0.03 gallons per square yard. The application shall be made just prior to the placement of the bituminous concrete pavement, but shall progress sufficiently ahead of the paving so that the surface to be paved will be tacky.

E. Contact surfaces such as curbing, gutters, manhole and catch basin rims shall be painted with a thin, uniform coat of emulsified asphalt immediately before the bituminous concrete pavement is placed against them. Precautions must be taken to protect non-contact surfaces from excess emulsion.

F. Where bituminous concrete is used to resurface existing pavement and the existing pavement contains irregularities, depressions or waves, such deficiencies shall be eliminated by the use of a bituminous concrete shim course(s) of appropriate mix for leveling to bring the existing base to uniform section and grade before placing of the required courses of bituminous concrete.

G. Where pavement has been removed for trenching, the Permittee's Contractor shall cleanly cut existing pavement back with a pavement saw in a straight line, a minimum of one foot from the top edge of the trench. Cut must be made such that remaining existing pavement is competent and sound. Cut edge of pavement shall be coated with a uniform coat of emulsified asphalt immediately before the bituminous concrete pavement is placed against it.

H. Where a pavement overlay is required, grinding of the existing pavement is required at the termination of the overlay. Grinding shall be done with proper equipment necessary for grinding the full width of the pavement being overlaid. Depth and length of taper shall be determined by the thickness of the overlay. Minimum depth of grind at termination end shall be equal to the thickness of the pavement overlay to be placed. The grind shall taper at a slope of one inch in twenty five feet, so that the top of the grinding is flush with the existing pavement at the appropriate distance away from the pavement overlay termination. The entire area ground shall be sprayed with emulsified asphalt tack coat before placement of the bituminous concrete pavement overlay.

I. Where pavement overlay fabric is indicated on the Drawings, sufficient tack coat shall be used to allow saturation of the overlay fabric, while bonding with the existing pavement. Tack coat shall not be of such quantity that pools or puddles form. Install the overlay fabric with the heatset side up, without folds or wrinkles. Immediately following the fabric laydown, place the hot pavement. Only lay out fabric which can be immediately covered.

3.02 EQUIPMENT

A. Equipment for spreading and finishing the bituminous concrete pavement shall be a self propelled paving machine provided with an articulated and heated screed. The machine shall be capable of maintaining line, grade and minimum thickness specified and spreading the pavement without segregation.

B. When irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the pavement shall be spread, raked and finished with hand tools.

C. Equipment for compacting shall be steel tired power rollers having a minimum weight of ten tons, except that hand held vibratory compactors may be used in areas not accessible to rollers when specifically approved by the Fire District. Rollers shall be equipped with tanks and sprinkler bars for wetting the rollers.

3.03 WEATHER AND SITE CONDITIONS

A. Bituminous concrete pavement shall not be placed between November 1 and May 1, unless approval is obtained from the Fire District.

B. Bituminous concrete pavement shall not be placed when the air temperature at the paving site in the shade and away from artificial heat is below 40°F.

C. Bituminous concrete pavement shall not be placed on a wet, frozen or thawing surface or when weather or other conditions would prevent the proper handling, finishing or compacting of the material.

D. No material shall be delivered so late in the day as to prohibit the completion of spreading and compaction of the pavement during daylight hours.

3.04 PLACEMENT

A. The bituminous pavement, at the time of discharge from the haul vehicle, shall be within 10°F of the midpoint of the compaction temperature for the approved mix design. In no instance shall the temperature of the pavement be less than 275°F or more than 325°F.

B. The bituminous concrete pavement shall be placed and finished with the specified equipment and struck off in a uniform layer to the full width required and of such depth that each course, when compacted, shall have the required thickness and shall conform to the grade and elevation specified.

C. Any pavement which becomes loose, broken or contaminated shall be removed and replaced with fresh pavement and properly compacted and blended with the surrounding pavement. Any area showing an excess or deficiency of asphalt shall be removed and replaced. These corrections shall be done at no expense to the Fire District.

D. Suitable aprons to transition approaches shall be placed at side road and driveway intersections.

3.05 ROLLING AND COMPACTING

A. Immediately after the bituminous concrete pavement has been spread, struck off and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.

B. The surface shall be rolled when the pavement is in the proper condition and temperature, and when the rolling does not cause cracking or shoving.

C. Unless otherwise directed, the longitudinal joint shall be rolled first and then rolling shall begin at the low side of the pavement and proceed towards the center or high side with lapped rollings parallel to the centerline. The speed of the roller shall be slow and uniform to avoid displacement of the pavement. The roller should be kept in as continuous operation as practical. Rolling shall continue until all roller marks and ridges have been eliminated. Stopping or sharp turning of the roller on the fresh pavement is not permitted.

D. Traffic shall not be allowed on freshly placed pavement until it has been compacted and cooled to 140°F.

3.06 JOINTING

A. Unless otherwise noted by the Fire District or on the drawings, transverse joints in pavement shall be butt type.

B. Butt joints shall be formed by ending the new pavement in a vertical plane at right angles to the centerline. The butt joint shall be thoroughly coated with emulsified asphalt just prior to butting the adjacent course of pavement.

C. When directed by the Fire District, tapered joints shall be formed by ramping down the last 18 to 24 inches of the course being laid to match the lower surface. Care shall be taken in raking out and discarding the coarser aggregate at the low end of the taper, and in rolling the taper. The taper shall be thoroughly coated with emulsified asphalt just prior to resumption of paving.

D. Longitudinal joints that have become cold and joints between successive work days shall be coated with emulsified asphalt before the adjacent pavement is placed. If directed by the Fire District, they shall be cut back to a clean vertical edge prior to painting with emulsion.

E. Unless otherwise directed by the Fire District, longitudinal joints shall be offset at least six inches from any joint in the lower courses of pavement. Transverse joints shall not be constructed nearer than one foot from the transverse joints constructed in lower courses.

F. Utility covers shall be flush with the surface of the finish course. When finish coarse paving will not be completed within seven days of placement of the base course, the Permittee's Contractor shall leave the covers flush with the base coarse and raise them at the time of finish coarse paving at no cost to the Fire District. The base course of pavement shall be patched after raising the covers, prior to placing the finish course of pavement. If the utility covers need to be left higher than the base course, for less than seven days, the Permittee shall provide all necessary traffic control and barricades to protect the utility covers and the public.

3.07 PAVEMENT MARKINGS

A. The Permittee shall thoroughly clean the areas upon which painting or durable markings will be placed.

B. All painting and durable markings shall be accurately placed as indicated on

the Drawings.

C. The Permittee shall apply paint and durable markings in accordance with the manufacturer's recommendations and referenced standards, using all means necessary to protect paint and durable markings until cured.

D. Where removal of pavement markings are shown on the Drawings, grinding of the existing pavement is required. Grinding shall be done with proper equipment necessary for grinding the full width of the marking being removed. Depth shall be determined by the thickness of the marking and its penetration into the pavement. Maximum depth of grind shall be 1/8". The grind shall taper so that the top of the grinding is flush with the existing pavement approximately one foot away from the marking limits.

END OF SECTION 02511

SECTION 02930 - LAWNS AND GRASSES

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. Preparation, furnishing and installing topsoil, fertilizer, seed and mulch.
B. Maintenance of lawns and grasses.

1.02 SUBMITTALS

A. The Permittee shall submit seed mix compositions and analysis for each seed mix type to be used on the project. Each seed mix shall indicate percentage and germination of each seed type in the mixture. Purity and weed seed content of the mixture shall be indicated.
B. The Permittee shall submit the location of source, analysis and sample of off-site topsoil, as required by the Fire District.

1.03 QUALITY ASSURANCE

A. The Permittee's Contractor shall be thoroughly trained and experienced in the skills and equipment required for the work included.
B. The Permittee shall protect lawn and grass areas and materials before, during and after installation. In the event of damage, the Permittee shall immediately make all repairs and replacements necessary to the approval of the Fire District and at no cost to the Fire District.
C. Upon direction of the Fire District, the Permittee shall remove and/or rework all lawn and grass areas that do not meet the requirements of this Section. The Permittee shall perform all remedial measures at no cost to the Fire District.
D. Lawn and grass areas shall have a healthy, uniform growth upon completion, with no weeds, bare spots, rocks, clumps, or standing water.

PART 2.00 - PRODUCTS

2.01 MATERIALS

A. Topsoil shall be fertile, natural soil, typical of the locality, unfrozen, friable clay loam. It shall be free from clay lumps, stones, roots, sticks, stumps, peat, weeds, sod, brush, noxious seeds, or foreign materials.
    1. Topsoil shall have a pH range of 6 to 8
    2. Topsoil shall not contain toxic material harmful to plant growth.
    3. Topsoil shall be removed and stockpiled from the disturbed areas. In the event the topsoil removed during excavation is unsatisfactory or insufficient to obtain the required finished grades, the Permittee shall furnish the required quantity of satisfactory topsoil from approved off-site sources at no expense to the Fire District.
    4. Under no circumstances may the Permittee remove topsoil from the work area of this project for use elsewhere.
B. Fertilizer shall be a standard commercial grade prepared and packaged material containing a minimum of 10 percent nitrogen, 10 percent

phosphoric acid and 10 percent potash. Fertilizer shall comply with local, state and federal laws.

1. Fertilizer shall be delivered in the original, unopened containers, each showing the manufacturer's guaranteed analysis. It shall be stored so that when used it is dry and free-flowing.

C. Seed mixtures shall be of commercial stock of the current or previous season's crop and shall be delivered in unopened containers bearing the dealer's guaranteed analysis. Seed shall be stored in a dry, protected place.

1. Urban mix grass seed meeting the following mixture shall be used for finished lawns, public street grass areas and any other maintained grass areas.

Type of Seed	Percentage by
Creeping Red Fescue	35%
Kentucky Bluegrass	35%
Pennfine or Manhattan Perennial Rye	30%

2. Conservation mix grass seed meeting the following gradation shall be used for all other grass areas where urban mix is not used.

Type of Seed	Percentage by Weight
Creeping Red Fescue	35.0%
Kentucky Bluegrass	23.0%
Annual Rye	15.0%
Pennfine or Manhattan Perennial Rye	11.0%
White Clover	6.0%
Highland Bent Grass	10.0%

3. Wildflower mix seed shall be "Northeast Mix" by American Meadows, Vermont Wildflower Farm, or approved equal.

D. Hay mulch shall consist of mowed and properly cured stalks of oats, wheat, rye or other approved crops free from weeds, swamp grass, twigs, debris, rot, mold or other deleterious material. Wildflower seed shall not be mulched with hay, a light straw mulch shall be used if recommended by seed supplier.

E. Water shall be furnished by the Permittee which is suitable for irrigation and free from ingredients harmful to plant life. Hose and any watering equipment required shall be furnished by the Permittee.

PART 3.00 - EXECUTION

3.01 PREPARATION

A. Seeding shall only be done when weather and season will allow proper germination.

B. Areas to receive topsoil shall be graded to a depth of not less than four inches below the finished grade. If the existing depth of topsoil prior to construction was greater than four inches, the topsoil shall be replaced not less than the greater depth.

C. Remove all debris, sticks, roots, stones and inorganic material and rake subgrade prior to placing topsoil. Topsoil shall not be placed on frozen or muddy subgrade.

3.02 INSTALLATION - GRASS

A. Specified topsoil shall be spread and lightly compacted on the prepared subgrade to the depth required.

B. Uniformly spread the fertilizer at a rate of 20 pounds per 1,000 square feet and immediately mix with the upper two inches of topsoil.

C. Immediately following this preparation, uniformly apply the seed at a rate of 5 pounds per 1,000 square feet.

D. Lightly rake the seed into the surface. Lightly roll the surface and water with a fine spray.

E. Promptly thereafter or within 24 hours after the seeding, lightly and uniformly mulch the area at a rate of 90 pounds per 1,000 square feet. Mechanical or hand spreaders may be used. Excessive amounts or bunching of mulch will not be accepted.

F. Mulch shall be anchored by an acceptable method.

G. Unless otherwise specified, mulch shall be left in place and allowed to disintegrate. Any anchorage or mulch that has not disintegrated at time of first mowing shall be removed.

H. Seeded areas shall be watered as often as required to obtain germination and to obtain and maintain a satisfactory sod growth. Watering shall be done in a manner to prevent washing out of seed or mulch.

I. All lawn and grass areas shall drain properly. Under no circumstances will standing water or puddling be allowed.

J. Hydroseeding may be accepted as an alternative method of applying fertilizer, seed and mulch, upon approval of the Fire District.

3.03 INSTALLATION – WILDFLOWER SEED

A. Soil preparation and sowing shall exactly follow published instructions by seed supplier. Application rate shall be 1 pound per 1000 square feet.

B. Seed must be rolled in. If mulch is recommended to preserve moisture or control erosion, only straw mulch shall be used.

3.04 MAINTENANCE AND PROTECTION

A. Permittee shall mow all lawn areas before the new grass reaches a height of three inches. Not more than a of the grass leaf shall be removed by the initial or subsequent cuttings. Permittee shall maintain and mow all lawn areas until Substantial Completion of the Project.

B. The Permittee shall be responsible for protecting and caring for seeded areas until final acceptance of the work. The Permittee shall repair and replace, at no expense to the Fire District, all areas where seed has failed to germinate, or any areas damaged by erosion, weeds, pedestrian or vehicular traffic or other causes.

END OF SECTION 02930

SECTION 03301 - CURB AND SIDEWALK

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. Cast-in-place concrete curb, sidewalk and ramps.
B. Granite curb.
C. Detectable Warning Surface (Truncated Domes)

1.02 REFERENCE STANDARDS

A. Where referenced, the Permittee shall adhere to the latest version of the State of Vermont Agency of Transportation (VTrans), "Standard Specifications for Construction."

1.03 SUBMITTALS

A. The Permittee shall submit separate project mix criteria according to the reference standards for each concrete type to be used on the project, including all calculations, data and information necessary for mix evaluations and placement review and testing. The Permittee shall secure the Fire District's approval for the mix design a minimum of 48 hours prior to the start of concrete placement.
B. The Permittee shall submit manufacturers' data and secure the Fire District's approval for fiber reinforcement, admixtures, curing and sealing compound, exposed aggregate/surface treatment retardant compound and all other necessary materials before the start of concrete placement.
C. The Permittee shall submit the name and address of quarry and supplier of granite. If required by the Fire District, a granite sample shall also be supplied.
D. The Permittee shall submit manufacturers' data and secure the Fire District's approval for truncated domes before the start of concrete placement.

1.04 QUALITY ASSURANCE

A. The Permittee shall be thoroughly trained and experienced in the skills and equipment required for placement and finishing of curb and sidewalk.
B. The Permittee's Contractor shall protect curb and sidewalk materials before, during and after installation. In the event of damage, the Permittee shall immediately make all repairs and replacements necessary to the approval of the Fire District and at no cost to the Fire District.
C. Testing to verify air content and slump of concrete being placed shall be done at the time of placement, at the Fire District's discretion.
D. Cylinder samples for concrete strength testing shall be taken at the time of placement, at the Fire District's discretion.
E. The Permittee shall keep a record at the project site showing time and location of each segment of concrete placed, together with mix delivery slips certifying the contents of each load of concrete. One copy of all such records shall be furnished to the Fire District.
F. Upon direction of the Fire District, the Permittee shall cut out and replace all

curb and sidewalk that do not meet the requirements of this Section. The Permittee shall perform all remedial measures at no cost to the Fire District.

PART 2.00 - PRODUCTS

2.01 MATERIALS

A. Concrete shall have a minimum compressive strength of 4,000 psi at 28 days, unless otherwise specified, and shall meet all other requirements for Class A Concrete in the referenced standard, unless revised below.
   1. Air entrainment shall be between six and eight percent (6%-8%).
   2. Maximum Water-Cement ratio shall be 0.45.
   3. Min. Cement Factor (Sacks/C.Y.) shall be 7.0.
   4. Maximum Slump shall be 4-inches.

B. Concrete curbs and sidewalks shall have Grace Construction Products "MicroFiber" ™ reinforcement admixture, or equal.
   1. Fibers shall be ¾-inch polypropylene, maximum 3 denier, complying with ASTM C1116, Type III, Par. 4.1.3.
   2. Fibers shall be added at the concrete batch plant to ensure proper mixing. Mix in truck for a minimum of 20 minutes after fiber addition.
   3. Fiber application rate shall be one pound per cubic yard of concrete, resulting in not less than 50 million individual fibers per pound.

C. Portland Cement shall be ASTM C150, Type II unless otherwise specified. Use of air-entraining or other types of cements is prohibited without the prior acceptance of Fire District. Use only one brand of cement. Color variations which prejudice the appearance of exposed concrete are deemed unacceptable

D. Fine Aggregate for concrete shall meet ASTM C33.

E. Coarse Aggregate for concrete shall meet ASTM C33, ¾" maximum size.

F. Concrete Admixtures
   1. Air Entraining admixture shall be "Darex AEA", by W.R. Grace, "Pozzolith MB-VR" by Master Builders, or approved equal. Use of air entraining cement is prohibited. Add air entraining admixtures to all concrete which will remain exposed to freezing and thawing.
   2. Water Reducing Retarder shall meet ASTM C-494, "Plastiment" by Sika Chemical Corporation, "Pozzolith 322N" by Master Builders, or approved equal. Quantity of retarder to be added per sack of cement shall be as recommended by the approved manufacturer for general use and as required to suit actual ambient or mix temperatures.
   3. Water Reducing admixture shall be "WRDA with Hycol" by W.R. Grace, "Pozzolith 110N" by Master Builders or approved equal.
   4. No other admixtures are permitted without the prior review of the Fire District.
   5. Admixtures shall be compatible with one another and with aggregates, cement, finishing materials, and other materials which may be affected thereby.
   6. Chloride based accelerators shall not be permitted.

G. Mixing water shall be fresh, clean and potable. Should Fire District question the suitability of the water, Permittee shall have it tested in accordance with AASHTO T-26.

H. Curing and sealing compound shall be AKure-N-Seal@7 as manufactured by Sonneborn, or equal.

I. Exposed aggregate/surface retardant compound shall be ARugasol-S@7 as manufactured by Sika Corporation, or equal.

J. Expansion joint material shall be preformed type with vegetable fibres, mineral fillers and two asphalt-saturated felt liners, complying with ASTM D994, with a minimum thickness of 2 inch. Depth of expansion joint shall be the thickness of the concrete minus ¼-inch. Expansion joints shall be provided at all joints between building slabs and foundations, joints in sidewalks, driveways, curbs, steps, and at other locations shown on the approved Drawings.

K. Detectable Warning Surface (Truncated Domes) shall be a pattern of truncated domes that meets the dimensional and spacing requirements of the Americans with Disabilities Act (ADA) Accessibility Guidelines.

1. Detectable warning surfaces shall be provided on sidewalk ramps at locations shown on the Drawings.
2. Truncated domes shall be a part of either a precast tile/paver, semi-rigid composite sheet or surface applied product. Stamping or imprinting systems shall not be accepted.
3. The Detectable warning surface material shall have a homogeneous color throughout, that contrasts with the surrounding material. The color shall be “Dark Green”, color chip number 14090, conforming to Federal Standard No. 59B
4. The Detectable warning surface shall be one of the products on the “Approved Products List” on file with the VTrans Materials and Research Section, telephone number 802-828-2561.

L. Granite Curb shall consist of hard, durable, quarried granite. It shall be gray in color, free from seams, cracks or structural defects and shall be of a smooth splitting character. The curb may have natural color variations that are characteristic of the granite source.

1. The individual curb stones shall be of the dimensions indicated on the Drawings and shall be of uniform thickness in any continuous run. The individual curb stones shall be furnished in minimum lengths of 6 feet, unless otherwise specified.
2. The top surface of the curb stones shall be sawed to an approximately true plane and shall have no projection or depression greater than ⅛ inch. The bottom surface may be sawn or split.
3. The top front arris line shall be rounded as indicated on the Drawings. The exposed arris line shall be pitched straight and true, with no variations from a straight line greater than ⅛ inch.
4. The front face shall be at right angles to the plane at the top and shall be smooth quarry split. Drill holes in the exposed part of the face shall not be permitted. The front face shall have no projections greater than one inch or depressions greater than ½ inch, measured from the

vertical plane of the face through the top arris line for a distance of eight inches down from the top. For the remaining distance, there shall be no projections or depressions greater than one inch measured in the same manner.

5. The back surface of the curb stones shall have no projection for a distance of three inches down from the top which would fall outside of a plane having a batter of one horizontal to three vertical from the back arris line.
6. The ends of all curb stones shall be square with the planes of the top and front face and so finished that when the stones are placed end to end as closely as possible, no space more than one inch shall show in the joint for the full width of the top or down on the face for eight inches. The remainder of the end may break back not over six inches from the plane of the joint.

M. Mortar between Granite Curb sections shall be Type I, conforming to Section 707.01 of the referenced standard.

PART 3.00 - EXECUTION

3.01 CAST IN PLACE CONCRETE CURB AND SIDEWALK

A. WEATHER AND SITE CONDITIONS
1. Cast in place concrete shall not be placed when the air temperature at the site in the shade and away from artificial heat is below 40°F.
2. Freshly placed concrete shall not be allowed to exceed 85°F.
3. Concrete shall not be placed on a frozen or thawing base or when weather or other conditions would prevent the proper handling, finishing or consolidation of the material.
4. The Permittee's Contractor shall haul, transport and place concrete in manners to prevent segregation of aggregate from the mix.

B. FORMING
1. The Permittee may use metal or wood forms appropriate for the purpose. Forms shall be free from warp and sufficiently strong to resist the weight of concrete.
2. Forms shall be cleaned and oiled before placing. The Permittee shall brace and stake forms adequately to hold line and grade until removed.
3. Slip forms may not be used without the written approval of the Fire District.

C. PLACING CONCRETE
1. The Permittee shall place sufficient concrete to attain full depth at all sections along walk or curb.
2. The Permittee shall thoroughly consolidate the concrete so that all honeycomb will be eliminated.

D. FINISHING CONCRETE
1. Surface is to be finished by float.
2. No plastering or patching is permitted
3. Edges of walks and curbs are to be rounded with edger with ¼ inch

radius.

4. Before the concrete is set, the Permittee shall test for waves or irregularities with a straight edge (10 feet long). All defects above or below the proper surface of more than ¼ inch shall be corrected.
5. After screeding and floating, the Permittee shall finish sidewalks with broom, drawn over surface perpendicular to the line of traffic.
6. The Permittee shall make final pass with edger and jointer after broom finishing.
7. Handicapped ramps and other sections as designated on the Drawings are to have exposed aggregate finish.

E. JOINTS

1. Expansion joints in walk and curb shall be placed every 20 feet, and shall be formed around fixed objects such as, but not limited to, buildings, manholes, utility poles, curb stops, steps and valve boxes.
2. Expansion joints and filler material shall extend full depth of walk and curb.
3. "Dummy" joints in walk and curb shall be placed every 5 feet, unless otherwise specified. Dummy joints shall be ⅛-inch wide and 1-½ inches deep, and rounded with edger with ¼-inch radius.

F. CURING

1. The Permittee shall apply first coat of curing and sealing compound, at manufacturer's recommended application rate, uniformly and evenly, as soon as possible after final finishing.
2. The Permittee shall use moist burlap for curing.
3. The Permittee shall apply exposed aggregate retarding compound, where required, at manufacturer's recommended application rate, after surface is finished. The Permittee shall power wash the surface in approximately 12 hours, subject to weather conditions.
4. The Permittee shall ensure a minimum of 3 days without pedestrian traffic and 14 days without vehicle traffic. The Permittee shall provide barriers and protection as necessary to prevent damage. Any sections damaged or marked shall be replaced by the Permittee at no expense to the Fire District.
5. The Permittee shall protect the concrete from rain, freezing or inclement weather.
6. The Permittee shall apply second coat of curing and sealing compound at manufacturer's recommended application rate, uniformly and evenly, after 7 days.

3.02 DETECTABLE WARNING SURFACE

A. Detectable Warning Surface shall be installed by following all applicable supplier's and manufacturer's requirements for environmental conditions, surface preparation, installation procedures, curing procedures and materials compatibility.
B. The Permittee is responsible for removing and material spatters. The Permittee shall repair any damage that should arise from installation or clean-up effort.

3.03 GRANITE CURB

B. The curb and slope edging shall be set so that the front top arris line conforms to the line and grade required. All space under and behind the curbing shall be filled with concrete (4,000 psi).

C. The curb and slope edging shall be laid so there will be no open joints exceeding one inch between stones. Joints between stones shall be carefully filled with mortar, Type I, and neatly pointed on the top and exposed front portions. After pointing, the stone shall be satisfactorily cleaned of all excess mortar and the joints kept moist until the mortar has set.

END OF SECTION 03301

SECTION 03325 - CONTROLLED LOW STRENGTH MATERIAL (FLOWABLE FILL)

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. All labor, materials, services and equipment for furnishing and installing controlled low strength material (CLSM), commonly known as "flowable fill."

1.02 REFERENCE STANDARDS

A. Information and requirements contained in this Specification are based on the most recent version of the following standards:

Referenced American Concrete Institute (ACI) and American Society for Testing Materials (ASTM) Standard Specifications.

1.03 SUBMITTALS

A. Mix Design: The Permittee shall submit separate project mix criteria according to the reference standards for each concrete type to be used on the project, including all calculations, data and information necessary for mix evaluation and placement review and testing. The Permittee shall secure the Fire District's approval for the mix design a minimum of 48 hours prior to the start of concrete placement.

B. Materials List : A complete list and manufacturers' data for all materials and their sources of supply proposed to be furnished and installed under this Section shall be submitted including:

1. Portland Cement,
2. Flyash,
3. Fine Aggregate,

C. Chemical Admixtures.

1. Mix Design: The Permittee shall submit separate project mix criteria according to the reference standards for each concrete type to be used on the project, including all calculations, data and information necessary for mix evaluation and placement review and testing. The Permittee shall secure the Fire District's approval for the mix design a minimum of 48 hours prior to the start of concrete placement.
2. Materials List: A complete list and manufacturers' data for all materials and their sources of supply proposed to be furnished and installed under this Section shall be submitted including:
    1. Portland Cement,
    2. Flyash,
    3. Fine Aggregate,
    4. Chemical Admixtures.

D. Delivery Slips: Upon arrival of each CLSM delivery vehicle to the site, provide to the Fire District a copy of the delivery slip, noting the following:

1. Name and address of CLSM supplier,
2. Number of truck delivering the CLSM,

3. Date and time CLSM was batched,
4. Date and time vehicle arrived on and left site,
5. Batch weights and volume of vehicle contents.

1.04 QUALITY ASSURANCE

A.

The Permittee's Contractor shall be thoroughly trained and experienced in the skills and equipment required for installation of these items.

1. The Permittee shall protect materials before, during and after installation. In the event of damage, the Permittee shall immediately make all repairs and replacements necessary to the approval of the Fire District and at no cost to the Fire District.
2. Upon direction of the Fire District, the Permittee shall remove, replace and/or rework all items that do not meet the requirements of this section. The Permittee shall perform all remedial measures at no cost to the Fire District.

PART 2.00 - PRODUCTS

2.01 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

A. All CLSM shall be produced in a concrete ready-mix plant conforming to ASTM C94.

B. Portland cement shall conform to ASTM C150, Type II. Cement content for mix design shall be between 50 lb/cy and 200 lb/cy.

C. Fly ash shall conform to ASTM C618, Type C or F. Fly ash content for any mix design shall be less than 300 lb/cy.

D. Aggregate shall conform to ASTM C33. Aggregate content for any mix design shall be between 2,000 lb/cy and 3,000 lb/cy. 100% of the aggregate shall pass the 1/2" sieve.

E. Water shall be potable. Water content for any mix design shall be between 240 lb/cy and 500 lb/cy.

F. Chemical admixtures shall be used that produce air entrainment between 15 and 40%. Mix proportioning shall be such that adverse segregation of the material shall not occur. Admixture shall be "DaraFill CLSM Performance Additive" by Grace Construction Products, or approved equal.

G. Flowability in accordance with ASTM C143 shall be between 6 and 8 inches.

H. Subsidence of the material when placed shall not exceed 2% of depth.

I. CLSM shall harden to bear traffic within 12 hours of placement. Shear strength shall exceed 4,000 psf at 56 days.

J. Unless otherwise noted, CLSM compressive strength shall be between 75 psi and 150 psi at 28 days. Long term compressive strength shall not exceed 200 psi, to allow future removal by conventional excavation equipment.

K. CLSM unit weight for any mix design shall be between 90 lb/ft^3 and

145 lb/ ft^3.

PART 3.00 - EXECUTION

3.01 GENERAL

A. Mixing, transport and placement of CLSM shall conform to ACI 304. CLSM as placed shall be homogeneous and consistent.

3.02 SITE AND MATERIAL CONDITONS

A. CLSM shall not be placed on frozen ground. Mixing and placing of the material is acceptable in freezing temperatures. At the time of placement the CLSM shall have a temperature of at least 40°F. When CLSM is placed in freezing temperatures, the material shall be covered with blankets overnight. When paving over CLSM in cold weather, any frozen material on the surface shall be scraped off and removed prior to paving.

3.03 TRANSPORT

A. CLSM shall be agitated during transport.

3.04 PLACEMENT

A. CLSM shall be placed by chutes, conveyors, pumps or buckets, directly into the space to be filled.
B. Internal vibration is not required.
C. Only as much material as can be placed at any one time shall be prepared for placement. In long trenches, end points shall be bulkheaded.
D. The CLSM may be placed part depth or full depth as conditions dictate. Care is to be taken to prevent pipe from floating. Formed walls or other bulkheads shall be constructed to withstand hydrostatic pressure exerted by the plastic flowable fill. All necessary means to confine the material within a designated space shall be provided.
E. Due to large buoyant and lateral forces during placement, CLSM shall be placed in lifts when used for pipe bedding, retaining wall backfill or backfilling of large, flexible structures. Mechanical connection between lifts may be necessary and include, but are not limited to, surface roughening, embedded reinforcement etc.
F. Sequential lifts shall only be placed once the preceding lift has hardened.
G. When using CLSM for pipe trench backfill, pipe bedding and envelope shall be installed and compacted prior to installation of CLSM. CLSM shall only be installed to the elevation of the bottom of the road subbase.

3.05 CURING

A. CLSM shall be protected from freezing and the excavation, if applicable, shall be dewatered until the CLSM has hardened.
B. Curing shall be in accordance with the CLSM supplier and applicable ACI standards.
C. The CLSM shall be left undisturbed until the material obtains sufficient strength. Sufficient strength for paving is achieved when the CLSM can

support the weight of foot traffic without apparent deformation. Sufficient strength for supporting vehicular traffic is 2.5 tons per square foot, as measured by a pocket penetrometer.

END OF SECTION 03325

SECTION 15123 - WATER METERS AND APPURTENANCES

PART 1.00 - GENERAL

1.01 WORK INCLUDED

A. All labor, materials, equipment and services to furnish and install water meter assemblies including meters, remote readers, meter setters, meter pits, ball valves, backflow preventers, copper pipe, fittings, expansion tanks, hangers, supports, plumbing modifications and all other items required for a complete water meter assembly as specified herein and in accordance with the Contract Documents.

1.02 REFERENCE STANDARDS

Information and requirements contained in this Construction Standard are based on the most recent version of the following standards:

A. AWWA Standard C700 for Cold-Water Meters - Displacement Type, Bronze Main Case.
B. AWWA Standard C701 for Cold-Water Meters - Turbo Type.
C. AWWA Standard C706-70 for Direct Reading-Remote Registration Systems for Cold-Water Meters

1.03 SUBMITTALS

A. The Contractor shall submit manufacturers' shop drawings, installation instructions and operation and maintenance manuals for the water meters, remote readers, meter setters, ball valves, backflow preventers, copper pipe, fittings and expansion tanks, and meter pits.
B. Manufacturer's Certification that all displacement type meters supplied meet AWWA C-700, latest revision.
C. Manufacturer's Certification that all turbo type meters supplied meet AWWA C-701, latest revision.
D. Prior to beginning work, the Contractor shall submit to the Engineer, for Owner's approval, an implementation plan, detailing the Contractor's schedule, protocols, procedures, and staff for this particular project. Contractor shall not begin work until Owner accepts the implementation plan. Owner reserves the right to order reasonable changes to the plan without increase in contract price.
E. The Contractor shall provide the names of all field personnel. The Owner reserves the right to provide these names to law enforcement authorities for appropriate background checks as deemed necessary to protect the safety of the public. Employees of the Contractor determined by law enforcement authorities to be a risk to public safety shall be reassigned to duties not requiring entry onto private property.

1.04 QUALITY ASSURANCE

A. The Contractor shall be thoroughly trained and experienced in the skills and equipment required for installation and testing of water meters and appurtenances.

B. The Contractor shall protect water meters and appurtenances before, during and after installation. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.
C. Upon direction of the Engineer, the Contractor shall remove, replace and/or rework all water piping that does not meet the requirements of this section. The Contractor shall perform all remedial measures at no cost to the Owner.
D. All plumbing work shall be performed under the direction of a Vermont Licensed Master Plumber.
E. The Contractor shall have five (5) years experience in the supply and installation of water meter equipment including a minimum of five (5) projects involving the installation of more than 100 meters. Project experience shall demonstrate the Contractors' technical, administrative and managerial capabilities to complete similar projects involving direct contact with the public and work on private property. The Contractor may retain the services of a local plumber or plumbing firm to assist with installation of meters.

1.05 WARRANTY

A. The Contractor shall warrant that the installation is free of defects for a period of one year from date of final completion and acceptance by Owner.
B. The water meter manufacturer shall guarantee that its meters shall perform to AWWA new meter accuracy standards for a period of one year after date of final completion and acceptance by Owner. The manufacturer shall guarantee that the reading obtained electronically matches the LCD display read on the register when the register is interrogated and that the manufacturer will pay the difference at the current rates whenever a discrepancy appears. Synchronization of electronic reading and mechanical read for any reason is not acceptable.
C. If the Owner has data indicating a meter assembly installed under this Contract is registering inaccurately, within the warranty period, the Contractor shall be responsible for removing, testing and/or replacing the meter equipment, as required by the Owner.

PART 2.00 - PRODUCTS

2.01 METER ASSEMBLY

A. The Engineer and Contractor will review each installation and determine:
   1. The type and size meter required.
   2. The non-standard installation equipment required.
B. Each meter installation shall include new equipment as follows:
   1. One (1) water meter (type and size, as appropriate) with a radio transmitter.
   2. One (1) new or existing backflow preventer (type and size, as appropriate).
   3. Two (2) new or existing pack joint compression fittings (type and size, as appropriate).
   4. One (1) new or existing ball valves (type and size, as appropriate), on the supply side of meter.
   5. One (1) new or existing expansion tank, if warranted (type and size, as appropriate).

6. Copper pipe, fittings and adapters as necessary.

2.02 DISPLACEMENT TYPE WATER METERS

A. Meters shall be "Neptune T-10" compatible with the Owner's meter reading equipment.

B. Meters shall be displacement type, magnetic drive, cold water meters, meeting the following specifications:

1. All meter maincases shall be frost-proof and made of a lead-free brass containing a minimum of 85% copper, such as Envirobrass II, that meets the ANSI/NSF 61 standard. Plastic maincases are not acceptable.
2. The meter serial number shall be stamped between the outlet port of the maincase and the register. Maincase markings shall be cast raised and shall indicate size, model, direction of flow, and NSF 61 certification.
3. Maincases for 5/8", 3/4" and 1" meters shall be of the removable bottom cap type with the bottom cap secured by four (4) bolts on 5/8" and 3/4" sizes and six (6) bolts on the 1" size. Intermediate meter maincases shall also be made of the same lead-free brass material in sizes 1-1/2" and 2" with a cover secured to the maincase with eight (8) bolts. Meters with a frost plug, a screw-on design or no bottom cap shall not be accepted in 5/8"-1" sizes.
4. Frost bottom plates shall be cast iron.
5. Trim and casing bolts shall be stainless steel.
6. Only magnetic driven, positive displacement meters of the flat nutating disc type will be accepted because of enhanced low flow accuracy performance.
7. The flat nutating disc shall be a single piece made from non-hydrolyzing synthetic polymer and shall contain a type 316 stainless steel spindle. The nutating disc shall be equipped with a synthetic polymer thrust roller located within the disc slot.
8. The measuring chamber shall be of a 2-piece snap-joint type with no fasteners allowed. The chamber shall be made of a non-hydrolyzing synthetic polymer.
9. The control block shall be the same material as the measuring chamber and be located on the top of the chamber. The control block shall be located after the strainer.
10. The measuring chamber outlet port shall be sealed to the maincase outlet port by means of an "O" ring gasket.
11. All meters shall contain a removable polypropylene plastic strainer screen. The strainer shall be located near the maincase inlet port, before the measuring chamber. The strainer shall also function as the device that holds the measuring chamber in place within the maincase.
12. All meters must be adaptable to a field programmable absolute encoder register without interruption of the customer's service.
13. Meters shall be of a tamper-resistant design.
14. Meters shall have low flow leak detector, full test circle, local odometer reading in 100 gallon increments. Register capacity shall be gallons with two fixed zeros. Registration shall be possible up to 1,000,000 gallons.

15. Accuracy shall be 100± 1.5% of actual throughput. Low Flow Registration shall be 95% at ¼ gpm. Max Pressure Loss shall be 10.8 psi at 20 gpm.
16. Max Operating Pressure shall be 150 psi.

C. Meters shall be sized based upon the anticipated flows, utilizing the following guidelines:

1.	5/8" x 3/4"	for	1gpm	to	20 gpm
2.	3/4" x 3/4"	for	1gpm	to	30 gpm
3.	1"	for	1gpm	to	50 gpm
4.	1½"	for	2gpm	to	100 gpm
5.	2"	for	2½ gpm	to	160 gpm

D. Meter shall not be painted.

2.03 TURBO TYPE METERS

A. Meters shall be "Neptune HP" compatible with the Owner's meter reading equipment, or approved equal.
B. Meters shall be turbo type, cold water meters, meeting the following specifications:
    1. Housing: Frost-proof with a non-corrosive waterworks bronze outer case.
    2. Rotor: Thermoplastic.
    3. Straightening Vanes: Stainless steel.
    4. Trim: Stainless steel.
    5. Radial Bearing: Graphite.
    6. Magnets: Ceramic.
    7. Thrust Bearings: Tungsten Carbide
    8. Frost bottoms: cast iron.
    9. Trim and casing bolts: stainless steel.
    10. All meters shall have cast on them, with raised characters, the size and direction of flow through the meters. Meter serial number shall be imprinted on each meter case.
    11. Meters shall be of a tamper-resistant design.
    12. Meters shall have low flow leak detector, full test circle, local odometer reading in 100 gallon increments. Register capacity shall be gallons with two fixed zeros.
    13. Meters shall have an electronic communications register compatible with the Owner's touch read automated system.
    14. Accuracy shall be 100± 1.5% of actual throughput.
    15. Low Flow Registration shall be 95% at 20 gpm.
    16. Max Pressure Loss shall be less than 1.0 psi at Maximum Continuous Duty.
    17. Max Operating Pressure shall be 150 psi.
    18. Registration shall be possible up to 1,000,000 gallons.
    19. Size: 3" rated for 5 gpm to 350 gpm.
    20. Maximum Continuous Duty: 150 gpm.
    21. Maximum Intermittent Flow: 450 gpm.
C. Meter shall not be painted.
D. Meters shall be supplied with matching removable strainer assembly.

2.04 WATER METER REGISTER

A. All Water meters shall be equipped with a self-contained solid state absolute encoder register metering system designed to obtain remote simultaneous water meter registration that is guaranteed to exactly match the registration on the register odometer. The metering information shall be obtained through an integrated radio housed within the encoder register. The system shall be configured as follows:
   1. Solid state absolute encoder meter register shall be direct mounting, electro-magnetically encoded measuring element into an electronic solid-state odometer.
   2. Encoder shall provide value-added flow data including leak, tamper and back flow detection when connected to a compatible Radio Frequency Meter Interface Unit.
   3. Batteries and digital counters using volatile memory are not allowed.
   4. Encoder register shall display flow rate information at register.
   5. The dial shall have a high resolution nine-digit LCD display for meter testing The register shall provide at least a nine-digit visual registration at the meter. The register shall display flow rate information.
   6. The unit shall provide an 8-digit meter reading for transmission through the radio MIU.
   7. The register shall employ a visual LCD leak detection indicator as well as provide remote leak detection through an ASCII format to the Meter Interface Unit (MIUs).
   8. Internal batteries shall not be allowed.
   9. The register should accumulate and register consumption without connecting to a receptacle or MIU.

B. Mechanical Construction
   1. The basement unit shall possess a hermetic sonic welded polycarbonate enclosure and lens. The pit unit shall have a rolled-seal enclosure with copper shell and glass lens.
   2. The register shall be attached to the meter case by a bayonet attachment. Fastening screws or nuts shall not be required.
   3. A tamper-proof seal pin shall be used to secure the register to the maincase.
   4. The register shall be removable from the meter without disassembling the meter body and shall permit field installation and/or removal without taking the meter out of service.
   5. Provision shall be made in the register for the use of seal wires to further secure the register.
   6. The solid-state absolute encoder register shall incorporate an Application Specific Integrated Circuit (ASIC) and firmware designed to verify accurate measurement, information transmission and data integrity.
   7. The Radio MIU will be integrated within the solid-sate encoder register housing. The MIU power supply (battery) must be

mounted on the outside of the register and be field replaceable.

2.05 RADIO FREQUENCY TRANSMITTERS

A. Each meter shall be equipped with a matched, self-generating, weatherproof, tamper-proof, radio transmitter.

B. The transmitter shall be integrated within the solid-state water meter register. The transmitter shall interrogate the encoder register and transmit the meter reading and other information to a remote reading device every 15 seconds. The same RF(RF) Meter Interface Unit (MIUs) must be capable of being read by a walk-by handheld/mobile computer equipped with a RF interface unit.

C. The integrated MIUs shall be manufactured in both basement and pit models. The basement MIU shall have the ability to be mounted in a basement and the pit MIU shall have the ability to be mounted in a pit or an underground vault. The pit MIU shall be a fully potted waterproof design.

D. Integrated Radio Unit

1. The Unit shall provide a location for a tamper deterrent seal. Tampering with the device functions or connections shall not be possible without causing visible damage to the device exterior or to the seal.
2. The Unit must be protected against static discharge without loss of data.
3. The Unit shall be capable of operating at temperatures of -22°F to 149°F (-30°C to +65°C) with a humidity factor of 0 to 95%.
4. The circuit board shall be coated for moisture protection.
5. The battery will be protected by encapsulation in a hard potting material.
6. The system shall not require any special licensing, including licenses from FCC. The system must, therefore, operate in the 902 MHz to 928 MHz unlicensed bandwidth.
7. A single manufacturer shall produce all components of the system (water meters, RF transmitters, meter reading equipment, and route management software), and provide a turn-key system.
8. To minimize the potential for RF interference from other devices, the MIU shall transmit using the Frequency Hopping Spread Spectrum technique comprised of alternating pseudo-random frequencies within the 902 MHz to 928 MHz unlicensed bandwidth.
9. The meter interface unit shall operate within FCC Part 15 regulations for devices operating in the 902 MHz to 928 MHz unlicensed bandwidth. The output power of the devices will be governed by their conformance with these relevant FCC standards.
10. Output power shall meet FCC Part 15.247 requirements and shall be a minimum of 100 milliwatts.

11. Power shall be supplied to the MIU by a lithium battery. The Manufacturer shall warrant that any battery provided and installed in the MIUs shall be free of manufacture and design defects for a period of twenty years - the first ten (10) years from their date of shipment from factory without pro-rating, and the second ten (10) years with pro-rating, as long as the MIU is working under the environmental and meter reading conditions specified.
12. The battery life shall not be affected by outside erroneous wake-up tones (i.e. other water, gas, or electric utilities reading and therefore sending out a wake-up tone).
13. The number of reads performed must not affect the battery life.
14. The batteries shall be field replaceable (the replacement shall be demonstrated) and be designed for minimum twenty (20) years life expectancy. The MIU shall not require reprogramming if the battery discharges before it is replaced.
15. No MIU programming shall be necessary for installation.
16. The MIU shall transmit the meter reading continuously at a predetermined transmission interval. The MIU shall not send readings older than an hour.
17. Each device shall have a unique pre-programmed identification number of 10 character. ID numbers will be permanent and shall not be altered. Each device shall be labeled with the ID number in numeric and bar code form. The label shall also display FCC approval information, manufacturer's designation, and date of manufacture. A duplicate self-stick tear-off label with barcode data must also be provided. The duplicate can be affixed to the work order and scanned to ensure accurate and efficient data entry.
18. The MIU shall transmit the encoder meter reading and a unique MIU ID number.
19. The handheld/mobile reading equipment shall be available to verify proper operation of the MIU by displaying the MIU ID number and meter reading.
20. The MIU shall be capable of being received by either a handheld receiver & mobile receiver.

2.06 METER SETTERS

A. Meter Setters shall be "Kornerhorn" KH Series, manufactured by the Ford Meter Box Company, Inc., Wabash, IN or equal, of appropriate size for the meter.
B. Meter setters shall have removable pack joint assembly and meter gaskets.
C. Other fittings such as pack joints or angle meter couplings may be required depending on the installation.

2.07 DUAL CHECK VALVE ASSEMBLY

A. Dual check valves shall be Series KH-HHCH -1, as manufactured by The Ford Meter Box Company, Inc., Wabash, IN, or approved equal.

B. Check valves shall have no more than a 10 pounds-per-square-inch head loss at a flow of 15 gallons-per-minute.

C. Check Valves shall be manufactured so that Cartridge Assemblies may be inspected and/or replaced without removing the valve or meter from service, through a removable O-ring sealed cap located at the top of the valve. Both cartridges are to be identical, interchangeable. Each cartridge assembly shall be so constructed that it can provide backflow prevention even with the other cartridge assembly removed from the valve body. Cartridge Assemblies shall be supplied with O-rings attached to ensure a watertight seal between the cartridge and the inside of the body.

D. Valves to be approved under ASSE Standard 1024-1994.

E. The access cap shall have a 7/8" hex nut on the top for removal with a 7/8" socket wrench.

F. All brass material shall meet the following Standards: Bronze (red brass) - ASTM B62 and/or ASTM B584, UNS No. C83600, AWWA C800 (including the 85-5-5-5 brass specification.)

G. Check assemblies to be made of acetyl plastic with stainless steel springs.

H. Manufacturer shall, upon request, submit a notarized certification of adherence to the above material standards.

2.08 BALL VALVES

A. Ball valves shall be Series KHBV-1, as manufactured by The Ford Meter Box Company, Inc., Wabash, IN, or approved equal.

B. All cast metal components of the Ball Valve shall be certified waterworks red brass, containing 85% copper, 5% tin, 5% lead, and 5% zinc, as per AWWA standard C800 and ASTM: B62 and/or ASTM B584, UNS No. C83600.

C. The ball shall be Teflon-coated and shall rotate between two seats made from Buna-N rubber.

D. The water passages shall be full 5/8" diameter, and an O-ring shall seal the stem that turns the ball.

E. Valves shall be watertight at any pressure up to 250 PSI.

F. Valves shall be threaded for easy incorporation into meter setter and pack joints, without additional fittings.

2.09 COPPER PIPE AND FITTINGS

A. Copper tubing for inside structures shall be Type “L”, hard temper copper tubing conforming to ASTM Specification B-306.

B. Fittings shall be wrought-copper solder type fittings. Solder shall have less than 0.2% lead content.

C. Contractor shall provide di-electric unions in piping systems wherever dissimilar types of piping are connected.

D. Contractor shall assume each installation will require up to fifteen feet (15’) of appropriately sized copper pipe and associated fittings and adapters.

2.10 EXPANSION TANKS

A. Pre-pressurized diaphragm type water thermal expansion tanks shall be Amtrol “Therm-X-Trol ST-5”, or approved equal.
B. Expansion tanks shall be AWWA approved.
C. The outer shell shall be high grade steel with exterior epoxy coating.
D. The bladder shall be FDA approved butyl rubber and shall prevent water from contact with the shell interior.
E. The assembly shall incorporate a shrader valve for adjustable air precharge.

2.11 METER PITS

A. Meters serving buildings without basements shall be installed in meter pits located along the building service.
B. The meter pit shall be a Mueller7 / McCullough Riser EZ-SETTER7 Meter Box or approved equal.
C. Pits shall be 20 to 21-inch diameter, 60 inch deep, constructed of PVC or HDPE with open bottom. Cover shall consist of 18-inch diameter cast iron frame and locking cover and 4-inch thick insulated closed cell foam insert.
D. Provide meter pit extensions as necessary to achieve specified bury depth of water service.
E. Install meter pit on 12-inch thick crushed stone base.
F. Provide Owner with two (2) cover keys.

2.12 WATER METER INSULATION JACKET

A. Insulation Jackets shall be 2-piece expanded polystyrene molded to custom fit over the specified meters. Jacket shall cover the meter body and coupling nuts on the inlet and outlet ports.
B. Two piece jacket shall be secured around the meter with two “velcro” straps.

2.13 PRODUCT STORAGE AND HANDLING

A. Handle and transport water meters and appurtenances to insure they are in sound, undamaged condition and to prevent damage.
B. Examine all materials before installing. Defective or damaged materials shall be rejected.
C. If defective materials are discovered after installation, the Contractor shall remove and replace the defective piece(s) at no additional cost to the Owner.
D. The Owner shall make storage space available for the Contractor’s use to store new meters and materials as well as salvaged meters and equipment. The contractor shall be responsible for protection and security of materials.

PART 3.00 - EXECUTION

3.01 GENERAL

A. The Owner shall supply all customer data to the Contractor, including customer names, phone numbers, street and mailing addresses.
B. The Owner shall notify the public of the work prior to construction. Public

notification will be through advertisements in a local paper, direct mailing or other appropriate means.

C. As a portion of work under the Contract, the Contractor shall direct mailings, detailing the work to be done, to each home. The mailings shall request that the customer call a toll free or local number to make appointments for installation dates and times.

D. If a customer does not respond to the letter, the Contractor shall attempt to contact the homeowner by phone (once during the day, once on the weekend or at night). Failing that, a card will be left at the homeowner's door by the Contractor, asking the customer to call a toll-free or local number for the rescheduling. After these four attempts by the Contractor, the contact will become the responsibility of the Owner.

E. Employees of the Contractor will provide clear identification when attempting to gain access to a home. The installers will contact the local police to notify them of the work. All Contractor vehicles will be clearly marked on both sides with the Contractor's company name, and will also be registered with the proper town officials.

F. The Contractor may be required to work nights and weekends to complete the installations on schedule at no additional cost to the Owner. Night and weekend work will be kept as a last resort for installations in "lockout" situations, and unforseen delays. In the case of nighttime work, sufficient lighting and other precautions will be taken so as to insure the same degree of accuracy in workmanship, and the same conditions regarding safety as would be achieved in daytime.

G. Contractor employees shall not attempt to enter any dwelling in which there is not an adult present.

I. In the case of immediate problems or questions, the Contractor will be available at all times to assure a quick response time to emergencies through a telephone activated beeper, and through the use of a radio system.

J. All installations shall be performed under the direction of a Vermont Licensed Master Plumber, who will be directly responsible for the means, methods, techniques, sequences, and procedures of the installation.

K. Before beginning non-standard installations, the Engineer will review and the Owner must approve any additional work required.

L. "Non standard" installations are those which require additional work due to the existing piping. Installations shall be deemed "non-standard" in the following situations:

1. The existence of more than two "early branches" that necessitate replumbing.
2. Lack of free working space requires structural modifications or carpentry work.

M. The Owner shall be responsible for the location and operation of outside curb valves when required. The Contractor shall assume that all work shall be completed without using the curb stop to shut off water to the building. The Contractor shall anticipate the use of pipe freezing, if necessary. In unusual circumstances the Owner will close the curb stop to facilitate installation.

N. The Engineer and Owner will be notified by the Contractor of plumbing

found to be of questionable condition, and will notify the homeowner prior to the installation.

3.02 INSTALLATION

A. Water meters shall be installed according to the Contract Documents in accordance with the Manufacturer's recommendations.

B. Contractor shall work in an expeditious manner, with all necessary pipes, fittings and meter at the site prior to disrupting service and beginning work. In no case will water service be interrupted overnight, except by special arrangement with the Owner.

C. If lead service piping is discovered, the contractor shall report, in writing, to the Engineer. Meters shall not be installed on lead services.

D. Install hangers, supports and mounting devices as required to provide support for piping and meter assembly.

E. Typical Installation - A typical installation shall include the removal of the existing meter and installation of the new meter in the existing meter horn including all necessary fittings, couplings or adapters. This installation requires that the existing isolation valve(s) and meter setter are in good condition and, in the opinion of the installer, acceptable for continued reliable service.

F. Non-Typical Installations - A non-typical installation shall include installation of the following equipment, as noted, where a "typical installation" is not possible.

1. Meter Setters - The Contractor shall install a meter horn at all installations where one does not currently exist, or the condition of the existing horn warrants replacement. Meter setters shall be installed into building supply piping at a location which will not allow any bypass of the meter on the service connection. The meter setter shall be installed prior to any plumbing connections to the service line, as close to the service entrance as possible. Replacements shall be pre-approved by the Owner. The installation shall be compatible with the specified meter and include all necessary parts, materials and labor.
2. Dual Check Valves (DCV) - The Contractor shall install a DCV at all installations where one does not currently exist, or the condition of the existing DCV warrants replacement. Replacements shall be pre-approved by the Owner. The installation shall include all necessary parts, materials and labor.
3. Reduced Pressure Principle Backflow Preventers (RPPBP) - RPPBP's shall only be installed at locations directed by the Owner.
4. Isolation Ball Valves (BV) - The Contractor shall install BV's on the inlet side of the meter, at all installations where one does not currently exist, or the condition of the existing BV warrants replacement. Replacements shall be pre-approved by the Owner. The installation shall include all necessary parts, materials and labor.
5. Meter Pits
   i. Meter Pits shall only be installed at locations directed by the

Owner.

ii. The location of the Pit shall be reviewed with the Engineer and the property owner prior to the start of work.

iii. The pits shall be installed plumb and true with the frame and cover set one inch above finish grade.

iv. Pits shall be installed on a one foot bedding of 1" crushed stone.

v. Ground surfaces shall be restored to the condition which exists prior to the start of work.

6. Meter Insulation Jackets - Meter insulation jackets shall be installed on all meters located in an un-heated space subject to freezing temperatures.

7. Expansion Tanks

i. A pre-pressurized diaphragm type expansion tank shall be installed in the existing plumbing if, in the opinion of the Master Licensed Plumber, over-pressurization of the existing interior plumbing may occur.

ii. The plumber shall notify the Engineer and receive authorization prior to installing expansion tanks and provide justification based on specific location.

iii. It is not intent of this Contract to install expansion tanks on every customer's service. It shall be left up to the installer's Master Plumber licensing to determine when an expansion tank is essential to avoid over-pressurizing the system. An expansion tank may be required when the following conditions exist in the interior plumbing system:

(a) Rapid recovery hot water heaters.

(b) Multiple large volume (>80 gallon) hot water heaters.

(c) Multiple "dead end" branches in the interior plumbing.

(d) High static pressures in the interior plumbing.

iv. Installation shall be in accordance with manufacturer's published instructions; installed where requested by the customer.

G. Where the existing installation is insulated or protected from freezing by heat tape or other methods, the Contractor shall neatly removed existing insulation/heat tape as necessary to complete the installation. Reinstallation of frost protection measures shall be the responsibility of the water customer. The Contractor shall make note of those installations requiring re-insulation on both the installation log and in a summary report submitted monthly with the payment requests.

H. The pack joints will be set and tightened in a manner that will not disturb the overall grounding capability of the piping systems.

I. The meter and connections shall be sealed against unnoticed removal with the use of meter seal wire and a meter seal.

3.03 DISINFECTION AND TESTING

A. Disinfection shall be performed by dipping and swabbing the various components in or with a 15% chlorine solution.

B. Upon completion of the installation, refill the building piping with water, allowing 30 minutes of contact time for the chlorine to react prior to flushing the lines. During this period, check all new work for leaks at normal system pressure, and make any repairs necessary to stop all leaks.

3.04 RECORDS

A. Each installation will be carefully documented for the purpose of progress, as well as the records of the Owner.

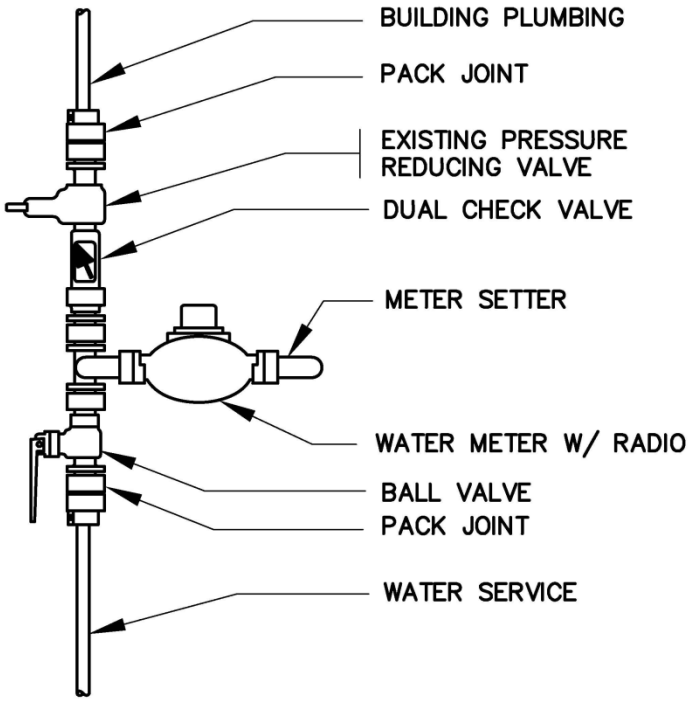
B. Installation Log - The Contractor shall complete an Installation Log for each installation in the form as included in the Appendix to this document or an approved equal.

C. Photographic Record - Digital photos which clearly depict the existing meter installation and the new meter installation. Each photo shall include a placard indicating the account number, installation address, date of installation, and existing versus new installation.
   1. Photos shall be provided in JPEG image format, readable in Windows based operating system, on CD media.
   2. Each photo electronic file shall be named according to the unique installation customer account number consistent with the Owner's master list. Photos of the existing meter and the new meter installations shall be labeled "B" for before and "A" for after.
   3. Electronic photos shall be provided to the Engineer on a regular basis as required by the contract documents.

D. The Contractor shall verify on the completion report that there is not any other water supply connected to the building's drinking water plumbing system.

E. Documentation shall be submitted monthly with the request for payment. A lack of documentation will prevent payment for the affected locations.

3.05 WATER METER DETAIL

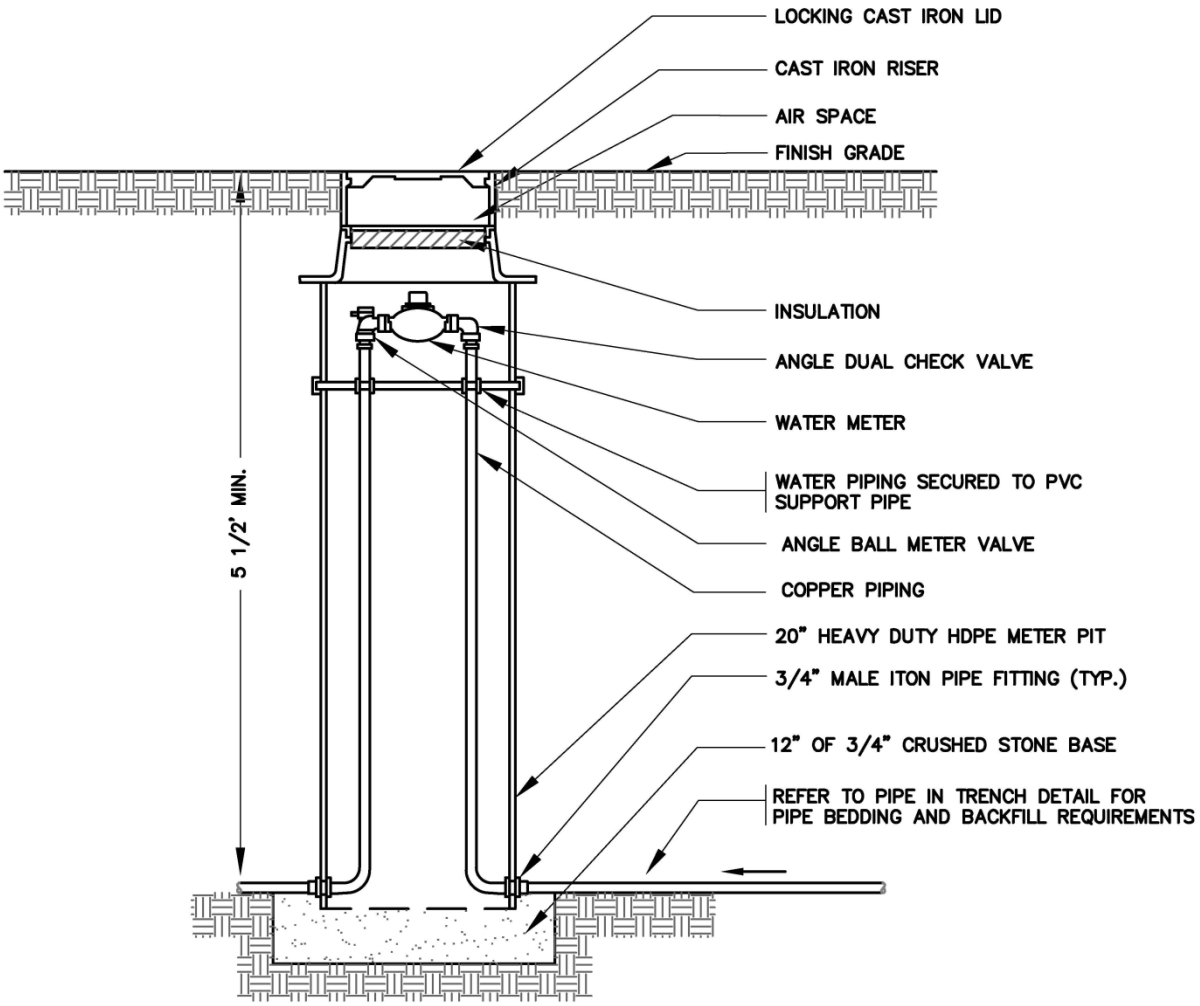


NOTE:
"STANDARD" INSTALLATION SHALL INCLUDE REPLACEMENT OF METER IN EXISTING METER SETTER. wHERE EXISTING INSTALLATION DOES NOT INCLUDE ALL COMPONENTS AS NOTED, RETROFIT MISSING COMPONENTS AS NECESSARY.

WATER METER DETAIL

NOT TO SCALE

3.06 METER PIT DETAIL



NOTES:

1. METER PITS SHALL BE SET AS FOLLOWS:
   A. WHEN IN PAVED OR CONCRETE SURFACE THE METER PIT SHALL BE INSTALLED FLUSH TO FINISH GRADE.
   B. WHEN IN GRAVEL SURFACE, THE METER PIT SHALL BE BURIED 2".
   C. WHEN IN A LAWN OR OTHER MOWED AREA, METER PIT SHALL BE INSTALLED 1/2" ABOVE FINISH GRADE.
   D. WHEN IN A FIELD OR WOODS, THE METER PIT SHALL BE INSTALLED 2" ABOVE FINISH GRADE AND MARKED WITH A STEEL FENCE POST.

2. WHEN SERVICE IS BEING INSTALLED AT A DEPTH LESS THAN 5 1/2 FEET IT SHALL BE INSULATED AS SHOWN ON THE PIPE IN TRENCH DETAIL.

3. METER PITS, METERS AND FITTINGS SHALL COMPLY WITH THE MUNICIPALITIES STANDARDS AND SPECIFICATIONS.

4. METER PIT SHALL BE SET PLUMB AND CENTERED ON THE METER.

5. METER PIT SHALL BE LOCATED AT THE RIGHT OF WAY OR AS DIRECTED BY THE ENGINEER.

6. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A MINIMUM OF THREE SWING TIES TO THE METER PIT

METER PIT DETAIL

NOT TO SCALE

END OF SECTION 15123

BRANDON FD NO 1 CONSTRUCTION STANDARD DETAILS