GENERAL SPECIFICATIONS

The Standard Specifications shall refer to the Vermont Agency of Transportation Standard Specifications for Construction (1990 Edition). All site work shall also be completed in accordance with the Town of Williston's Public Works standards. Any discrepancies with the plans or specifications shall be reported to the Engineer prior to beginning that work.

A. Earthwork

1. The site shall be cleared of all debris and vegetation, and all topsoil shall be stripped prior to placing any fill material. Debris and vegetation shall be disposed of at an approved location.

2. The excavated material from on site shall not be used within five feet (5') of the building or under parking lots, roads or sidewalks. General imported fill material shall not be larger than two inches (2") or have more than 20% passing the NO. 200 sieve. All excess excavated material shall be disposed of at an approved location.

3. Grading

a. Perform all rough grading, including excavation, formation of embankments, shaping, sloping, compaction, construction of ditches, disposal of surplus or unsuitable material, and any work necessary to prepare the subgrades of all roadways, walks and parking areas. Grading shall be brought to the bottom of the base course under paved or surfaced areas and to within a minimum of 24 inches of finished grade under side slopes and/or embankment areas to receive loam along roadways, walks or parking areas.

b. Accomplish all excavation and fill within the slope and grade lines as indicated on the Drawings unless otherwise authorized in writing by the Owner. Parking lots shall be graded to full cross section width at sub-grade before placing any type of sub-base or pavement except that partial width construction is permissible where necessary for the maintenance of traffic.

c. Do not use frozen material in the construction of embankments

d. Place all material being placed in embankments in horizontal layers of uniform thickness across the full width of embankment, except when it is impractical to construct full width of the embankment and partial width layers are authorized by the Owner. Do not allow or place stumps, trees, rubbish or other unsuitable material in embankments. Begin layers of embankment at the deepest part of the fill.

e. Areas of soft, yielding or otherwise unsuitable material that will not meet compaction requirements shall be removed, replaced with suitable material and properly compacted at no cost to the Owner.

f. Place embankments for paved or surface areas in horizontal layers of depths which will result in layers of compacted material not exceeding 8 inches. Compact each layer as specified before placing each new layer. Use effective spreading equipment on each layer to obtain uniform thickness prior to compacting. Each layer shall be kept crowned to shed water to the outside edges of embankment and continuous leveling and manipulating will be required to assure uniform density. Construction equipment shall be routed over the entire surface of each layer.

g. If, during the construction of the embankments, there is any indication that serious bulging, cracking, or unsafe movement may occur, the placing of fill shall be stopped or retarded to allow the material to stabilize.

h. All ditches and drains shall be constructed so they will effectively drain the roadway or parking lot before any sub-base or surface course material is placed. In handling materials, tools and equipment, the Contractor shall protect the subgrade from damage. In no case shall vehicles be allowed to travel in a single track and form ruts. If ruts are formed, the subgrade shall be reshaped and compacted and any pockets of clay, sand or soft material that may have been left in the subgrade shall be removed, replaced with approved material and properly compacted at the Contractor's expense. The subgrade shall be kept in such condition that it will drain. Sub-base, base or surface material shall not be deposited on the sub-grade until the sub-grade has been checked and approved by the Owner. After the sub-grade has been approved, hauling shall not be done nor equipment moved over the sub-grade which will distort the cross section. A tolerance of 1/2 inch above or below the finished sub-grade will be allowed provided that this 1/2 inch above or below sub-grade is not maintained for a distance longer than 50 feet, and that the required cross section is maintained.

4. Compaction:

a. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification.

b. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum dry density for soils which exhibit a well defined moisture-density relationship determined in accordance with ASTM D 2049, for soils which will not exhibit a well defined moisture-density relationship.

1. Lawn or unpaved areas: Compact top 6" of sub-grade and each layer of backfill or fill material to 90% maximum dry density.

2. Compaction under paved and surfaced areas: The entire area of each layer shall be uniformly compacted to at least the required minimum density by the use of compacting equipment consisting of rollers, compactors or a combination thereof. Earth-moving and other equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment. Each layer for its full width shall be compacted to not less than 90 percent of the maximum dry density as determined by the Standard Method of Test for Moisture-Density Relations of Soils, ASTM-D698, Method C, except that the material in the top two feet of any embankment, immediately below the sub-grade shall be compacted to not less than 95 percent of the maximum dry density. The field density determination will be made by a qualified testing laboratory using a nuclear density gauge.

3. Concrete Slabs: Compact each layer of backfill or material to 95 % maximum dry density.

c. Moisture Control: Where sub-grades or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of sub- grade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

B. Access Drives and Parking Lots:

1. The sub-grade shall be prepared in accordance with Section 203.12 of the Standard Specifications.

2. Bank run gravel (gravel for sub-base) shall meet the following grading requirements (Section 704.04):

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
No. 4	20 – 60
No. 100	0 – 12
No. 200	0 – 6

The gravel shall be uniformly graded from coarse to fine and the maximum size stone particle shall not exceed 2/3 of the thickness of the layer being placed. The gravel sub-base shall be compacted to 95% of the maximum dry density as determined by AASHTO-T99.

3. Crushed Gravel for Sub-base: All materials shall be secured from approved sources. This gravel shall consist of angular and round fragments of hard durable rock of uniform quality throughout, reasonably free from thin elongated pieces, soft or disintegrated stone, dirt, organic or other objectionable matter. The grading requirements shall conform to the following table (Section 704.05 – Fine):

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
2"	100
1 1/2"	90 – 100
No. 4	30 – 60
No. 100	0 – 12
No. 200	0 – 6

The crushed gravel shall be compacted to 95% of the maximum dry density as determined by AASHTO-T99.

4. Dense Graded Crushed Stone for Sub-base: Dense graded crushed stone for sub-base shall consist of clean, hard, uniformly graded, crushed stone. It shall be reasonably free from dirt, deleterious material and pieces which are structurally weak and shall meet the following requirements:

a. Source: This material shall be obtained from approved sources and the area from which this material is obtained shall be stripped and cleaned before blasting.

b. Grading: This material shall meet the requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
3 1/2"	100
3"	90 – 100
2"	75 – 100
1"	50 – 80
1/2"	30 – 60
No. 4	15 – 40
No. 200	0 – 6

5. Bituminous Concrete Pavement: The materials, grading and composition, placement, and finishing for bituminous concrete pavement (Type Is, IIs, IIIs, & IVs) shall meet the requirements of the Vermont Agency of Transportation Standard Specifications Section 702. Other requirements are as follows: Application of bituminous concrete pavement shall meet all the requirements of the Vermont Standard Specifications for Construction Section 406, or as periodically amended, but not limited to, the following:

a. Section 490 of the specifications.

b. Note that where the drawings reference a specific pavement type such as type IV, it shall be considered to be type IVS in conformance with this specification.

6. Stabilization Fabric: Stabilization fabric where required by the Engineer shall be Mirafi 500X or equal. The fabric shall be installed in accordance with manufacturer's requirements.

7. All pavement markings shall be VT. 708.10 Thermoplastic Pavement Markings.

C. Drainage Systems

1. All culverts and storm drains shall meet the requirements of Section 601 of the Standard Specifications.

2. At the Contractor's option, the following materials may be used for the storm drainage:

a. Polyvinyl Chloride pipe conforming to ASTM Specification D3034 or F679, (PVC) sewer pipe and fittings SDR 35.

b. Reinforced concrete pipe meeting the requirements of Section 710.01.

c. Corrugated Polyethylene pipe meeting the requirements of Section 710.03.

d. Corrugated aluminum alloy pipe meeting the requirements of Section 711.02.

D. Water

1. Materials:

a. Ductile Iron Water Pipe: Pipe shall be four-inch diameter Tyton Ductile Iron Class 52 conforming to current ANSI/ AWWA C151/ A21.51-81. Push-on joint pipe shall be minimum thickness Class 52. Push-on joint accessories shall conform to applicable requirements of ANSI/AWWA C111/A21.11.

Pipe shall be cement mortar lined on the inside in accordance with ANSI/AWWA C104/A21.4 except that the cement lining thickness shall not be less than three-sixteenths inch (3/16"). A plus tolerance of one-eighth inch (1/8") will be permitted.

Pipe outside coating shall be an asphaltic coating approximately 1 mil thick. The coatings shall be applied in accordance with The Handbook for Ductile Iron Pipe.

b. Fittings: Ductile Iron fittings shall conform to AWWA/ANSI-C104, Class 350 pounds working pressure, and be of a compact body design.

c. Gate Valves Resilient Seat: Valves shall be manufactured to meet all requirements of AWWA Specification C509 (latest version). Valves 12 inches and smaller shall be bubble tight, zero leakage at 200 psi working pressure. Valves shall have non-rising stems, open counterclockwise and be provided with a two-inch (2") square operating nut with arrow cast in metal to indicate direction of opening.

d. Valve Box: Cast Iron New England style slide-type; five and one-quarter inch (5 1/4") shaft; 5 inch by 6 foot.

Cover shall be cast iron, marked "WATER" and indicating direction of opening.

2. Installation

a. All pipe and fittings shall be inspected and tested in accordance with the manufacturer's specifications and the aforementioned AWWA Specifications. The Contractor shall furnish for approval certification from the pipe manufacturer that all tests have been performed with satisfactory results. Pipe shall not be installed without the Engineer's or the Town of Williston Fire Department's approval.

b. Pipe, fittings, and accessories shall be carefully handled to avoid damage. Prior to the date of acceptance of the project work by the Owner, the Contractor shall replace any new pipe or accessory found to be defective at any time, including after installation, at no expense to the Owner. All installation and testing shall be done in accordance with AWWA Standard C600-93 and ANSI Specification A21.11.

c. All pipe showing cracks shall be rejected. If cracks occur in the pipe, the Contractor may, at his own expense and with the approval of the Engineer, cut off the cracked portions at a point at least 12 inches from the visible limits of the crack and use the sound portion of the pipe. Conductivity wedges shall be installed at all joints. Three per joint (min.)

d. All pipe and fittings shall be cleared of all foreign matter and debris prior to installation and shall be kept clean until the time of acceptance by the Owner.

e. At all times, when the pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed. The pipe shall be installed in trenches and at the line and grade shown on the Contract Drawings. Any deflection joints shall be within the limits specified by the manufacturer.

f. All piping and appurtenances connected to the equipment shall be supported so that no strain will be imposed on the equipment. (If the equipment manufacturer's specifications include that piping loads are not to be transferred, the Contractor shall submit certification of compliance).

g. Concrete thrust blocks shall be installed on all plugs, tees, and bends deflecting 11 1/4 degrees or more. Care shall be taken to ensure that concrete will not come in contact with flanges, joints, or bolts. The required area of thrust blocks are indicated on the plans or shall be as approved by the Engineer.

h. A minimum 18 inch vertical separation between the outside pipe surfaces shall be maintained where force mains cross water mains. Force mains shall cross water mains at or near right angles with one full length of water pipe centered on the force mains so both end joints are at maximum separation from the force main. Special structural support for the water main and the force main may be required.

i. There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks which are supplied or may be supplied with a water that is, or may be contaminated.

j. All trenching safety standards shall be in conformance with all applicable State and Federal guidelines and as specified on the plans.

k. The Contractor shall, at all times, keep the trenches entirely free of water until all work is finished and trenches are ready for backfilling.

l. Valve boxes are to be installed on all buried valves. The boxes shall be cast iron with a minimum 5 1/4" diameter and long enough to extend from the valve to finished grade. The boxes shall enclose the operating nut and stuffing box of the valves. Valve boxes shall not transfer loads onto the valve.

Covers shall be close fitting and dirt tight with the top of the cover flush with the top of the box rim. Covers shall be marked "WATER" with an arrow indicating direction of opening.

m. Chlorination of the water service shall be conducted only after the service has been flushed and a clear stream is obtained as determined by the Engineer. All chlorination testing shall be done by an independent third party approved by the Engineer and the Town of Williston.

The Contractor shall furnish all labor, equipment, materials, and tools necessary to disinfect the pipe and appurtenances in accordance with the AWWA Standard for Disinfecting Water Mains C651-86 (tablet method not acceptable).

The method of disinfection shall be by the continuous feed method unless otherwise approved by the Engineer. After filling, flushing, and addition of chlorine solution, the chlorine concentration within the pipe shall be at least 10 mg/l. All disinfection shall be performed under the supervision of the Engineer. The disinfection process shall be deemed acceptable only after two samples of water from the flushed disinfected main show no evidence of bacteriological contamination.

n. The Contractor shall furnish all gauges, testing plugs, caps, and all other necessary equipment and labor to perform a pressure test. All pressure testing shall be done by an independent third party approved by the Engineer and the Williston Fire Department. The Contractor shall develop and maintain for two hours, 150 percent (150%) of the working pressure measured in pounds per square inch (200 psi – minimum). Failure to hold the designated pressure for the two hour period constitutes a failure of the section tested. No pipe installation shall be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND\sqrt{P}}{7{,}400}$$

Whichever is Less

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

S = Length of Pipe Testing
L = Allowable Leakage in Gals/HR
D = Nominal Diameter of Pipe (")
P = Average Test Pressure (psi)
N = Number of Joints in the Pipeline Tested

All testing shall be conducted in accordance with AWWA C600-93 latest revision.

o. If there is an area where a cover of five feet (5') cannot be maintained over the water line, the Contractor shall notify the Engineer (in writing) for a revised design.

p. All revisions affecting the water line must be approved by the Department of Environmental Conservation – Water Supply Division. As-Built plans shall be provided to the Water Supply Division and the Town of Williston Fire Department.

E. Sanitary Sewer

1. Description

This item shall consist of the excavation and backfilling required for the re-routing of the gravity sanitary sewer main, removal and disposal of replaced facilities, and installation of service connections. This work shall include all pipe, manholes, structures and other appurtenances necessary to complete the system indicated in the drawings. All sanitary sewer materials and construction of same shall be as shown on the contract drawings and shall meet the requirements of the Town of Williston Public Works Department.

2. Materials

a. PVC Sewer Pipe: PVC sewer pipe shall conform in all respects to the latest revision of ASTM Specifications D-3034 or F679, Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, SDR 35. Wall thickness of all PVC pipe shall meet ASTM Specifications for SDR 35 pipe. All pipe and fittings shall be clearly marked as follows:

- Manufacturer's Name and Trademark
- Nominal Pipe Size – 4"
- Material Designation 12454C PVC
- Legend "Type PSM SDR 35 PVC Sewer Pipe" or "PS 46 PVC Sewer Pipe"
- Designation ASTM D-3034 or F679

Joints shall be push-on type using elastomeric gaskets and shall conform to ASTM D-3212. The gaskets shall be factory installed. The pipe shall be furnished in nominal 13-foot lengths. Sufficient numbers of short lengths and full machine fittings shall be provided for use at manholes and connections. All connections will require the use of manufactured fittings. Field fabricated, saddle-type connections will not be considered acceptable.

3. Installation

a. Excavations shall be made at a point at least six inches (12" where trench is in ledge) below the pipe invert to accommodate the bedding material. All excavations are to be kept dry while pipe is being laid and until each joint and pipe have been inspected by the Engineer and approval given to commence backfilling operations.

b. The bell end of the pipe shall face upgrade at all times and be placed in such a position as to make the invert even when the succeeding section is inserted. Where required by adverse grading conditions, the Contractor shall fill any gully to make a suitable bedding for the sewer pipe. The fill shall be pneumatically or mechanically compacted to a 90 % dry density (95% in roads) as determined by the AASHTO-T-99, Method A (Standard Proctor) test, upon which the six inches (6") of bedding material shall be placed. Any pipe which is not laid to grade and alignment shall be re-laid to the satisfaction of the Engineer. The bedding material shall be placed and compacted on each side of the pipe to a height of one-half the pipe diameter for the full width of the excavated trench and as shown on the accepted plans.

c. Backfill shall consist of approved material placed in six-inch (6") layers with each layer being thoroughly compacted to not less than 95 percent of maximum dry density as determined by the ASSHTO-T-99 Standard Proctor by means approved by the Engineer.

No stones in excess of one and one-half inch (1 1/2") diameter shall be placed within two feet (2') of the outside of the pipe. Particular precautions shall be taken in placement and compaction of the backfill material in order not to damage and/or break the pipe. The backfill shall be brought up evenly on both sides of the pipe for its full length. Walking or working on the completed pipeline except as may be necessary in tamping or backfilling shall not be permitted until the trench has been backfilled to a height of at least two feet (2') on the top of the pipes. During construction, all openings to the pipe lines shall be protected from the entering of earth or other materials.

d. Leakage Tests and Allowances for Gravity Sewers: Prior to testing for acceptance, the pipe should be cleaned by passing through the pipe a full gauge squeegee. It shall be the responsibility of the Contractor to have the pipe cleaned.

Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to the plugged air installation until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding further.

The pipeline shall be considered acceptable when tested at an average pressure of 3.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe if:

i. the total rate of air loss from any section tested in its entirety between manhole cleanout structures does not exceed 2.0 cubic feet per minute; or

ii. the section under test does not lose air at a rate greater than 0.0030 cubic feet per minute per square foot of internal pipe surface.

The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe is not less than that computed according to the following table:

MINIMUM TEST TIME FOR VARIOUS PIPE SIZES

Diameter (Inches)	Time (Seconds/100 Feet)
4	18
6	40
8	70

e. Vacuum Test: This method of testing manholes for leakage involves the use of a device for sealing the top of the manhole cone section and pumping the air out of the manhole, creating a vacuum and holding this vacuum for a prescribed period of time. The procedure for this test is as follows:

1. All lifting holes and exterior joints shall be filled and painted with an approved non-shrinking mortar. The completed manhole shall not be backfilled prior to testing. Manholes which have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of the exfiltration leakage test.

2. All pipes and other openings into the manhole shall be suitably plugged in a manner to prevent displacement.

3. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

4. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of air shall then be stopped and the test begun.

5. The manhole shall pass this test if the vacuum holds at 10" Hg or drops no lower than 9" Hg within the following times:

Depth of 4' Diameter Manhole	Time: Minutes	Seconds
0' – 10'	2	0
10' – 15'	2	30
15' – 20'	3	0
20' – 25'	3	30

6. If the vacuum drop exceeds 1" Hg during the specified time periods, the manhole shall be resealed and steps 2 through 5 above repeated until the vacuum holds for the specified time.

7. After the manhole passes the vacuum test, it shall be backfilled carefully so that no leaks are created. If the manhole is disturbed in any way during backfill, it shall be vacuum tested according to steps 1 through 5 above. If the manhole fails the vacuum test, the Contractor shall test the manhole using the manhole exfiltration test.

8. The Contractor shall provide the Engineer with a written log of each manhole leakage test result.

9. Manholes shall be tested and accepted prior to building manhole inverts.

f. The Contractor shall be responsible for verifying the location and maintaining the integrity of all utilities shown on the plan.

g. The Contractor shall coordinate all construction with the Town of Williston and the Vermont Agency of Transportation.

Pressurization:

i. Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe.

ii. Air Removal: Before applying the specified test pressure, air shall be expelled completely from the pipe valves.

iii. Examination: All exposed pipe, fittings, valves and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings or valves that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated.

Leakage Test: A leakage test shall be conducted concurrently with the pressure test.

i. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

ii. Allowable Leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND\sqrt{P}}{7400}$$

S = Length of Pipe Testing
L = Allowable Leakage in Gals/HR
D = Nominal Diameter of Pipe (")
P = Average Test Pressure (psi)
N = Number of Joints in the Pipeline Tested

F. Underground Utilities

For underground electrical and telephone (cable) services, the Contractor shall trench, place bedding, place conduit, and backfill in accordance with the utility company's requirements.

REVISIONS	BY

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PROJECT # IM-BLDG(4)
WILLISTON VERMONT

DRAWN	CCE
CHECKED	PD
SCALE	NONE
DATE	01/16/01
JOB NO.	93114
SHEET	C16sb