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PREFACE

This manual, entitled "Bolton Public Works Specification", is intended to serve a long-established need. Its major usefulness lies in the design and construction of streets, storm sewers, and related work. These specifications are also supplemented by the Town of Bolton Zoning Ordinance, Sewage Ordinance, Access Permit Regulation and other State and Federal regulations.

It is applicable to any new construction and to many aspects of reconstruction due to obsolescence or deterioration. Variations from these specifications and details will not be permitted unless supplemental specifications or special provisions are included in the proposed work. In cases where the design of a facility is not governed by these specifications and details, the latest design methods shall be used and included on the plans for acceptance by the Officials of the Municipality. It shall be policy that all engineering design be based on the latest methods and technology when determining sizes, strengths, and amounts. All plans and specifications shall have a note stating, "All work to be performed in accordance with the Town of Bolton Public Works Specification."

Acknowledgements are due: Mr. Andre' R. Nadeau, C.E., the former Director of Public Works for the Town of Essex and the Village of Essex Junction for the use of his specifications and standards as prepared for those communities;

The Village of Essex Junction, the Town of Jericho, the Town of Colchester, and the Town of Shelburne for the use of their Public Works Specifications;

Dennis Lutz, P.E., the Director of Public Works for the Town of Essex, for the use of Town specifications.

The State of Vermont, Agency of Transportation, for the use of their Standard Specifications for Construction.

Leonard Lamoureux, P.E.
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BOLTON PUBLIC WORKS SPECIFICATIONS - TABLE OF CONTENTS

GENERAL SPECIFICATIONS

	<u>Page</u>
1.0 Introduction	1
1.1 Basic Design Standards	3
1.2 Engineering Plans	5
1.3 Development Traffic Studies	6
1.4 Plan Approval for Construction	7
1.5 Project Bond/Highway Letter of Credit	7
1.6 Work to Conform	8
1.7 Protection of Work Persons and the Public	8
1.8 Protection and Repair of Existing Utilities	9
1.9 Reconstruction of Existing Utilities	9
1.10 Permits	9
1.11 Work Outside Owned Property Limits or Within Public Right of Way	9
1.12 Supervisors on the Job Site	10
1.13 Construction/Warning Signs	10
1.14 Maintenance and Protection of Traffic	10
1.15 Pre-Construction Meeting	11
1.16 Testing and Inspection Requirements	11
1.17 Submittal of Record Drawings	13
1.18 Special Controls	15
1.19 Other Referenced Standards	17
1.20 Other Miscellaneous Requirements	18

STREETS

2.0 General	19
2.1 Excavation for Roadways	19
2.2 Controlled Blasting, Earth and Rock Removal	19
2.3 Embankments	28
2.4 Geotextile Fabric	30
2.5 Underdrains	30
2.6 Sand	32
2.7 Gravel Base - Bottom Course	33
2.8 Gravel Base - Top Course	34
2.9 Bituminous Concrete (Asphalt) Pavement	35
2.10 Portland Cement Concrete Pavement	37
2.11 Cement Concrete Curb	45
2.12 Cement Concrete Sidewalk	47

BOLTON PUBLIC WORKS SPECIFICATIONS - TABLE OF CONTENTS

	<u>Page</u>
2.13 Cement Concrete Driveway Aprons	48
2.14 Bituminous Concrete Driveway Aprons	49
2.15 Street Guard Rail	51
2.16 Street Sideline Monuments	51
2.17 Planting of Trees	52
2.18 Street Name Signs	52
2.19 Street Lighting	53
2.20 Landscaping	53

STORM DRAINAGE

3.0 General	55
3.1 Materials	55
3.3 Construction Methods	56

APPENDIX I

List of Illustrations	59
-----------------------	----

APPENDIX II

Forms	81
-------	----

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

1.0 INTRODUCTION

This document details the requirements for all new construction as well as reconstruction projects involving roads and ancillary infrastructure within the Town of Bolton.

The standards are considered minimum acceptable standards and deviation from the specifications and details will not be permitted unless the deviation provides a higher degree of reliability than the specified minimum. The acceptability of any deviations from these specifications shall be determined by the Town Engineer, subject to appeal to the Board of Selectmen.

In cases where the design of an item is not specifically covered by these specifications and details, the submittal of such an item shall include sufficient information for a determination of acceptability by the Town Engineer. At a minimum, the information will include a description of the item, detailed materials information or reference to universally recognized standards (AWWA, ANSI, etc.), a description of the methods to be used for construction and any testing necessary to verify the quality of the installation. The Town Engineer may also require a list of locations and contact personnel where the item has previously been installed or the procedure used. It is not the intent of this document to prevent alternative solutions; however, the burden of proof for acceptability of alternate solutions lies with the proponent.

The primary purpose of this document is to establish a uniform level of quality for all infrastructure within the Municipality and to reduce the engineering time necessary for review of all proposed improvements. Plan submittals on new improvements will not be required to duplicate the contents of these standards providing these standards are referenced on submitted plans and further, providing a copy of the standards are physically available at the construction site.

It should be noted that all projects involve a degree of uncertainty, especially with regard to subsurface conditions. Adherence to these minimum Municipality standards does not guarantee acceptance on the part of the Municipality for the final installation. When unexpected subsurface conditions are encountered, the contractor must report the changed conditions to the design/project engineer who in turn reports the situation to the Municipality before the work is allowed to proceed. A review will be made of conditions and if necessary, site specific changes to the plans will be determined which will likely exceed the Municipality's minimum standards. Providing the installation is then constructed on the basis of the revised and approved standards and all installations meet the required tests, Municipality acceptance will follow.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

With regard to the reconstruction of existing facilities, it is the goal of the Municipality to make improvements over time to update the Municipal infrastructure to the standards outlined in this manual. The timing and implementation of improvements is not included in the Public Works Specifications.

Within the Public Works Specifications, the terms contractor, developer, design/project engineer, town, municipality, and town engineer are used. In this document, they are defined as follows:

TOWN, means Municipality.

CONTRACTOR, means the party actually responsible for performing the construction activity.

DEVELOPER, means the individual, partnership, corporation or authorized agent developing a parcel or parcels of land.

The **DESIGN/PROJECT ENGINEER** is a Vermont registered professional engineer experienced in the design of streets and appurtenances, sewer and water systems and/or stormwater systems, hired by the developer to perform planning, design and construction related engineering services.

The **TOWN ENGINEER** is the individual appointed by the Town to perform the duties of this position.

The Public Works Specifications shall become effective upon adoption by the Board of Selectmen. All construction within the Town which takes place subsequent to the adoption shall conform to the requirements of this document. Appeals on the denial of waivers for plans approved prior to adoption are subject to review by the Board of Selectmen.

Utilization of this document by any party does not constitute a liability on the part of the Town or the Town Engineer.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

1.1 BASIC DESIGN STANDARDS

All new proposed streets, utilities, and other public improvements shall be designed and constructed in accordance with the minimum, nationally accepted standards and practices as well as these *Public Works Specifications*.

The minimum width of rights-of-way, measured from property line to property line shall not be less than sixty feet (60'). Street grades shall not exceed ten percent (10%). In no case shall a grade of ten percent (10%) be longer than three hundred feet (300'). Street grades longer than three hundred feet (300') shall have a maximum grade of eight percent (8%). The minimum grade shall not be less than one-half of one percent (0.5%). The maximum grades within one hundred feet (100') of the centerline intersection of two streets shall not be greater than three percent (3%).

The width of the bituminous concrete wearing course surface of any curbed street may not be less than thirty feet (30'), and the width of bituminous concrete or concrete wearing course of any non-curbed street shall not be less than twenty-four feet (24'). All new public streets will be paved. The municipality may require sidewalks and/or bike paths in new developments. The minimum width of sidewalks shall be four feet (4') and the minimum width of bike paths shall be six feet (6').

Any street lines within a block deflecting from each other at any one point shall be connected with a curve the radius of which at the centerline shall not be less than one hundred fifty feet (150') for minor streets and two hundred fifty feet (250') for collector streets.

Street corners shall have a minimum curb or edge of pavement radius of not less than twenty feet (20'). Commercial, industrial, or major residential streets or drives shall have a minimum curb or edge of pavement radius of not less than thirty feet (30').

Every change in grade shall be connected by a vertical curve constructed so as to afford a minimum sight distance of two hundred fifty feet (250').

A tangent of at least fifty feet (50') in length shall be introduced between reverse curves on all proposed streets.

Street intersections with centerline offsets of less than two hundred feet (200') shall not be allowed.

Street intersections shall be at right angles and no intersection shall be at an angle of less than 80 degrees.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

A cul-de-sac is a street terminating in a turn-around at one end. Cul-de-sac streets shall be permitted; however, the length of a cul-de-sac shall not exceed ten times the minimum required lot frontage for the district(s) involved or maximum of one thousand eight hundred feet (1,800'). All dead-end streets shall have a cul-de-sac.

The turn-around on a dead-end street (cul-de-sac) shall have a minimum diameter of right-of-way of one hundred twenty feet (120') and a minimum outside diameter of the paved traveled way of one hundred feet (100'). The number of dwelling units served by a cul-de-sac or by a system of streets sharing a common, single access shall not exceed 50 unless additional connections to other public streets are approved by the Town after consultation with the Municipal Engineer.

Where the subdivision borders on an existing road or an abutting developable parcel of land and when the Municipality determines that a realignment or widening of the road or a future road right-of-way would be in the public interest, the Municipality may require that such areas be shown and marked on the Final Property Plat "Reserved for Road Alignment and/or Widening Purposes or Future Road". Areas shown in this manner shall be dedicated to the Municipality. Subdivisions with 50 or more existing or new lots or dwelling units shall have more than one public street connection to other existing public streets.

No street shall be approved unless its elevations are above the elevation of the historic flood or record (100 year flood elevations).

Driveway and street culverts at a minimum diameter of 18 inches shall be required at the entrance to new developments unless the Road Foreman, ~~Zoning Administrator,~~ ~~or Engineer~~ feels they are not needed. Each application for a Zoning permit shall show the location of the proposed driveway, and shall not be issued until completion of all conditions of the application. The maintenance of driveways and culverts shall be the responsibility of individual property owners or a homeowner's association.

The location of all driveway or street accesses, including those for individual single-family houses, shall be approved by the Road Foreman, Zoning Administrator, and Engineer. Single driveways serving up to two (2) dwellings may be permitted providing they are constructed to allow ingress and egress for emergency vehicles.

Any other type of access serving three (3) or more dwellings, or any commercial, retail, or industrial activities may be considered a public or private road and shall be developed in accordance with these Public Works Specifications.

Private roads, if approved by the Municipality, shall be developed to the same standards as public roads. Provisions for a possible future sixty foot (60') public roadway

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

shall be made, including locating any proposed structures with a minimum front yard set-back equal to that permitted in the Zoning Ordinance.

All road cuts in existing roads for new access drives, roads or utilities, shall be restored to original or better condition within one week of initial cut. The repair work shall be approved by the Road Foreman prior to release of any deposits by the Municipality. Restored road cuts shall be guaranteed by the applicant for a period of two years.

Prior to submittal of final drawings, soil borings and/or test pits shall be made by the developer at his expense to a depth of six feet (6') below final road grade surface on the basis of at least one representative test every 500' and at every change in soil type. Soil tests shall be performed by a soils laboratory acceptable to the Town on samples taken and the test shall consist of:

- 1) Standard sieve analysis and grain size distribution curve for each representative soil in the cross sections.
- 2) Plasticity index and liquid limit for each representative soil in the cross section.
- 3) The highest seasonal ground water elevation shall be determined.

The Town Engineer may waive the necessity for soil borings altogether or modify the spacing or depth requirements depending upon the specific ground water and soil characteristics at each proposed roadway.

The sampling and testing of all materials to be used in the construction of the project is the responsibility of the design/project engineer. Sufficient lead time must be established for acquiring the approvals of materials prior to placement.

1.2 ENGINEERING PLANS

At each stage of a project's development, engineering plans and documentation are required to determine project compliance with Town standards. The level of engineering detail required for approval generally increases with each stage of development approval. All engineering plans or documentation of an engineering nature submitted to the Town must be prepared by a Vermont licensed professional engineer.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

1.3 DEVELOPMENT TRAFFIC STUDIES

One of the major issues requiring resolution in the development of all projects is the traffic access and impact. The following guideline has been developed to assist in determining the need for and adequacy of traffic studies and impacts. Driveways and street intersections shall be designed to meet the latest standards or requirements of the State of Vermont Agency of Transportation and the Institute of Transportation Engineers for corner site distances.

A complete traffic study will be required for all commercial and industrial developments and/or expansions and for any residential project with 10 or more living units. All projects regardless of type or size will require a sight distance and safety analysis. Because each project is unique, the Municipality reserves the right to modify the guidelines accordingly.

1. The scope of the study shall include the impacts of project driveways and intersections, adjacent signalized and unsignalized intersections, and other locations as stipulated by the Planning Commission.
2. The analysis periods shall be
 - a. Base year - time of project or major phase completion.
 - b. Planning year
 - (1) If the project is fully completed in the base year - base year plus five years.
 - (2) If the project is not fully completed in the base year - base year plus five years or year of final completion, whichever is longer.
3. Study content
 - a. Listings of project development characteristics, trip generation rates, and related travel patterns.
 - b. Tabular summaries of existing, development, and combined vehicular volumes for the analysis periods.
 - c. Documented warrant evaluations for:
 - (1) Geometric needs in terms of 30th highest hour volumes.
 - (2) Signal needs in terms of average weekday volumes.
 - d. Traffic performance evaluations for all study locations in terms of 30th highest hour volumes for the selected analysis periods.
 - (1) Numerical measures of capacity.
 - (2) Level of service descriptions, delay and gap calculations.
 - e. Study of proposed driveway(s) features
 - (1) Sight distances
 - (2) Non-interfering approach speeds on the intersecting street or road.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

- (3) Acceptable spacings with respect to adjacent intersections and/or major driveways.
- (4) Recommend driveway configuration in terms of number and use of lanes, lane widths, and edge of pavement designs.
- f. Safety evaluation on main roadway or intersection at project driveway(s).
 - (1) Summary of accident characteristics for the past five years by:
 - a: Cause
 - b: Type
 - c: Severity
 - (2) Comparison of actual and critical accident rates.
 - a: Roadway - accidents per 1,000,000 vehicle miles.
 - b: Intersection - accidents per 1,000,000 incoming vehicles.
 - (3) Recommend improvements for any accident prone locations.
- 4. Summary of any recommended geometric and/or control improvements to provide proper traffic performance and safety.
- 5. Miscellaneous items as requested by the Planning Commission.
 - a. Facilities for pedestrians, bicyclists, and/or handicapped persons.
 - b. Evaluation of internal circulation.
 - c. Parking requirements.

1.4 PLAN APPROVAL FOR CONSTRUCTION

Upon receipt of acceptable final engineering plans, the Town Engineer will approve the plans for construction. Three sets of paper working drawings will be submitted. Prior to proceeding with construction, a pre-construction meeting will be required. Also, an estimate of the project cost must be submitted as part of the requirement for a project bond.

1.5 PROJECT BOND/HIGHWAY LETTER OF CREDIT

All of the public works improvements to be dedicated to the Municipality shall be guaranteed by a bond or letter of credit provided to the Municipality at no cost. The bond shall be in an amount sufficient to cover the total estimated costs of the improvements as approved by the Town Engineer. The bond shall be conditioned upon the satisfactory condition of the improvements for a period of three years, from the date of construction acceptance by the Municipality.

Prior to establishment of a satisfactory dollar value for the bond, the developer

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

shall submit an accurate construction estimate. The completed document shall be submitted to the Town Engineer for review and approval prior to posting of a bond or letter of credit.

1.6 WORK TO CONFORM

All materials, design and workmanship must meet with nationally accepted standards and practices as set forth in Section 1.19 and all applicable standards of the Municipality. The Municipality recognizes the State of Vermont Agency of Transportation Standard Specifications for Construction, latest edition as a supplemental source for standards not detailed in the Municipality specifications. Where a conflict arises between the published standards established in this manual and other published standards, the published standards of the Municipality shall take precedence.

During the progress of construction and upon completion, all work shall conform to these standards and the lines, levels and grades as indicated on plans approved by the Municipality. Field revisions necessitated by the conditions of the site must be approved by the design/project engineer and the Municipality prior to acceptance of the completed work. The work shall be performed in a thoroughly substantial and workmanlike manner.

1.7 PROTECTION OF WORK PERSONS AND THE PUBLIC

Work persons and the public shall be protected by the contractor, from any and all hazards connected with the construction work. Open trenches, materials, or equipment within the working limits of the public right of way are to be guarded by the use of adequate barricades or flag persons. All barricades left in position overnight are to be properly lighted. Kerosene pots are not acceptable. When work narrows the useable pavement, flag persons shall be employed to aid the flow of traffic so that there will be no undue delays. The contractor shall be held responsible for the safety of all work persons and the general public and all damages to property otherwise growing out of a failure on the part of the contractor to protect persons or property from the hazard of open trenches, materials, or equipment at any time of the day or night within the working area. All work shall be in conformance to applicable VOSHA regulations.

1.8 PROTECTION AND REPAIR OF EXISTING UTILITIES

The contractor shall notify Dig-Safe prior to any excavation in the public right of way or utility easement limits. In addition, the Municipal office shall be contacted forty-

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

eight hours prior to any scheduled work within the limits of the public right-of-way. Wherever culverts, sewers, drains, manholes, catch basin connections, water mains, valve chambers, electric conduits, telephone conduits, utility poles, overhead lines or other existing facilities are encountered they shall be protected and firmly supported by the contractor at his/her own expense, by methods approved by the design/project engineer, until excavation is backfilled and the existing structures are made secure. Injury to any such structures caused by or resulting from the contractor's operations, shall be repaired at the contractor's expense within a time period that will not place an unreasonable burden on the users. The authority having charge of any particular underground structure shall be notified promptly of injury to its structure.

Pipes or other underground structures encountered in excavating or trenching shall be permanently supported by methods acceptable to the Municipality.

1.9 RECONSTRUCTION OF EXISTING UTILITIES

In case it shall become necessary to remove or reconstruct any water main, electric conduit, telephone conduit, any connections thereto, or any appurtenant structures, approval for relocation shall be obtained from the appropriate party prior to relocation. The contractor shall be responsible for the work and for providing notice to users before interrupting service. Unless specifically provided for by written agreement, reconstruction of the utilities shall be at the contractor's expense. In no case shall the contractor move, change or repair any water main, electric conduit, telephone conduit, or any underground cables, conduits or structures, without permission of the Municipality and the utility owner and until they are satisfied that adequate warning to the users has been provided.

1.10 PERMITS

It shall be the contractor's responsibility to obtain all federal, state, regional, local or utility company permits necessary for the construction of the project prior to initiation of construction. The contractor is also responsible for maintaining these permits in force during the length of the contract and for taking all required actions to comply with the content of the permits.

1.11 WORK OUTSIDE OWNED PROPERTY LIMITS OR WITHIN PUBLIC RIGHTS OF WAY

The contractor shall not, without written consent of a property owner enter or occupy with persons, tools, materials, or equipment, any private land without written

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

consent of the property owner. In a similar manner, no excavation shall take place within the public right of way without first obtaining authorization from the Municipality or State, as applicable.

1.12 SUPERVISORS ON THE JOB SITE

The contractor shall be responsible for ensuring that there is a supervisor or responsible individual with the authority to make decisions for the contractor under his/her direct employ on the job site at all times that construction is underway, whether or not the construction is being accomplished by a prime contractor or subcontractors hired by a prime contractor.

1.13 CONSTRUCTION/WARNING SIGNS

Construction approach signs shall appear at each end of a public highway under construction and on all intersecting public highways. The exact placement of any sign will depend upon the alignment of the highway and the character of the roadside. The location, measurements, and minimum spacing shall comply with Section E plans of the State of Vermont design standards.

The design of the signs shall conform with the standards prescribed in the Manual on Uniform Traffic Control Devices prepared by the National Joint Committee on Uniform Traffic Control Devices.

The signs shall be of metal, wood, plywood, hardboard, or any other material satisfactory to the Road Foreman or the Town Engineer. No material shall be approved that will deteriorate by exposure to the weather during the required life of the sign.

The signs shall be in place at the time the project officially commences. Each sign shall be erected in a neat and workmanlike manner and shall be maintained by the contractor.

1.14 MAINTENANCE AND PROTECTION OF TRAFFIC

The contractor shall provide uniformed traffic police or flagpersons necessary to maintain safe and adequate traffic flow.

The contractor shall, as conditions warrant, employ flag persons at any location on the project where his/her equipment or construction operations are such that they will

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

in any manner interfere with the movement or safety of the traveling public within the public right of way.

The cost of traffic police services deemed necessary by the Municipality, Town Engineer, or Police Department shall be paid for by the contractor.

The contractor shall notify the Town Engineer, police and fire departments at least 48 hours in advance of any need to close streets. The contractor shall work with the Municipality to establish a suitable alternate route, and shall at his/her own expense, provide and maintain suitable marked and well lighted detour signs.

The employment or presence of traffic flag persons or uniformed police does not relieve the contractor of responsibility or liability.

1.15 PRE-CONSTRUCTION MEETING

Prior to the start of construction or each phase of construction on larger projects, a pre-construction meeting will be held.

1.16 TESTING AND INSPECTION REQUIREMENTS

1. General

Proper construction requires field verification of materials and technique. All projects require either periodic or full time inspection by a qualified engineer or inspector experienced in the area of construction to be undertaken. Checklists and tests are required to be completed and filed on a timely basis.

Upon completion of the construction, the Developers' Project Engineer shall certify that required testing and inspection has been conducted and the project is in reasonable conformance with the approved plans on the form provided by the Municipality. The certification is required prior to acceptance of the project by the Municipality.

A final walk-through inspection will be made of the project by the Developer, the Project Engineer, a representative from the Town Board of Selectmen, the Road Foreman, and the Town Engineer.

When the final walk-through inspection is complete, all deficiencies corrected, drawings accepted, and the project certification is received, the Municipality will accept the construction and a warranty period will begin.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

2. Road Inspection Schedule

One (1) day notice for all inspections will be given to the Municipality and the Town Engineer.

A sample of all subbase and base materials will be tested by a testing lab approved by the Municipality in accordance with these Specifications. Sieve analyses shall be performed using the 1", #4, #40, #100, and #200 sieves for all base materials as required by the Town Engineer at the contractor's expense. Approximately 14 days should be allocated between submittal of material for testing and placement of the material.

The subbase and base material compaction will be tested by AASHTO-T-99, Method A (Standard Proctor) test in fill sections at minimum intervals of every 500 feet in length and two feet (2') of depth and changes in material. The responsibility for testing shall be the contractor's.

In addition to the standard Proctor test, a fully loaded tandem dump truck with a total weight not less than 24 tons shall be driven over the compacted subgrade and the depression left by the truck wheels shall be used by the design/project engineer to make a judgement on the acceptability or unacceptability of the subgrade.

The Town's Engineer will be notified 24 hours in advance to inspect the construction of any and all roads at the following phases of construction:

- Preparation of subgrade;
- Installation of subbase and base material;
- Completion of finished grading;
- During the placement of the base coat of asphalt;
- During and after the placement of the top coat of asphalt.

The Municipality's authorized representative will inspect work during the placement of curbs, sidewalks, and driveway aprons.

A final inspection will be made after the completion of all roads, curbs, driveways, sidewalks, bicycle paths and setting of all pins and monuments for lots and street rights-of-way. The following roadway general checklist will be used at final inspection:

- Settlement, depression, or imperfections in finish surface;
- Seeding and erosion control on cut and fill slopes;
- Surface drainage (during rainstorm);
- General appearance;

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

Material testing results, lab reports, and record drawing complete and on file.

3. Storm Drainage Systems

No backfilling shall occur until the installation of storm drains and culverts is inspected and approved by the Engineer or Road Foreman.

The Engineer or Road Foreman shall inspect and approve all storm drain and culvert joints and connections to catch basins.

All storm drainage facilities will be inspected upon completion of the project using the following checklist:

1. Catch basins, manholes, and pipelines clean;
2. Ditches and outlets clean;
3. Erosion control measures completed;
4. General appearance; and
5. Material testing results, lab reports, manufacturer's certificates, and record drawings complete and on file.

1.17 SUBMITTAL OF RECORD DRAWINGS

1. General

Record drawings shall be produced for all construction projects and should include the following information.

a. Roads

Accurate locations and elevations of all streets and storm drain lines, culverts, and other facilities; including

- Width of pavement from curb to curb or shoulder to shoulder;
- Right of way dimensions for streets;
- Width of sidewalk and bike paths;
- Location of street lights;
- Location of driveways;
- Location and size of planter islands, if any;
- Typical cross-section of streets as installed;
- Location of all underground electric and telephone lines.
- Street monuments.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

b. Water

Accurate locations and elevations of all water lines.

Measurement to within 1' from all valves and curb stops, from permanent fixtures such as telephone poles, hydrants, buildings, transformers, etc., along with depths of waterlines. Three point tie measurements to the closest building or structure is required.

All curb boxes will be marked with stakes so contractors can easily locate them before building services are connected.

c. Sewer

Accurate locations of all sewer lines.

Accurate measurements to all tees and/or wyes for building connections (shown on tie drawings.)

Location of building connections at property line and depth and location of all manholes (shown on tie drawings).

Invert and manhole cover elevations, distances between manholes, size of pipe in manholes, and pitch of pipe.

d. Storm drainage

For storm drainage facilities, the following shall be shown:

Depth, size, location and type of all storm drain lines and culverts, including underdrains and services;

Location and elevations of all catch basins;

Location and details for all storm drainage facilities such as detention ponds;

Location of all drainage ways, water courses, etc;

After the initial set of record drawings have been submitted, there will be a field inspection by the Municipality to verify that the hydrant, valve boxes, curb boxes, etc., are properly raised to ground level.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

e. Final drawings

A final set of record drawings, including one set of mylar reproducible and two sets of prints, shall be submitted to the Municipality within 60 days of the completion of a project or project phase. The final set of the project record drawings shall be stamped by the design/ project engineer. The record drawings shall also contain a stamped and signed statement by a licensed Land Surveyor that all property corner markers have been set in accordance with the approved property plat.

1.18 SPECIAL CONTROLS

1. Dust Control:

The contractor shall be responsible at his/her own expense for ensuring that the dust created as a result of construction activities does not create a nuisance or a safety hazard. Where and when deemed necessary by the Municipality, the contractor will be required to wet sections of the construction area with water, or apply calcium chloride, or sweep the roadway with a wetted power broom as dust control measures.

2. Water Control:

The contractor shall take all necessary measures to handle all water in excavations and shall furnish all materials and equipment and shall do all incidental work to keep the excavation entirely clear of water while pipelines, structures, and their foundations are being built. The contractor shall be responsible for choosing the method for control of water and shall assume all responsibility for the adequacy of the methods chosen. No construction shall be undertaken if, in the opinion of the Municipality, adequate control of water is not assured.

3. Pollution Control:

During the construction period, the contractor shall exercise every reasonable precaution to prevent pollution of the waters of the State. Pollutants such as chemicals, paints, fuels, lubricants, bitumens, raw sewage, and other harmful waste shall not be discharged into or alongside these waters or into natural or man-made channels leading thereto. Applicable statutes and regulations of the Vermont State Agency of Natural Resources relating to the prevention and abatement of pollution shall be complied with.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

4. Erosion Control:

The contractor shall carry out his operations in such a manner to give adequate protection of water courses and minimize surface erosion.

Development or construction plans shall include detailed information on the proposed methods for erosion control. No work shall be started on areas which are highly susceptible to erosion, as indicated by the Municipality, or within existing drainage channels until the methods of erosion control to be employed on the project have been approved.

The Town Engineer has the authority to limit the surface area of erodible earth material exposed by excavation, borrow and fill operations and to order the contractor to provide immediate erosion control measures to prevent contamination of adjacent streams or other water courses, and areas of water impoundment. These measures shall include but not be limited to, haybale check dams, haybales for mulch, matting, and silt fencing. As the excavation proceeds, cut slopes shall be seeded and mulched to the extent considered desirable and practicable by the Municipality. The exposure of uncompleted cut slopes and embankments to the elements shall be as short as practicable. Seeding, mulching, installation of erosion control shrubbery or other designed treatment should be initiated promptly, and concurrently with the other work.

If and when conditions develop that will suspend construction operations for any appreciable length of time, the excavation and embankment areas shall be shaped in such a manner that the runoff of water may be intercepted and diverted to points where least erosion shall result. Slope drains shall be installed as soon as possible to assist in carrying this runoff. If these preventative measures should fail and an appreciable amount of material begins to erode into a river, stream and impoundment, the contractor shall act immediately to correct and prevent further erosion.

Erosion control measures shall be continued until the permanent drainage facilities have been constructed and until grass on seeded slopes or specially installed shrubbery is established sufficiently to be an effective deterrent against erosion.

Unless otherwise approved in writing, mechanized equipment shall not be operated in live streams except as may be required to construct changes in channel and permanent or temporary structures. Rivers, streams and impoundments shall, as soon as construction will allow, be cleared of all falsework, piling and debris caused by the construction operations.

The contractor shall perform all of the storm water and erosion control

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

specifications and details shown on the approved plans including installation, maintenance and removal of temporary dams and inlet protection.

1.19 OTHER REFERENCED STANDARDS

Standard Specifications for Construction, State of Vermont, Agency of Transportation, latest edition
Transportation and Traffic Engineering Handbook, ITE, latest edition
American Society of Testing Materials Standards
American Water Works Association Standards
American Concrete Institute Standards
Water Pollution Control Federation Standards
American Society of Civil Engineer Standards and Manuals of Practice
American National Standards Institute
National Plumbing Code
National Electric Code
Portland Cement Association Standards
New England Water Works Association
Ten States Standards on Water and Sewage
American Public Works Association Standards
VOSHA Safety and Health Standards
Town of Bolton Sewer Use Ordinance
New England Interstate Water Pollution Control Commission "Guides for the Design of Wastewater Treatment Works"
Public Water Supply Regulations of the State of Vermont

1.20 OTHER MISCELLANEOUS REQUIREMENTS

1. Traffic Control Devices

The developer shall be responsible for ensuring the erecting of all traffic control devices necessitated by the construction of the roadway.

Prior to completion of construction, the developer shall request a list from the Municipality of the required traffic control devices. The manual or uniform traffic control devices shall be the controlling document for installation of signs.

In the event other traffic control devices such as signals are warranted, according to the Manual of Uniform Traffic Control Devices (MUTCD), the developer shall be responsible for installing signalization at his own expense.

BOLTON PUBLIC WORKS SPECIFICATION - GENERAL

In addition, any road striping such as walkways, stop bars, median striping and the like shall be installed by the developer at his own expense.

2. Street Names

No duplicate, or near duplicate, names for streets or developments will be allowed. When a developer chooses names for any development, subdivision, street, or road, the proposed names shall be submitted in writing to the Zoning Administrator prior to the filing of the property plat in the land records. The Zoning Administrator shall review the proposed names with the Board of Selectmen. The final approval authority for all street names is the Board of Selectmen.

3. Street Numbers

Prior to submittal of the property plat for Municipality approval and recording, the developer shall obtain the street numbers for each building from the Town Assessor's Office. The final plans will include street numbers as well as lot numbers.

Within each development, the developer as a condition of sale of a lot or structure, shall ensure that street numbers are installed per the following:

The numbers shall be placed both on a United States Post Office approved mailbox at curbside and on the structure of the house at a point no more than two feet (2') away from the frame of the front door. The numbers shall be in the form of a minimum of two inch (2") high Arabic numerals and shall be on a color contrasting background.

4. Emergency Vehicle Access

In order to provide adequate emergency protection, any plans submitted for consideration to the Municipality multi-family, commercial or industrial buildings shall have suitable access provided for fire and emergency vehicles.

The need for a separate emergency access road for these buildings will be considered by the Municipality on a case by case basis.

If required, a separate emergency access road must be able to support the weight of a two-axle forty thousand pound (40,000#) truck. Preferred construction should be bituminous concrete, as per the specifications for paved public roadways although gravel roadways will be accepted if they conform to the weight specification above.

Emergency access roads must be passable year round.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

2.0 GENERAL

The developer is required to have a qualified engineer inspect the project during construction for the purpose of providing verification of materials and tests and to verify that the project was constructed in accordance with the approved plans.

2.1 EXCAVATION FOR ROADWAYS:

Sufficient topsoil shall be stripped from the areas to be filled or excavated to provide a minimum of four inches (4") of cover over all finished slopes. This material shall be stored in stockpiles on the site until completion of grading operations and then shall be spread uniformly over all finished slopes.

All excavating and filling required for construction of pavements, curbs, gutters, headwalls, drainage structures, and installation of pipe drains shall be as specified herein and as shown on the Plans. The entire area of work shall be brought to the required lines and grades by excavation or filling. Excavated material, if suitable, shall be used in making embankments, in filling the low areas of work, and at such places as may be required.

All earthwork shall be performed in accordance with Division 200 of the Vermont Standard Specifications for Construction, or as periodically amended.

2.2 CONTROLLED BLASTING, EARTH AND ROCK EXCAVATION

A. *DESCRIPTION OF WORK*

1. The work to be done under this section includes:

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

2. Protecting new and existing construction, workers, owner, and the general public from damage or injury from improper handling of explosives, flyrock, and excessive

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

ground vibrations.

3. Furnishing, installing, and implementing an audible warning system to indicate impending blasting and familiarizing workers, architect, owner, and the general public with the system implemented.
4. Conducting blasting monitoring as required to excavate rock utilizing the blast monitoring procedures and equipment specified in this Section.

B. DEFINITIONS

1. 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 excavate 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.
2. Earth: All excavated materials not defined as rock.
3. Flyrock: Fractured rock propelled through the air resulting from blasting if not prevented by use of blasting mats.
4. Geophone or vibration transducer: A sensor used to monitor ground vibrations (particle velocity components).
5. Grades or elevations: The design vertical levels to which excavation shall be conducted and thereby define the design vertical limits of excavation. The actual vertical limits of excavation will be determined by the amount of overbreak below the design grades after removal of overbreak and cleaning of the resulting rock surface as specified.
6. Overbreak: The excess amount of rock removed by and/or resulting from blasting outside beyond the A-line or below the design excavation grades indicated on the drawings.
7. 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.
8. Rock: Material which is geologically classified as intact, untransported rock, and requires systematic drilling and blasting for removal. Rock does not include

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

boulders or loose rock fragments less than one (1) cubic yard in volume.

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

C. QUALITY ASSURANCE

1. Qualifications

A. The Contractor shall refer, in this specification section, to a qualified professional licensed blasting contractor with a minimum of 5 years experience in the design, review, evaluation, and actual field experience in blasting operations. The blasting Contractor shall design, supervise, and conduct test blasts until regular production controlled blast patterns are developed that produce the required performance specified hereinafter while meeting the requirements for vibrations control. The Contractor 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 meeting the requirements of these Specifications. The Superintendent shall have a minimum of 5 years of experience in field blasting work.

B. 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 Contractor must submit a list of previous similar projects he and the field Superintendent have done. Drillers shall have demonstrated proficiency in collaring and drilling holes precisely.

2. Codes, Permits, and Regulations:

A. The Contractor shall comply with all applicable laws, rules, ordinances, and regulations of the Federal Govt., 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 additional cost to the owner. The Contractor shall comply with the following regulations:

1. Vermont Department of Labor and Industry and the Vermont Agency of Human Services as promulgated by the Occupational Safety and Health

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

Administration, United States Department of Labor, VOSHA Safety and Health Standards for Construction: "Subpart U-Blasting and the Use of Explosives" with amendments as of March 1, 1979, with any current revisions.

2. Code for the Manufacture, Transportation, Storage, and Use of Explosives and Blasting Agents (N.F.P.A. No. 495).

B. The Contractor shall obtain and pay for all permits and licenses required to complete the work of this Section.

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

3. Blasting Limit Criteria:

A. Peak Particle Velocity Limits:

1. The Contractor shall conduct all blasting in such a manner that the resulting peak particle velocity does not exceed 2.0 inch per second at the ground line adjacent to existing structures in the vicinity of the project.

4. Blasting Monitoring:

A. The Contractor shall monitor peak particle velocity resulting from all blast rounds fired for the project as required.

B. The Contractor shall permit the Engineer to utilize the Contractor's blast monitoring equipment to conduct a test calibration at any time during the blast monitoring.

5. Blast Monitoring Reports:

A. Following each blast, a Blast Monitoring Report shall be submitted to the Engineer within 24 hours of the blast as specified in this Section.

6. Blast Monitoring Instrumentation:

All instrumentation proposed for use on the project shall have been calibrated within the previous six (6) months to a standard which is traceable to the National Bureau

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

of Standards.

7. The Contractor shall cooperate with the Engineer in permitting observation of the Contractor's drilling and loading procedures, as well as in providing detailed information on blasting operations.
8. The Contractor 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 Town.

D. SUBMITTALS

1. Advance Submittals:

The Contractor shall submit the following information to the Engineer at least three (3) weeks prior to commencing drilling and blasting operations:

A. Sequence of blasting rounds indicating the general method of developing excavations.

B. Specifics of the proposed blasting procedures for round design to be implemented in each individual project area including control blasting technique(s) to be utilized to form the excavation perimeter:

1. Diameter, spacing, burden, depth, and orientation of each blast hole for each round design.
2. Nomenclature and amount (in terms of weight and number cartridges) of explosives and distribution of charge to be used within each hole, on each delay, and the total for the blast.
3. Nomenclature and type of detonators; delay pattern wiring diagram for the round: type and capacity of firing source, size, type, and location of safety switches and lightning gap.
4. Type and location of stemming to be used in holes.
5. Calculations of anticipated vibration levels at nearest adjacent structure.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

C. Methods of matting or covering of the blast area in open excavations to prevent flyrock.

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. Name and qualifications of the Superintendent responsible for directing the blasting. This submittal shall document by project lists and samples of blasting round design calculations that the Contractor and his personnel have the required experience in production and control blasting required to adequately and safely perform this work.

F. Details of an audible advance signal system to be employed at the job site as a means of informing workers, engineer, owner and the general public that a blast is about to occur.

G. List of instrumentation that the Contractor proposes to use to monitor vibrations.

H. 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.

I. Submit a shop drawing indicating the location(s), limits, and details of initial test blast(s) proposed by the Contractor to define the relation between charge weight per delay and peak particle velocity level.

3. Progress Submittals:

A. Within 24 hours following each blast, the Contractor shall submit to the Engineer a Blast Monitoring Report. Each Blast Monitoring Report shall include all of the following applicable items:

1. 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.
2. Blast Monitoring Location Plan.
3. General Blast Round Design Data including blast pattern, charge weights, and distributions, other pertinent information, and location.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

4. Copy of strip chart with calibration and monitoring record marked with the date, time, and location of the blast as well as the monitoring location.

B. Prior to changing the approved blast round designs, the Engineer shall be informed in writing as to the nature of the change and the reasons therefore. Changes shall be subject to the approval of the Engineer. Allow sufficient time for review.

C. In the event that the Contractor's design round results in ground vibrations which exceed the blasting limit criteria specified in this Section, the Contractor shall immediately revise the round design appropriately and submit the revised round design to the Engineer for approval.

D. Review by the Engineer of blast designs and techniques shall not relieve the Contractor 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.

E. The Contractor shall report to the Engineer in writing all blasting complaints received by the Contractor within 24 hours of receipt. Each blast complainant, time received, date, and time of blast complained about, and a description of the circumstances which led to the complaint.

E. JOB CONDITIONS

1. Blasting:

A. The Contractor shall comply fully with codes, permits, and regulations for the transportation, storage, handling, and use of explosives.

B. No blasting shall be permitted between the hours of 6:00 P.M. and 7:00 A.M. , and all day Saturday, Sunday, and legal holidays. The Contractor shall provide advanced warning prior to detonating a blast. The means of warning shall be acceptable to the Engineer.

C. Prior to construction, the Contractor shall have prepared by an independent consultant satisfactory to the Town, a 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 Contractor shall have prepared by the same independent agency, a survey addressing the structural integrity of the same structures and utilities.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

2. Vibration Control:

A. The Contractor shall monitor blasting vibrations for blast(s) during the course of the work as required.

B. Blasting operations shall be controlled to conform with the requirements in this Section.

C. If the data indicates that these requirements are not being met, 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.

D. The Contractor shall install a signal system between the location of the blasting machine or 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.

E. The Contractor shall be completely responsible for all damages resulting from the blasting operations and shall 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 additional cost to the Owner.

F. *SAFETY PRECAUTIONS*

1. Special Hazards:

The Contractor 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.

2. Clearing the Danger Area Before Blasting:

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 Contractor shall familiarize all personnel on the project, the Engineer, Town, 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.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

3. Explosives shall be stored, handled, and employed in accordance with federal, state, and local regulations and in accordance with N.F.P.A. No. 495 as referenced above.
4. No explosives, caps, detonators, or fuses shall be stored on the site during non-working hours until a permit has been obtained from the State and Municipality and submitted to the Engineer.
5. The 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 construction, or any property adjacent to the site.
6. Immediately after each blast, the sidewalls of rock excavations shall be scaled by experienced scalers to dislodge loose or shattered rock liable to fall. Previously excavated portions shall also be routinely tested and scaled.
7. 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 Contractor under or in connection with a project; and the Contractor 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 Contractor shall be responsible for and pay for any damage to adjacent structures resulting from work executed under this Section.

G. MONITORING PROCEDURE

1. Mount, place, and locate instrumentation as specified in this Section.
2. Align the axis of vibration measurement:
 - Axis 1: Vertical
 - Axis 2: Horizontal, radial direction to the blast location.
 - Axis 3: Horizontal, perpendicular to the radial direction.
3. Set the strip chart(s) speed in accordance with instrumentation manufacturer's recommendations.
4. Make a calibration strip chart before blast detonation in accordance with instrumentation manufacturer's recommendations.
5. Clearly label the strip chart with calibration levels, control settings, location, time, and

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

date of blast.

6. Coordinate closely with the blaster such that the strip chart is advancing at the time the blast is detonated.
7. During the measurement period, observe instrumentation to ensure that recorded vibrations correspond to blasting and not some other source.

2.3 EMBANKMENTS:

Embankments shall be constructed by the Contractor with either approved surplus excavated material or with approved material obtained elsewhere. The construction area shall be cleared of trees, brush, bushes, and shrubs and shall be grubbed to remove all stumps, roots, grass turf, debris, or other objectionable material.

All material resulting from clearing and grubbing shall be satisfactorily disposed of in a manner approved by the Engineer and in compliance with local ordinances. Under no conditions will this material be buried below the seasonal high groundwater.

When embankments are to be made on a hillside, the slope of the original ground on which the embankments are to be constructed shall be stepped and properly drained as the fill is constructed so that adverse movements of the slopes do not occur.

Placement of material other than rock shall stop when the sustained air temperature, below 32 degrees Fahrenheit, prohibits the obtaining of the required compaction. If the material is otherwise acceptable, it shall be stockpiled and reserved for future use when its condition is acceptable for use in embankments.

When an embankment is to be constructed across a swamp, in muck, or in areas of unstable soils, the unsuitable material shall be excavated to reach soils of adequate bearing capacity and the embankment begun. Alternative methods, such as use of a filter fabric in place of excavation and backfill, may be utilized only after approval of same by the Engineer.

Material being placed in embankments shall be placed in horizontal layers of uniform thickness across the full width of the embankment. Stumps, trees, rubbish, and other unsuitable material shall not be placed in embankments.

The layers shall begin at the deepest part of the fill. Material shall be placed in six inch (6") lifts with a 95 percent maximum dry density by the AASHTO-T-99, Method A

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

(Standard Proctor) test. Effective spreading equipment shall be used on each layer to obtain uniform thickness prior to compaction. Each layer shall be kept crowned to shed water to the outside edge of the embankment, and continuous leveling and manipulating will be required to assure uniform density.

The entire area of each layer of each layer shall be uniformly compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors, or a combination thereof. Earthmoving and other equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment.

All fill material shall be compacted at a moisture content suitable for obtaining the required density. In no case shall the moisture content in each layer under construction be more than three percent above the optimum moisture content, and in no case shall it be less than that quantity that will cause the embankment to become unstable during compaction.

Sponginess, shoving, or other displacement under heavy equipment shall be considered prima facie evidence for an engineering determination of lack of stability under this requirement, and further placement of material in the area affected shall be stopped or retarded to allow the material to stabilize.

When the moisture content of the material in the layer under construction is less than the amount necessary to obtain satisfactory compaction by mechanical compaction methods, water shall be added by pressure distributors or other approved equipment. Water may also be added in excavation or borrow pits.

The water shall be uniformly and thoroughly incorporated into the soil by disc, harrowing, blading, or by other approved methods. The manipulation may be omitted for sands and gravel. When the moisture content of the material is in excess of three percent above the optimum moisture content, dry material shall be thoroughly incorporated into the wet material; or the wet material shall be aerated by disking, harrowing, blading, rotary mixing, or by other approved methods; or compaction of the layer of wet material shall be deferred until the layer has dried to the required moisture content evaporation.

Upon completion of filling and excavating, the subgrade shall be formed to the required grade and contour; and the entire surface should again be rolled as specified above. High spots shall be removed and low spots filled with acceptable material, and the process of leveling and rolling continued until no further depression results. Approval of the Engineer shall be necessary prior to placing of gravel bottom course.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

2.4 GEOTEXTILE FABRIC:

Where required on the plans or where directed by the Engineer, the Contractor shall provide and install geotextile fabric over the subgrade or prior to placement of fill, for slope reinforcement, under the gravel base, around drains, or as used for sedimentation control. Soil reinforcement fabrics used over the subgrade or prior to the placement of fill or the gravel base shall be Mirafi 500X as manufactured by Mirafi, Inc., or an approved equal. Prior to the placement of the fabric, the surface shall be smoothed to remove all objectionable material which could damage the fabric.

Where more than one width of fabric must be employed, the edges shall be overlapped to establish approximately two feet (2') at the edges and joined by an overlapped strip to the ground surface with a six inch (6") minimum U-shaped wire pin, a single-shaft steel pin with metal-disc fasteners, or similar devices. Fasteners should be placed six feet (6') apart on the overlap. Immediately after the placing of the fabric, a four inch (4") bedding blanket of gravel shall be carefully placed over the fabric so as to protect the fabric from damage.

Geotextile grid fabrics as used for slope reinforcement shall be Tensar SR1 as manufactured by Tensar Corp., Miragrid 5T as manufactured by Mirafi, Inc., or an approved equal.

Filter fabrics used in underdrains, channels, or streams, shall be Mirafi 140N as manufactured by Mirafi, Inc., or an approved equal. Fabric should be overlapped in the direction of the water flow. Toeing may be required to ensure that the fabric remains in place.

Fabrics used for sedimentation control shall be Envirofence or silt fence as manufactured by Mirafi, Inc., or an approved equal. The fabric shall be toed in a minimum of six inches (6"). Wood or metal posts extending the full height of the fabric and eighteen inches (18") below the fabric shall be installed a minimum of every eight feet (8').

2.5 UNDERDRAINS:

A. *DESCRIPTION*

This item shall consist of constructing underdrains using pipe, stone, filter fabric, underdrain outlets, clean outs, and risers in accordance with these specifications and a

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

shown on the accepted drawings or as ordered by the Engineer.

B. MATERIALS

Perforated Polyvinyl Chloride (PVC): PVC SDR35 pipe shall conform to AASHTO M278 and ASTM F75B. For pipe sizes 4", 6", and 8" perforations shall be 1/4" diameter holes, 3 1/4" on center, with a total of 4 rows spaced at 90 degrees and 150 degrees. For pipe sizes 10" and larger perforations shall be 1/4" diameter holes, 3 1/4" on center, with a total of 6 rows spaced at 90 degrees, 125 degrees, and 160 degrees.

Perforated Corrugated Steel Pipe: Pipe shall conform to AASHTO M36. Minimum sheet metal thickness required is 0.052 inches for six inch diameter underdrain and 0.064 inches for eight inch diameter or larger. For pipe sizes 4", 6", and 8" perforations shall be 1/4" diameter holes, 3 1/4" on center, with a total of 4 rows spaced at 90 degrees and 150 degrees. For pipe sizes 10" and larger perforations shall be 1/4" diameter holes, 3 1/4" on center, with a total of 6 rows spaced at 90 degrees, 125 degrees, and 160 degrees.

Perforated Corrugated Aluminum Alloy Pipe: Pipe shall conform to AASHTO M196. For pipe sizes 4", 6", and 8" perforations shall be 1/4" diameter holes, 3 1/4" on center, with a total of 4 rows spaced at 90 degrees and 150 degrees. For pipe sizes 10" and larger perforations shall be 1/4" diameter holes, 3 1/4" on center, with a total of 6 rows spaced at 90 degrees, 125 degrees, and 160 degrees.

Stone: Stone fill shall be clean, durable, three-fourths inch to one and one-half inch (3/4" to 1 1/2") stone.

Filter Fabric: The fabric shall be Mirafi 140N or equal with an effective opening size (EOS) no larger than a #100 sieve (.0059 inches) and a porosity of at least 100 gal/min/sf.

C. CONSTRUCTION METHODS

Trenches for underdrain shall be excavated to the dimensions and grade shown on the plans or as ordered by the Engineer. Stone fill shall be placed to a depth of six inches (6") below the bottom of the pipe in conformity with the lines and grades shown on the plans or as directed by the Engineer.

Underdrain shall be placed in the center of the trench and firmly embedded in the material. The underdrain trench shall be backfilled to the gravel road base with

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

three-fourths inch to one and one-half inch (3/4" to 1 1/2") clean stone. Placing shall begin at the outlet end and shall proceed toward the upper end. The under-drain shall be placed with perforations down unless otherwise ordered by the Engineer.

The joints between sections shall be made by fitting the ends as tightly as practicable. Corrugated steel or aluminum alloy underdrain shall be joined with an approved coupling. PVC plastic underdrain shall be suitably joined with approved fittings by the same manufacturer. Upgrade ends of all underdrain pipe installations shall be closed with suitable plugs to prevent entry of soil material.

Underdrain cleanouts, of the length shown on the plans, and cast iron covers shall be installed at locations shown on the plans or as directed by the Engineer. Pipes used in an underdrain system placed at road crossings, outlets, or as directed by the Engineer shall be placed on a firm bed and joined in the same manner as underdrain. Unless other-wise directed, non-perforated pipe shall be used.

Backfill material shall not be placed directly in the trench by dumping from haul vehicles or by pushing material into trenches by bulldozers, graders, or other equipment. Placing shall be limited to the use of hand shovels, backhoes, front-end loaders, or other similar types of equipment.

Filter fabric shall be placed in the trench around the stone fill with a twelve inch (12") fabric overlap at the top (see underdrain detail).

2.6 SAND:

A. DESCRIPTION

This item shall consist of a subbase course of sand as approved by the Engineer and constructed on a prepared subgrade in accordance with the sections as shown on the accepted drawings.

B. MATERIALS

Sand shall consist of material free from silt, loam, clay, or organic matter. It shall conform to the Vermont Standard Specifications for Construction for sand cushion, # 703.03. It shall be obtained from approved sources and shall meet the requirements set forth in this table:

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

Sieve Designation	Percentage By Weight Passing Square Mesh Sieve
2"	100
1 1/2"	90 - 100
1/2"	70 - 100
#4	60 - 100
#100	0 - 20
#200	0 - 8

2.7 GRAVEL BASE - BOTTOM COURSE:

A. *DESCRIPTION*

This item shall consist of a base course composed of bank run gravel and filler as approved by the Engineer and constructed on a prepared subgrade in accordance with the sections as shown on the accepted drawings.

B. *MATERIALS*

All materials shall be secured from approved sources. Such gravel shall consist of hard, durable stones, which show uniform resistance to abrasion and which are intermixed with sand or other approved binding material as directed by the Engineer. It shall meet the requirements of Vermont Standard Specification for Construction, # 704.04, Gravel for Subbase, or as periodically amended. The gravel shall be uniformly graded from coarse to fine and shall meet the grading requirements set forth in this table:

Sieve Designation	Percentage By Weight Passing Square Mesh Sieve
#4	60 - 100
#100	0 - 20
#200	0 - 8

All bottom course material shall be deposited and spread so as to distribute the

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

material in uniform layers, compacted at optimum moisture content; and the maximum size stone particles shall not exceed two-thirds (2/3) of the thickness of the layer being placed.

C. PREPARATION OF SUBGRADE

The subbase material shall be placed on a prepared surface with an approved spreader box or by use of some other approved mechanical spreading equipment. The material shall be deposited so as to meet the requirements of the Vermont Standard Specifications for Construction, Section 301, or as periodically amended, and compacted to a 95 percent dry density by the AASHTO- T-99 Method A (Standard Proctor) test. If necessary, where there is high groundwater or frost susceptible soils, subbase fabric and underdrains shall be installed beneath the roadway as specified by the Engineer or as shown on the street details of these specifications.

2.8 GRAVEL BASE - TOP COURSE:

A. DESCRIPTION

This item shall consist of an upper course of crusher run gravel to be placed over the bottom course of bank run gravel, which will have been prepared in accordance with these specifications. This upper course shall conform to the following specifications and be placed in accordance with the lines, grades, and typical cross-sections as shown in the accepted drawings. Material shall meet Vermont Standard Specifications for Construction, Item # 704.05, Crushed Gravel for Subbase, or as periodically amended.

B. MATERIALS

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, or other objectionable matter. The grading requirements shall conform to the following table:

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

Sieve Designation	Percentage By Weight Passing Square Mesh Sieve
2"	100
1 1/2"	90 - 100
# 4	30 - 60
# 100	0 - 12
# 200	0 - 6

This upper course of crushed gravel shall be deposited and spread in a uniform layer and compacted to a 95 percent dry density by the AASHTO-T-99 Method A (Standard Proctor) test.

2.9 BITUMINOUS CONCRETE (ASPHALT) PAVEMENT

A. DESCRIPTION

This type of pavement shall be composed of mineral aggregate, mineral filler if required, and bituminous material, plant mixed and laid hot. This pavement shall be constructed in two courses on the prepared or existing base in accordance with these specifications and in conformity with the lines, grades, thickness, type of pavement, and typical cross-sections shown on the drawing.

B. MATERIALS

The course aggregate shall consist of clean, hard crushed rock or screened crushed gravel free from dirt or foreign matter. It shall be reasonably free from soft and elongated pieces.

The fine mineral aggregate shall consist of sand or a mixture of sand and stone screenings of which at least 50 percent by weight shall be sand. The sand shall consist of clean, hard, durable grains free from injurious amounts of vegetable matter or other harmful substances.

The asphalt cement shall conform to all the requirements as set forth in Sections 702 and 704.10 of the Vermont Standard Specifications for Construction, or as periodically amended.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

C. CONSTRUCTION METHODS

Equipment for spreading and finishing the mixture shall be a mechanical spreading and finishing machine provided with an activated screed and heated if required. The machine shall be capable of spreading the mixture without segregation and shall be approved by the Engineer before being used.

Application of bituminous concrete pavement shall meet all the requirements of the Vermont Standard Specifications for Construction, Section 406, or as periodically amended including, but not limited to, the following:

WEATHER LIMITATIONS: Bituminous material shall not be placed between November 1 and May 1. Material shall not be placed when the air temperature at the paving site in the shade and away from artificial heat is 40 degrees Fahrenheit or below.

CONDITIONING: Prior to placing the bituminous material, the existing surface shall be cleaned then sprayed with a coat of Emulsified Asphalt, RS-1.

COMPACTION: Immediately after the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling. Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot or lightly oiled hand tampers, smoothing irons, or mechanical tampers. On depressed areas, a trench roller may be used; or cleated compression strips may be used under the roller to transmit compression to the depressed area.

SURFACE TOLERANCES: The surface will be tested by the Engineer using a 16 foot straight-edge at selected locations parallel with the centerline. Any variations exceeding three-sixteenths of an inch (3/16") between any two contacts shall be satisfactorily eliminated. A ten foot straight-edge may be used on a vertical curve. The straight-edges shall be provided by the Contractor.

MATCHING SURFACES: When a new pavement is to match an existing bituminous pavement for a roadway or trench, the Contractor shall vertically smooth cut the existing pavement along a straight line a minimum of one foot (1') into the existing pavement over the existing gravel base. The smooth cut shall be thoroughly cleaned and coated with Emulsified Asphalt, RS-1, just prior to paving.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

2.10 PORTLAND CEMENT CONCRETE PAVEMENT

A: DESCRIPTION

This type of pavement shall be composed of portland cement concrete constructed on a prepared subgrade in accordance with these specifications and in conformity with the lines, grades, and typical cross-sections shown in the plans or established by the Engineer.

B: DESIGN CRITERIA

THICKNESS - The applicant shall use either the AASHTO portland concrete pavement design equation which was developed from data obtained at the AASHTO Road Test or the Portland Concrete Association design procedure based on theoretical stress considerations to determine the required concrete thickness and submit this information to the Engineer. The minimum acceptable thickness shall be 5".

CONCRETE QUALITY: - The required compressive strength of the concrete shall be 4000 psi.

JOINTING - Joints in concrete pavements control the location and spread of cracks. The applicant shall submit to the Town for review before beginning construction a plan showing the proposed joint location, spacing, and details. Joints shall be laid out according to the following rules:

Provide mechanical load transfer if truck (18,000 lb. axles) traffic exceeds 200 vehicles per day, per lane.

Joint spacing shall not exceed 30 times the slab thickness, 12.5 x 12.5 feet for 5" thickness. Regardless of the slab thickness, joint spacing shall not exceed 15 feet.

Lay out joints to form square panels. If not practical, rectangular panel may be used if the long dimension is no more than 1.25 times the short side.

Control joints shall have a depth equal to 1/4 of the slab thickness, e.g., 1.25" for a 5" slab.

Isolation (expansion) joints shall extend the full depth and shall be used only to isolate fixed objects abutting to or located within the paved area.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

Crack control joints should run continuously and extend through integral curbs. Crack control joints can be terminated and offset at isolation joints.

Adjust jointing layout or location of manholes, catch basins; small foundations, and other built-in structures, so that the joints will line up the corners of the structure.

Offset control joints to avoid acute angles or small pieces of slab at curves. Offsets shall be at least 1.5 feet.

C: MATERIALS

CONCRETE - Concrete shall be composed of portland cement, aggregates, and water. Air entrainment shall be provided with air-entraining portland cement or by adding an air entrainment agent.

PORTLAND CEMENT - Portland cement shall conform to AASHTO M85, ASTM C150, or CSA A5.

ADMIXTURES - No admixtures shall be used in the concrete without prior permission.

STEEL - Deformed bars shall conform to the requirements of ASTM A615, A616, or A617. Deformed steel billet bars conforming to ASTM A615, Grade 40, shall be used for tiebars that are to be bent and restraightened during construction.

JOINT MATERIALS - Poured sealer for joints shall conform to the requirements of AASHTO M173 or ASTM D1190. Preformed fillers for joints shall conform to the requirements of AASHTO M33 or M123; ASTM D994 or D1751 as specified, and shall be punched to admit dowels where called for on the plans. The filler for each joint shall be furnished in a single piece for the full depth and width required unless otherwise authorized by the Engineer.

CURING MATERIALS - Curing materials shall conform to the following specifications:

Burlap cloth made from jute or kenak - AASHTO M182

White liquid membrane-forming compounds for curing concrete - AASHTO M148 or ASTM C309

Sheet materials for curing concrete - AASHTO M171 or ASTM C171

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

AGGREGATES - Fine aggregate shall conform to the requirements of AASHTO M6. Coarse aggregate for concrete shall conform to the requirements of AASHTO T26. The allowable aggregate size shall be 1 1/2" maximum, but not greater than 1/4 the thickness of the slab.

PROPORTIONING CONCRETE - Each cubic yard of concrete shall contain 560 lb. of cement plus or minus 2% and the water-cement ratio by weight shall not exceed 0.50.

ENTRAINED AIR - The concrete shall contain the following percentages of entrained air (6% minimum):

Maximum aggregate size 3/4" to 1 1/2" - 6% entrained air

Maximum aggregate size 3/8" to 1/2" - 7 1/2 % entrained air

D: BASE PREPARATION

The subbase, gravel, sand, drainage, and fabric shall be prepared and installed as specified in the other sections of the Public Works Specifications and as shown on the plans. Concrete shall not be placed on a soft, spongy, frozen, or otherwise unsuitable subgrade. The subgrade gravel shall be moist when the concrete is placed.

E: FORMING

GENERAL - Forms shall be of such cross-section and strength and so secured as to resist the pressure of the concrete when placed and the impact and vibration of any equipment they support, without springing or settlement. The method of connection between sections shall be such that the joints do not move in any direction. The maximum deviation of the top surface shall not exceed 1/8" in 10 feet or the inside face not more than 1/4" in 10 feet from a straight line. Flexible or curved forms of proper radius shall be used on curves of 100 feet radius or less.

SETTING FORMS - The subbase under the forms shall be compacted and cur to grade so that the form when set will be uniformly supported for its entire length at the specified elevation. All forms shall be cleaned and oiled each time they are used.

GRADE AND ALIGNMENT - The contractor shall check and correct alignment and grade elevations of the forms immediately before placing the concrete. When any form

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

SLIPFORM PAVING - The contractor may place concrete with a slipform paver designed to spread, consolidate, screed, and float finish the freshly placed concrete in one complete pass of the machine. The slipform paver shall be operated with as nearly a continuous forward movement as possible and all the operations of mixing, delivering, and spreading concrete shall be so coordinated as to provide uniform progress with stopping and starting of the pave held to a minimum.

E: PLACING AND FINISHING

GENERAL - The concrete shall be deposited on a moist subbase in such a manner as to require as little rehandling as possible. Placing shall be continuous between the transverse joints without the use of intermediate bulkheads. Necessary hand spreading shall be done with shovels, not rakes. Workmen shall not be allowed to walk in freshly mixed concrete with boots or shoes coated with earth or foreign substances.

The concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies. Vibrators shall not be allowed to come in contact with a joint assembly, the grade, or a side form. The vibrator shall never be operated longer than 15 seconds in any one location.

Concrete shall be deposited as near to expansion and contraction joints as possible without disturbing them but shall not be dumped onto the joint assembly.

STRIKEOF, CONSOLIDATION, AND FINISHING - The sequence of operations shall be the strikeoff and consolidation, floating if necessary, straightedging, and final surface finish. The pavement shall be struck off and consolidated with a mechanical finishing machine, vibrating screed, or by hand-finishing methods when approved by the Engineer. A slipform paver may be used.

In general, adding water to the surface of the concrete to assist in finishing shall not be allowed.

After the pavement has been struck off and consolidated, it shall be scraped with a straightedge 10 feet long equipped with a handle to permit operation from the edge of the pavement. Any excess water and laitance shall be removed from the surface of the pavement. The straightedge shall be operated parallel to the centerline of the pavement and shall be moved forward one-half its length after each pass. Irregularities shall be

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

corrected by adding or removing concrete. All disturbed places shall be again straightedged.

Before final finishing is completed and before the concrete has taken its initial set, the edges of the slab shall be carefully finished with an edger of the radius shown on the plans.

A burlap drag or broom shall be used for final finishing. The burlap drag shall be at least 3 feet wide and long enough to cover the entire pavement width. It shall be kept clean and saturated while in use. It shall be laid on the pavement surface and dragged in the direction in which the pavement is placed. For a broom finish, a stiff bristled broom shall be drawn from the center to the edge of the pavement with adjacent strokes slightly overlapping to produce surface corrugations of uniform appearance and about 1/16 inch in depth.

PAVEMENT PROTECTION - The contractor shall always have available materials to protect the surface of the plastic concrete against rain. These materials shall consist of burlap, curing paper, or plastic sheeting. When slipform construction is being used, materials such as wood planks of forms to protect the edges of the pavement shall also be required.

F: CURING

GENERAL - Concrete shall be cured by protecting it against loss of moisture, rapid temperature change, and mechanical injury for at least three days after placement. Moist curing, waterproof paper, white polyethylene sheeting, or a combination thereof may be used. After finishing operations have been completed, the entire surface of the newly placed concrete shall be covered by whatever curing medium is applicable to the local conditions and approved by the Engineer. The edges of the concrete slabs exposed by the removal of the forms shall be protected immediately to provide these surfaces with continuous curing treatment equal to the method selected for curing the slab.

The contractor shall have at hand and ready to install before actual placement begins the materials and equipment needed for adequate curing.

MOIST CURING - Moist curing shall be accomplished by a covering of burlap or other approved fabric mat used singly or in a combination. Curing mats shall be thoroughly wet when applied and kept continuously wet and in intimate contact with the pavement surface for the duration of the curing. Burlap or fabric mats shall be long enough to cover the entire width and edges of the pavement lane and lapped at joints to prevent drying between adjacent sheets.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

WATERPROOF PAPER OR WHITE POLYETHYLENE - Waterproof paper of white polyethylene shall be in pieces large enough to cover the entire surface and edges of the slab and shall be overlapped at least 18 inches. The paper or polyethylene shall be adequately weighted to prevent displacement due to wind, and material folded down over the pavement edges shall be secured by a continuous bank of earth. Tears or holes appearing in the paper or polyethylene during the curing period shall be immediately repaired.

COLD-WEATHER PROTECTION - Except by specific written authorization, concreting shall cease when the descending air temperature in the shade and away from any artificial heat falls below 40 degrees F. It shall not be resumed until the ascending air temperature in the shade and away from artificial heat rises to 35 degrees F.

When concrete has been placed in cold-weather and the temperature may drop below 35 degrees F., straw, hay, insulating blankets, or other suitable materials shall be provided along the line of work. Whenever the air temperature may reach the freezing point during the night or day, the material shall be spread deep enough over the concrete to prevent its freezing. Concrete shall be protected from freezing temperatures until it is at least 10 days old. Concrete injured by frost action shall be removed and replaced at the Contractor's expense.

G: JOINTS

GENERAL - Contraction joints, expansion joints, and all longitudinal joints shall be placed as indicated on the plans. Transverse joints shall be used as required. Transverse joints shall extend through the pavement.

TRANSVERSE CONTRACTION JOINTS - Transverse contraction joints shall consist of planes of weakness created by forming or cutting grooves in the surface of the pavement. They shall be equal to at least one-fourth the depth of the slab.

1. Transverse strip contraction joints shall be formed by installing a parting strip to be left in place.
2. Formed grooves shall be installed by depressing an approved tool or device into the plastic concrete. The tool or device shall remain in place until the concrete has obtained its initial set and then shall be removed without disturbing the adjacent concrete.
3. Sawed contraction joints shall be created by sawing grooves in the surface of the pavement with an approved concrete saw. After each joint is sawed, the saw cut

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

and the adjacent concrete surface shall be thoroughly cleaned.

Sawing of the concrete shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 24 hours. All joints shall be sawed before uncontrolled shrinkage cracking occurs. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions. A standby saw shall be available in case of a breakdown.

The sawing of any joint shall be omitted if a crack occurs at or near the joint location before the time of the sawing. Sawing shall be discontinued if a crack appears ahead of the saw. In general, all joints shall be sawed in sequence. All contraction joints in lanes adjacent to previously constructed lanes shall be sawed before uncontrolled cracking occurs. If extreme conditions make it impracticable to prevent erratic cracking by early sawing, the contraction joint groove shall be formed before the initial set of the concrete, as provided above.

4. Transverse formed contraction joints shall consist of a groove or cleft extending downward from and normal to the surface of the pavement. These joint shall be made while the concrete is plastic by an approved mechanically or manually operated device.

TRANSVERSE CONSTRUCTION JOINT - Transverse construction joints shall be placed whenever the placing of concrete is suspended for more than thirty minutes. A butt joint with dowels or a thickened edge joint shall be used if the joint occurs at the location of a contraction joint. Keyed joints with tiebars shall be used if the joint occurs at other location.

TRANSVERSE EXPANSION JOINTS - Transverse expansion joints shall consist of a vertical expansion joint filler placed in a butt-type joint with or without dowel bars as shown on the plans. The expansion joint filler shall be continuous from form to form, shaped to the subgrade, and to the keyway along the form. Preformed joint filler shall be furnished in lengths equal to the pavement width of equal to the width of one lane. Damaged or repaired joint filler shall not be use without the permission of the Engineer.

The expansion joint filler shall be held in a vertical position. An approved bar or other device shall be used if necessary to ensure proper grade and alignment during the placing and finishing of the concrete. Finish joints shall not deviate in horizontal alignment more than 1/4 inch from a straight line. If joint fillers are assembled in sections, there shall be no offsets between adjacent sections. No plugs of concrete shall be permitted anywhere within the expansion space.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

LONGITUDINAL JOINTS - Longitudinal joints shall consist of planes of weakness created by forming or cutting grooves in the surface of the pavement. They shall be equal to at least one-quarter of the slab plus 1/2 inch.

1. Sawed longitudinal joints shall be sawed grooves made with a concrete saw after the concrete has hardened. The joint may be sawed at any time before use by traffic.
2. Longitudinal groove joints are formed in the same manner as transverse formed groove joints.
3. Longitudinal strip joints are formed in the same manner as transverse strip joints.
4. Longitudinal construction joints shall be of the dimensions shown on the plans. Where a key is required, it shall be constructed by forming when the first lane adjacent to the joint is placed. These joints shall be finished with an edger of the radius shown on the plans. When placing the second slab, concrete must not be left overhanging the lip formed in the first slab by the edging tool.

SEALING JOINTS - Joints to be sealed shall be filled with joint sealing material before the pavement is opened to traffic and as soon after completion of the curing period as is feasible. Just before sealing, each joint shall be thoroughly cleaned of all foreign material and the joint faces shall be clean and the surface dry when the seal is applied. Material for sealing applied hot shall be stirred to prevent localized overheating.

The sealing material shall be applied to each joint opening. The joint sealing shall be done without spilling material on the exposed surface of the concrete. Any excess material on the surface of the concrete shall be removed immediately and the pavement surface cleaned. The use of sand or similar material to cover the seal is not permitted. Joint sealing material shall not be placed when the air temperature in the shade is less than 50 degrees F., unless approved by the Engineer.

H: CONCRETE TESTING

GENERAL - Slumps shall be determined by AASHTO T119 or ASTM C143. Air content shall be determined by AASHTO T152 or ASTM C231. A chace indicator may be used to determine the approximate air content and to indicate the need for checks by one of the above methods. The contractor shall furnish the equipment and concrete required to perform the test. Any laboratory testing fees shall be paid by the Owner. All testing results shall be reviewed by the Engineer. The minimum sampling frequency shall be one sample per every 100 cubic yards of concrete placed.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

The Contractor shall furnish the material and concrete necessary for casting test beams and cylinders. Test specimens shall be made, cured, and tested in accordance with AASHTO T22 and ASTM C39; AASHTO T23 and ASTM C31; and AASHTO T97 and ASTM C78. Cement content shall be determined in accordance with AASHTO T121 and ASTM C138. The minimum sampling frequency shall be one beam and yield sample per every 400 cubic yards placed. The laboratory testing fees shall be paid by the Owner and the results reviewed by the Engineer.

I: OPENING TO TRAFFIC

GENERAL - The pavement shall not be opened to traffic until the field cured concrete has obtained a flexural strength of 550 psi, or a compressive strength of 3,500 psi. If such tests are not conducted, the pavement shall not be opened to traffic until 14 days after the pavement is placed. Before opening to traffic, the pavement shall be cleaned.

2.11 CEMENT CONCRETE CURB:

A. *DESCRIPTION*

This item shall consist of a Portland cement concrete curb constructed on a prepared subgrade in accordance with these specifications and the cross-section shown on the drawings.

B. *MATERIALS*

All concrete used in the construction of roadway curbs shall be Air Entrained not less than five percent nor more than seven percent so determined by an air meter approved by the Engineer. This concrete shall have a 28-day compressive strength of 3,500 psi and shall meet Section 501 of the State of Vermont Standard Specifications for Construction for Class B concrete or as periodically amended.

C. *CONSTRUCTION METHODS*

Preparation of subgrade: All boulders, organic material, soft clay, spongy material, and any other objectional material shall be removed and replaced with approved material. The concrete curbing shall be built to the required line and grade on a bed of fully compacted gravel a minimum of six inches (6") in depth.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

Forms for concrete: The forms shall be of metal or of acceptable planed and matched lumber and of such construction that a smooth surface will be produced. All forms shall be oiled.

Placing and finishing concrete: Just prior to placing the concrete, the subgrade shall be moistened. After being mixed to the proper consistency, the concrete shall be placed in the forms and thoroughly tamped in place so that all honeycombs will be eliminated and sufficient mortar will be brought to the surface. The use of vibrators or other compaction equipment to move the concrete within the forms is not approved.

Immediately upon removal of the forms, the curbing shall be rubbed down to a smooth and uniform finish. No plastering or patching will be allowed. After the forms have been removed, the trench shall be backfilled with approved gravel and fill as needed and thoroughly tamped, care being taken not to affect the alignment or grade of the curbing.

Placement of the concrete by a curb-forming machine shall be allowed.

Expansion and contraction joints: Half inch (1/2") expansion joints shall be placed at intervals of 20 feet. At intervals not greater than 10 feet nor less than five feet, the concrete shall be scored for a depth equal to one-third the total depth of the concrete.

Curing the concrete: When completed, the concrete shall be kept moist for a period of not less than three days or longer if the Engineer deems necessary and shall be protected from the elements in an approved manner. If the Contractor elects, he may apply an approved curing compound according to directions of the manufacturer.

Seasonal limits: No concrete shall be poured on a frozen or thawing subgrade during unseasonable weather conditions or when the temperature is 38 degrees Fahrenheit and falling. The Contractor shall record the temperature daily as outlined in the Proposed Recommended Practice - Cold Weather Concreting, ACI 306. In hot weather, the temperature of freshly placed concrete shall not be allowed to exceed 85 degrees Fahrenheit, conforming to ACI 305.

Anti-Spalling Compound: When the initial curing period is over (approximately 28 days after placement), all exposed surfaces shall receive two coats of anti-spalling compound. The surfaces shall be cleaned and then the compound shall be applied; the first coat at a rate of 0.025 gallons per square yard, the second at a rate of 0.015 gallons per square yard. Anti-spalling compound shall only be applied when the air temperature is above 50 degrees Fahrenheit.

Curb cuts: Each house shall be allowed one curb cut.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

2.12 CEMENT CONCRETE SIDEWALK:

A. *DESCRIPTION*

This item shall consist of sidewalk made of one course Portland cement concrete not less than four inches (4") thick and with a width of not less than four feet (4'). Where the sidewalk crosses a driveway, the depth of concrete shall not be less than six inches (6") for residential driveways and eight inches (8") for commercial and industrial driveways for the full width of the driveway. The sidewalk shall be constructed in accordance with these specifications and the cross-sections shown on the accepted drawings.

B. *MATERIALS*

All concrete used in the construction of cement concrete sidewalks shall be Air Entrained not less than five percent nor more than seven percent so determined by an air meter approved by the Engineer. This concrete shall have a 28-day compressive strength of 3,500 psi and shall meet Section 501 of the State of Vermont Standard Specifications for Construction for Class B concrete or as periodically amended.

C. *CONSTRUCTION METHODS*

Preparation of subgrade: All boulders, organic material, soft clay, spongy material, and any other objectionable material shall be removed and replaced with approved material. The sub-grade shall be properly shaped, rolled, and uniformly compacted to conform with the accepted cross-sections and grades.

Base: A minimum depth of six inches (6") of compacted, crusher run gravel or as shown on the plans shall be constructed on the subgrade to accepted cross-sections and grades.

Forms for concrete: The forms for the concrete shall be of wood or metal, well-oiled, straight, free from warps or kinks, and of sufficient strength. They shall be staked securely enough to resist the pressure of the concrete without spring. When ready for the concrete to be deposited, they shall not vary from the approved line and grade and shall be kept so until the concrete has set.

Placing and finishing concrete: Just prior to placing the concrete, the subgrade shall be moistened. After being mixed to the proper consistency, the concrete shall be placed

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

in the forms and thoroughly tamped in place so that all honeycombs will be eliminated and sufficient mortar will be brought to the surface. After this, the surface shall be brought to a smooth, even finish by means of a float. The surface shall be broom finished. All faces adjacent to the forms shall be spaded so that after the forms are stripped the surface of the faces will be smooth, even, and free of honeycombs. All edges shall be tool-rounded with an edge having a quarter inch (1/4") radius.

Expansion joints and scoring concrete: Half inch (1/2") transverse expansion joints shall be placed at intervals not exceeding twenty feet (20'). Sidewalks shall be scored to a depth of one inch (1") every five feet (5').

Curing concrete: Same as for Cement Concrete Curb.

Backfilling: Backfill shall be of suitable bank run gravel and shall be placed and tamped until firm and solid. Backfilling shall follow immediately after the concrete forms have been removed.

Anti-Spalling Compound: When the initial curing period is over (approximately 28 days after placement), all exposed surfaces shall receive two coats of anti-spalling compound. The surfaces shall be cleaned and then the compound shall be applied; the first coat at a rate of 0.025 gallons per square yard, the second at a rate of 0.015 gallons per square yard. Anti-spalling compound shall only be applied when the air temperature is above 50 degrees Fahrenheit.

Seasonal limits: No concrete shall be poured on a frozen or thawing subgrade during unseasonable weather conditions or when the temperature is 38 degrees Fahrenheit and falling. The Contractor shall record the temperature daily as outlined in the Proposed Recommended Practice - Cold Weather Concreting, ASI 306. In hot weather, the temperature of freshly placed concrete shall not be allowed to exceed 85 degrees Fahrenheit, conforming to ACI 305.

2.13 CEMENT CONCRETE DRIVEWAY APRONS:

A. DESCRIPTION

This item shall consist of a Portland cement concrete drive- way apron not less than six inches (6") thick or as indicated on the plans to be constructed on a prepared subgrade in accordance with these specifications and as shown on the accepted drawings.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

B. MATERIALS

All concrete used in the construction of cement concrete driveway aprons shall be Air Entrained not less than five percent nor more than seven percent so determined by an air meter approved by the Engineer. This concrete shall have a 28-day compressive strength of 3,500 psi and shall meet Section 501 of the State of Vermont Standard Specifications for Construction for Class B concrete or as periodically amended.

C. CONSTRUCTION METHODS

Preparation for subgrade: Same as for Cement Concrete Sidewalk.

Forms for concrete: Same as for Cement Concrete Curb.

Placing and finishing concrete: Same as for Cement Concrete Sidewalk.

Expansion joints: Half inch (1/2") transverse expansion joints shall be placed where the driveway apron and driveway joins the sidewalk and curb or pavement.

Curb: Curbs shall be constructed so as to protrude one and one-half inches (1 1/2") above the roadway surface at the entrance to the driveway. This curb shall be constructed with a smooth and gradual depression transition which shall not exceed nine inches (9") in length.

Curing concrete: Same as for Cement Concrete Curb.

Seasonal limits: Same as for Cement Concrete Curb.

2.14 BITUMINOUS CONCRETE DRIVEWAY APRONS:

A. DESCRIPTION

This type of pavement shall be composed of mineral aggregate, mineral filler if required, and bituminous material, plant mixed and laid hot. This pavement shall be constructed in two courses on the prepared or existing base in accordance with these specifications and in conformity with the lines, grades, thickness, type of pavement, and typical cross-sections shown on the drawing.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

B. MATERIALS

The course aggregate shall consist of clean, hard crushed rock or screened crushed gravel free from dirt or foreign matter. It shall be reasonably free from soft and elongated pieces.

The fine mineral aggregate shall consist of sand or a mixture of sand and stone screenings of which at least 50 percent by weight shall be sand. The sand shall consist of clean, hard, durable grains free from injurious amounts of vegetable matter or other harmful substances.

The asphalt cement shall conform to all the requirements as set forth in Sections 702 and 704.10 of the Vermont Standard Specifications for Construction, or as periodically amended.

C. CONSTRUCTION METHODS

Equipment for spreading and finishing the mixture shall be a mechanical spreading and finishing machine provided with an activated screed and heated if required. The machine shall be capable of spreading the mixture without segregation and shall be approved by the Engineer before being used.

Application of bituminous concrete pavement shall meet all the requirements of the Vermont Standard Specifications for Construction, Section 406, or as periodically amended including, but not limited to, the following:

WEATHER LIMITATIONS: Bituminous material shall not be placed between November 1 and May 1. Material shall not be placed when the air temperature at the paving site in the shade and away from artificial heat is 40 degrees Fahrenheit or below.

CONDITIONING: Prior to placing the bituminous material, the existing surface shall be cleaned then sprayed with a coat of Emulsified Asphalt, RS-1.

COMPACTION: Immediately after the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling. Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot or lightly oiled hand tampers, smoothing irons, or mechanical tampers. On depressed areas, a trench roller may be used; or cleated compression strips may be used under the roller to transmit compression to the depressed area.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

SURFACE TOLERANCES: The surface will be tested by the Engineer using a 16 foot straight-edge at selected locations parallel with the centerline. Any variations exceeding three-sixteenths of an inch (3/16") between any two contacts shall be satisfactorily eliminated. A ten foot straight-edge may be used on a vertical curve. The straight-edges shall be provided by the Contractor.

2.15 STREET GUARD RAIL:

This item shall consist of the construction of twelve gauge standard steel beam-and-post guard rail, conforming to the design indicated on the accepted drawings, Sections 621 and 728 of the Vermont Standard Specifications for Construction as periodically amended, and pages G-1 and G-1d of the Vermont Design Standards.

All wood guard rail shall conform to the design details in Sections 621, 726, and 728 of the Vermont Standard Specifications for Construction as periodically amended and G-4 of the Vermont Design Standards. The posts and planks shall be pressure treated and light brown in color. Nuts and bolts shall be counter-sunk. A guard rail shall be erected when the height of fill at the shoulder point is more than ten feet (10') with a slope steeper than one on three (1:3) or as ordered by the Engineer.

2.16 STREET SIDELINE MONUMENTS:

A. *DESCRIPTION*

This item shall consist of installing street property sideline monuments at all street intersections and at all points of curve and/or tangency or other critical points in the street lines as will enable a land surveyor to correctly stake out any lot in the subdivision.

B. *MATERIALS*

Reinforced concrete monuments shall be those as manufactured by S.T. Griswold, or equivalent, and shall be 4"x 4"x 36". The top shall have a marked center which shall be the point of reference.

C. *CONSTRUCTION METHODS*

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

The monuments shall be set vertically and to the depth so that the top of the monument will project one-half inch (1/2") above the surrounding ground surface. The monuments shall be set in place after all other street improvements are completed. The monument's location shall be established by a surveyor licensed in the State of Vermont.

2.17 PLANTING OF TREES:

The Town of Bolton may require the planting of new trees in areas where no trees presently exist, within the area disturbed by new construction, or in an area which substantial loss of trees has or will occur in the process of the road construction.

Such trees shall be preferably of a type indigenous to the neighborhood. Such trees shall be planted in fertile or fertilized ground and shall be watered and nurtured after planting until growth is assured.

Trees shall have a minimum diameter of trunk at a point four feet (4') above ground level of at least two inches (2"). They shall be planted at intervals of no more than sixty feet (60') on both sides of the street. Such trees shall be clear of any branches from a point of ground level to a point six feet (6') above ground level. All new trees shall be planted outside of the street right-of-way and utility, drainage, or other public easements.

2.18 STREET NAME SIGNS:

A. *DESCRIPTION*

This item shall consist of a street name sign with a two inch (2") diameter steel post, constructed in accordance with these specifications and as shown on the accepted drawings. The developer is responsible for the purchase and installation of the street signs and poles.

B. *MATERIALS*

The post shall consist of a two inch (2") diameter pipe constructed of standard weight steel with anchors fabricated from one inch by three-eighths inch (1" x 3/8") band iron.

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

C. CONSTRUCTION METHODS

The sign post shall have a total length of ten feet, six inches (10'6") with an exposed length of eight feet (8'). The remaining two feet, six inches (2'6") shall have four (4) twelve inch (12") anchors welded in a staggered arrangement around the pipe so as to prevent rotation of the sign after it has been erected. The exposed portion of the pipe shall have two coats of flat black enamel applied before erection.

The sign post shall be set two feet, six inches (2'6") into the ground and the backfill shall be tamped to a maximum density so that the post shall be plumb and rigid. The sign post shall be located in the area between the curb and sidewalk at a point which will not interfere with pedestrian or vehicular traffic.

2.19 STREET LIGHTING:

Streets and roadways shall be illuminated by standard street lights, approved by the Municipality, a maximum of four hundred feet (400') apart and at all street intersections. The street lights will be installed on the sidewalk side of the street. Poles, brackets, and lights for street lighting are to be approved as to size, type, and location by the Municipality. They shall be complete and fully energized prior to acceptance of the street by the Municipality.

2.20 LANDSCAPING:

At completion of grading, slopes, ditches, and all disturbed areas shall be smooth and free of pockets with sufficient slope to ensure drainage.

All disturbed areas shall receive a minimum of four inches (4") of topsoil and shall be seeded, fertilized, limed, and mulched in accordance with the following:

BOLTON PUBLIC WORKS SPECIFICATIONS - STREETS

1. Seed mixture in lawn areas around dwellings and within street limits shall be urban mix conforming to the adjacent Table. For seeding between September 1 and October 1, winter rye shall be used in addition to the urban mix at an application rate of 100 pounds per acre.

URBAN MIX GRASS SEED		
% BY WEIGHT	LBS. LIVE SEED PER ACRE	TYPE OF SEED
37.5	45	CREEPING RED FESCUE
37.25	37.5	KENTUCKY BLUEGRASS
31.25	37.5	WINTER HARDY, PERENNIAL RYE
100	120 # LIVE SEED PER ACRE	

2. Seed mixture in all other disturbed areas shall be conservation mix conforming to the adjacent Table. For seeding between September 1 and October 1, winter rye shall be used in addition to the urban mix at an application rate of 100 pounds per acre.

CONSERVATION MIX GRASS SEED		
% BY WEIGHT	LBS. LIVE SEED PER ACRE	TYPE OF SEED
35	35	CREEPING RED FESCUE
23	23	KENTUCKY BLUEGRASS
15	15	ANNUAL RYE
11	11	WINTER HARDY, PERENNIAL RYE (VARIETY PENNFINE, MANHATTAN OR SIMILAR VARIETY)
6	6	WHITE CLOVER
10	10	HIGHLAND BENTGRASS
100	100# LIVE SEED / ACRE	

BOLTON PUBLIC WORKS SPECIFICATIONS - STORM DRAINAGE

3.0 GENERAL:

This item shall consist of catch basins, manholes, and pipe meeting the specifications for the diameter of pipe required and installed as indicated on the drawings.

3.1 MATERIALS:

A. *TYPES OF PIPE*

Types of pipe which may be used for storm drain lines are Reinforced Concrete Pipe (RC), Corrugated Galvanized Metal Pipe (CGMP), Polyvinyl Chloride Pipe (PVC), or an approved equal. Types of pipe which may be used for culverts are Reinforced Concrete Pipe (RCP), Corrugated Galvanized Metal Pipe (CGMP), or an approved equal.

B. *REINFORCED CONCRETE PIPE*

Pipe shall conform to the Vermont Standard Specifications for Construction, Section 710, and AASHTO, M170.

C. *CORRUGATED GALVANIZED METAL PIPE*

Pipe shall conform to standard specification for CGM pipe, AASHTO, M190. Pipe shall have a polymeric coating conforming to AASHTO M 246 Type B. Where indicated, Contractor shall install 24" wide bands with a watertight gasket in lieu of standard pipe collars.

D. *POLYVINYL CHLORIDE PIPE*

Pipe shall conform to ASTM Specification D-3034 or F679, (PVC) Sewer Pipe and Fittings, SDR35, or Perma-Loc sewer pipe and fittings in compliance with ASTM F794.

E. *MANHOLES*

Where indicated on the plans, the Contractor shall furnish and install manholes which meet the requirements of the sanitary sewer manholes of these specifications.

BOLTON PUBLIC WORKS SPECIFICATIONS - STORM DRAINAGE

F. CATCH BASINS

Catch basins shall be constructed of reinforced concrete and shall be provided with cast iron frames and grates. Frames and grates shall be LeBaron LK120, LK120A (for grades exceeding 5%), or an approved equal.

Precast risers and base sections shall conform to the Vermont Standard Specifications for Construction, Section 604, or as periodically amended. Frames shall be brought to grade with at least two, but not more than six, courses of brick and shall be set in a full bed of mortar. All brick surfaces shall be plastered with cement mortar, the plaster being carried up as the brickwork progresses.

Precast risers and bases for manholes shall conform to ASTM Specifications C-361. The pipe opening in the precast manhole riser shall have a cast-in-place flexible gasket or an equivalent system for pipe installation as approved by the Engineer. Joints between manhole risers shall be rubber "O" ring seals or soft Butyl joint sealer (rope form).

The grating frames shall be set to final grade only after the curbs have been completed.

3.2 CONSTRUCTION METHODS:

A. LAYING PIPE

Storm drains and culverts shall be constructed in accordance with the Vermont Standard Specifications for Construction, Section 601, or as periodically amended; and on a trench bottom, they shall be prepared and bedded as shown on the drawings. Each pipe shall be checked just prior to laying to ensure that it is clear of all dirt and debris. It shall be laid true to line and grade as indicated on the contract drawings. All joints shall be tight, and inverts shall be continuous.

Metal pipe shall be firmly joined with coupling bands, concrete pipe joints shall be a rubber-gasket type, and PVC pipe shall be joined with standard push-on type using elastometric gaskets.

Storm drains and culverts with water flow velocities greater than 12 feet per second shall require special design which must be approved by the Engineer.

BOLTON PUBLIC WORKS SPECIFICATIONS - STORM DRAINAGE

B. BACKFILLING

All material for backfilling shall be free of roots, stumps, and frost. Backfill for all pipelines shall be placed in six inch (6") layers, each layer being thoroughly compacted to not less than 95 percent of maximum dry density as determined by the ASTM D698 Standard Proctor by a means approved by the Engineer.

C. PIPE BEDDING

Reinforced concrete pipe and asphalt-coated corrugated galvanized metal pipe shall be bedded from the trench bottom to the centerline of the pipe to a height of two feet (2') above the top of the pipe with material excavated from the trench having no stones larger than three inches (3") in the longest dimension. Should no excavated material be suitable, sand or gravel shall be used.

PVC pipe shall be bedded with crushed stone and then back-filled with material excavated from the trench having no stones larger than three inches (3") in the longest dimension. Sand or gravel shall be used if no excavated material is suitable.

D. HEADWALLS

The Contractor shall construct pipe headwalls at the outfall end of all storm lines or as ordered by the Engineer. Headwalls shall be either specifically designed polymeric-coated corrugated galvanized metal end sections, concrete, or rubble masonry construction.

If constructed of concrete or masonry rubble, headwalls shall conform to the Vermont Standard Specifications for Construction, Section 602. All concrete utilized for the purpose shall meet the requirements for Class B concrete as per the Vermont Standard Specifications for Construction, Section 501. Metal end sections shall conform to the Vermont Standard Specifications for Construction, Section 711, or as periodically amended.

E. DETENTION BASINS

Stormwater detention swales, drains, or basins will be constructed downgradient of all new developments to detain and store the storm runoff volumes equal to or less than pre-development quantities for a minimum ten-year, twenty-four hour storm event.

BOLTON PUBLIC WORKS SPECIFICATIONS - STORM DRAINAGE

The developer's engineer will submit the storm collection system design and detention calculations to the Town Engineer for review and approval when requested.

F. DRY WELLS

Dry well storm systems shall be permitted in areas of deep native sands as approved by the Town Engineer. The developer's Engineer shall submit the system design and calculations to the Town Engineer for review and approval.

BOLTON PUBLIC WORKS SPECIFICATIONS - APPENDIX

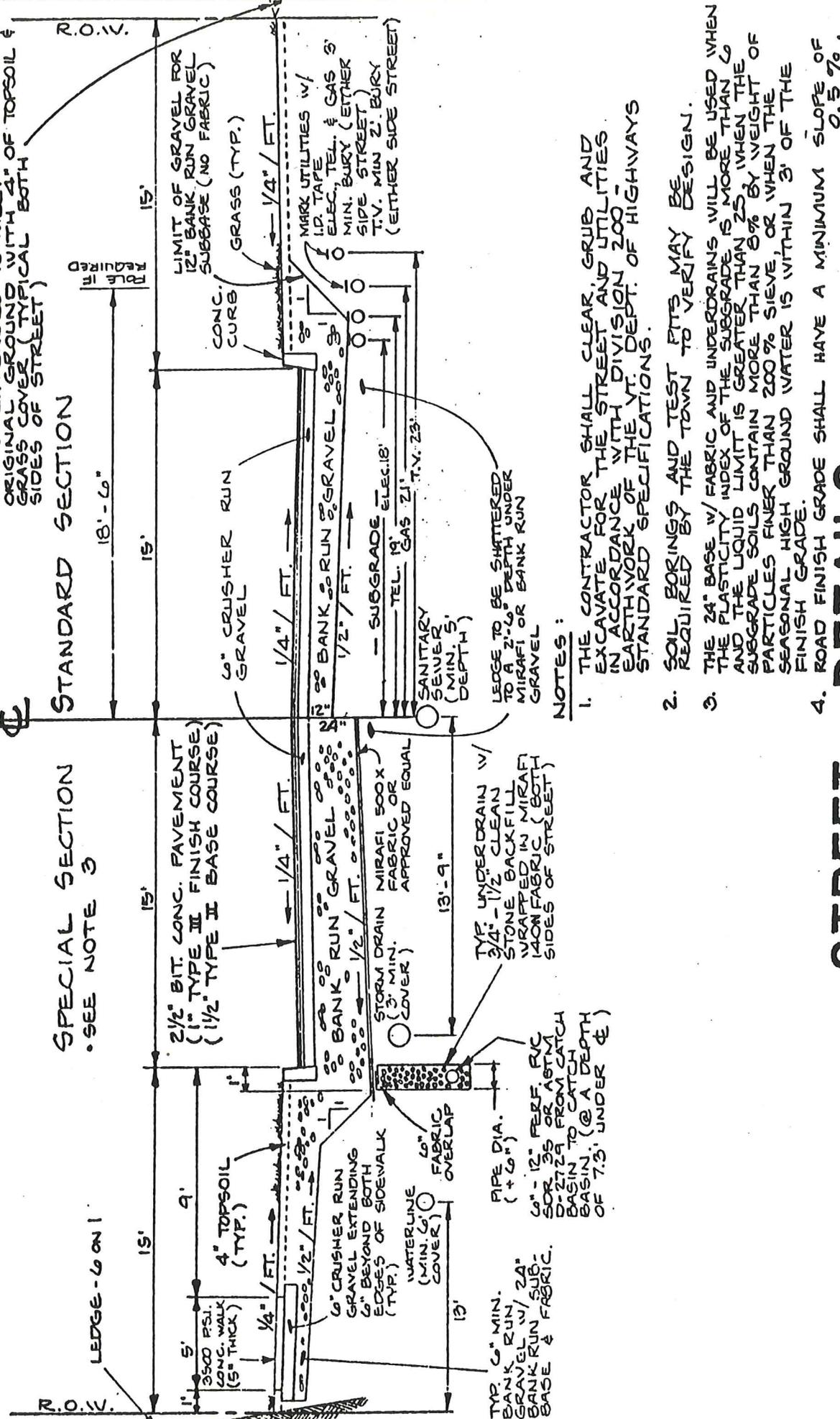
APPENDIX I

<u>Figure No.</u>	<u>List of Illustrations</u>
1.	Street Details- Type 1 Urban
2.	Street Details- Type 2 Rural
3.	Street Details- Concrete Sidewalk and Curb
4.	Street Details- Concrete Curb
5.	Street Details- Tapered End of Curb
6.	Street Details- Typical Clean-Out
7.	Street Details- Replacement of Existing Bituminous Pavement
8.	Street Details- Replacement of Existing Bituminous Pavement
9.	Street Details- Concrete Driveway Aprons
10.	Street Details- Rural Driveway
11.	Street Details- Street Name Signs
12.	Street Details- Sidewalk Ramp
13.	Street Details- Sidewalk Ramp Sections
14.	Street Details- Street Light
15.	Street Details- Traffic Sign & Markings
16.	Storm Drainage Details- Precast Catch Basin
17.	Storm Drainage Details- Standard Trench for Storm Drains
18.	Storm Drainage Details- Temporary Erosion Control
19.	Storm Drainage Details- Temporary Erosion Control
20.	Storm Drainage Details- Storm Sewer Outlet
21.	Storm Drainage Details- Unpaved & Stone-Lined Ditch

TYPICAL CUT OR FILL SLOPE SHALL NOT BE STEEPER THAN 1 ON 3 EXTENDED TO MEET ORIGINAL GROUND WITH 4" OF TOPSOIL & GRASS COVER (TYPICAL BOTH SIDES OF STREET)

STANDARD SECTION

SPECIAL NOTE 3
• SEE NOTE 3



3500 PSI CONC. WALK (5" THICK)
4" TOPSOIL (TYP.)
6" CRUSHER RUN GRAVEL EXTENDING 6" BEYOND BOTH EDGES OF SIDEWALK (TYP.)
WATERLINE (MIN. 6" COVER)
6" FABRIC OVERLAP
PIPE DIA. (+6")
6" - 12" PERF. R/C SOR. 35 OR ASTM D-2724 FROM CATCH BASIN TO CATCH OF 7.3' UNDER (E)TYP. 6" MIN. BANK RUN GRAVEL w/ 24" BANK RUN SUB-BASE & FABRIC.

2 1/2" BIT CONC. PAVEMENT (1" TYPE III FINISH COURSE) (1 1/2" TYPE II BASE COURSE)
1/4" / FT.
1/2" / FT.
1/2" / FT.
13'-9"

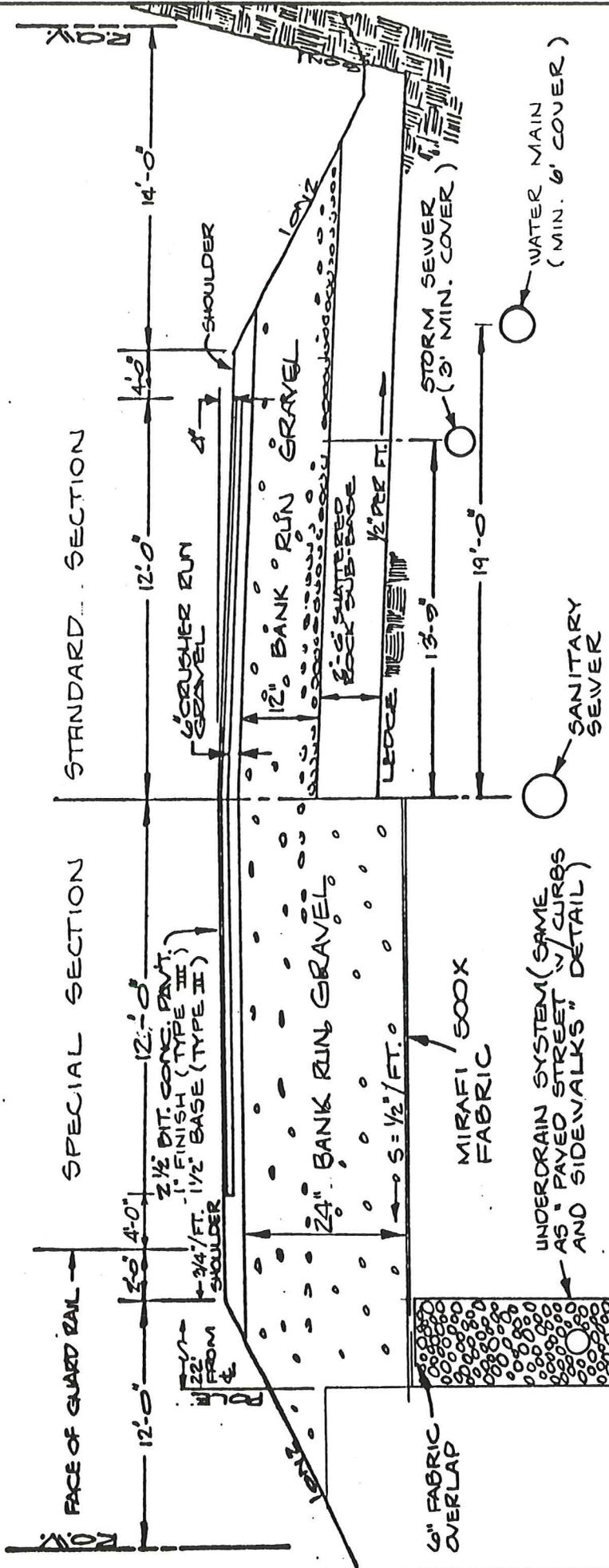
LEGE TO BE SHATTERED TO A 2'-6" DEPTH UNDER MIRAFI OR BANK RUN GRAVEL

NOTES :

1. THE CONTRACTOR SHALL CLEAR, GRUB AND EXCAVATE FOR THE STREET AND UTILITIES IN ACCORDANCE WITH DIVISION 200 - EARTHWORK OF THE VT. DEPT. OF HIGHWAYS STANDARD SPECIFICATIONS.
2. SOIL BORINGS AND TEST PITS MAY BE REQUIRED BY THE TOWN TO VERIFY DESIGN.
3. THE 24" BASE w/ FABRIC AND UNDERDRAINS WILL BE USED WHEN THE PLASTICITY INDEX OF THE SUBGRADE IS MORE THAN 6 AND THE LIQUID LIMIT IS GREATER THAN 25 WHEN THE SUBGRADE SOILS CONTAIN MORE THAN 8% BY WEIGHT OF PARTICLES FINER THAN 200% SIEVE, OR WHEN THE SEASONAL HIGH GROUND WATER IS WITHIN 3' OF THE FINISH GRADE.
4. ROAD FINISH GRADE SHALL HAVE A MINIMUM SLOPE OF 0.5%.

STREET DETAILS

TYPE I URBAN - FOR VILLAGE DISTRICTS



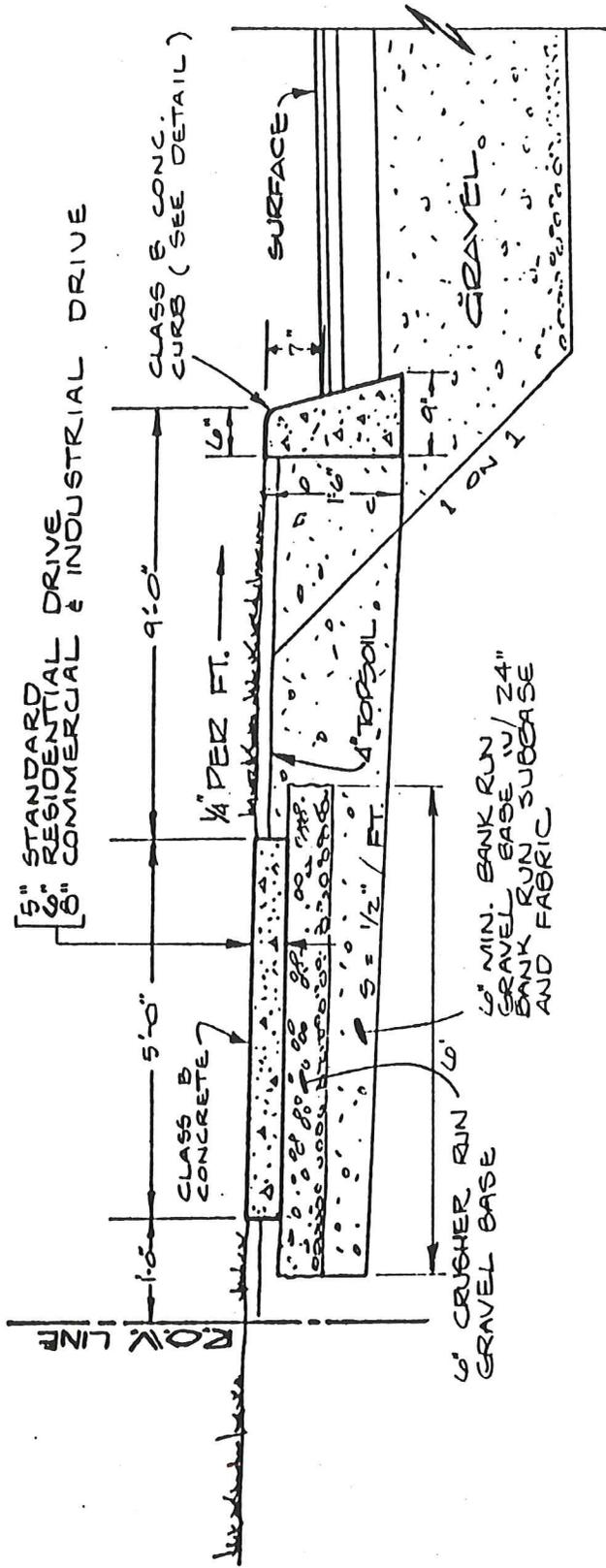
NOTE:

1. ALL UTILITIES NOT SHOWN SHALL BE LOCATED AS SHOWN IN FIGURE 1.
2. ALL MATERIALS AND CONSTRUCTION TO BE ACCORDING TO SPECIFICATIONS.
3. USE GUARD RAIL WHEN HEIGHT OF FILL AT SHOULDER POINT IS MORE THAN 10' FT.
4. MIN SLOPE FOR DRAINAGE PIPES TO BE 0.2%.
5. MIN R/W TO BE 60' FT. GREATER IF SO ORDERED BY THE BOARD OF SELECTMEN.
6. NOTES 1, 2, 3 & 4 OF PREVIOUS DETAIL FOR "TYPE I URBAN" SHALL APPLY TO THIS DETAIL.
7. SHALLOW DITCHES MAY BE USED ONLY WHEN A CLOSED STORM DRAINAGE SYSTEM IS USED WITH CATCH BASIN.

STREET DETAILS

TYPE II RURAL - FOR AGRICULTURAL and RURAL DISTRICTS

FIGURE 2



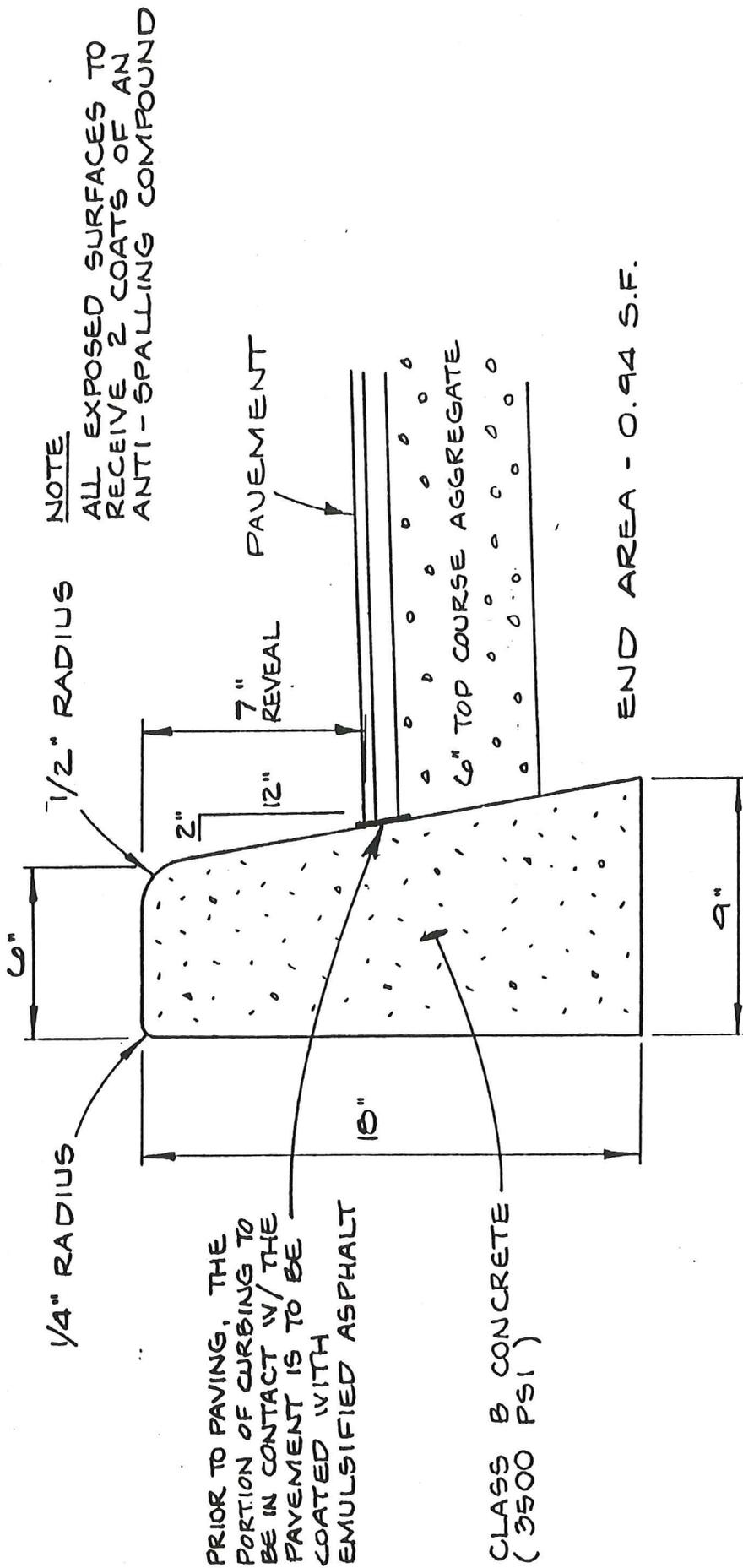
NOTE:

1. ALL MATERIALS AND CONSTRUCTION TO BE ACCORDING TO SPECIFICATIONS.
2. CURB AND SIDEWALK SECTIONS SHALL BE SEPARATED BY PREMOULDED EXPANSION JOINT FILLER.

STREET DETAILS

CONCRETE SIDEWALK and CURB

NTS

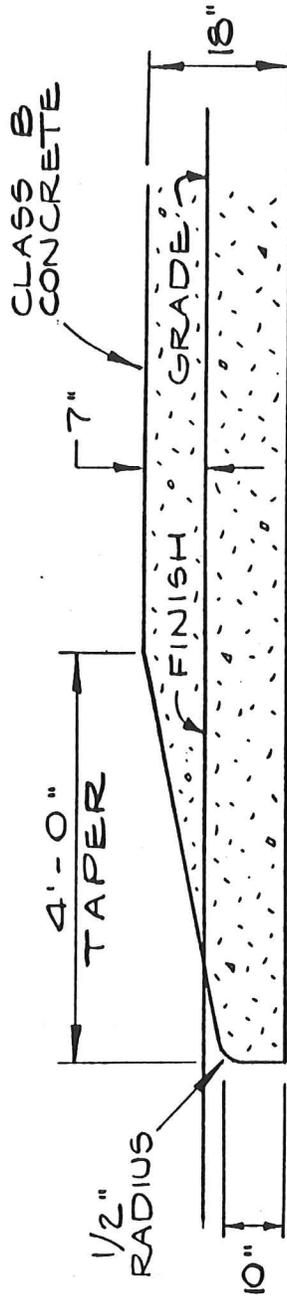


NOTES :

- 1) CURBING SHALL BE CONSTRUCTED IN 10' SECTIONS WITH 1/8" JOINT BETWEEN SECTIONS.
- 2) CURBING EXPANSION JOINTS SHALL BE CONSTRUCTED EVERY 20' AND SHALL BE CONSTRUCTED OF MATERIAL CONFORMING TO AASHTO DESIGNATION M-153 (1/2" SPONGE RUBBER OR CORK.)

STREET DETAILS

CONCRETE CURB NTS

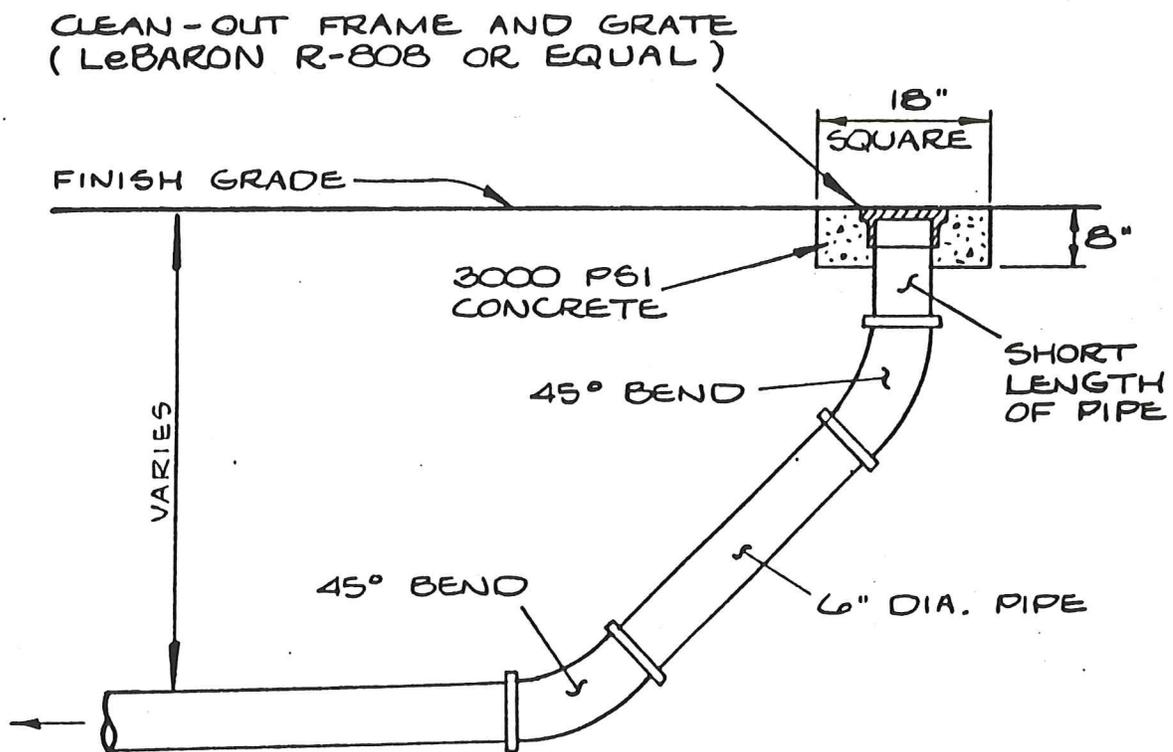


STREET DETAILS

TAPERED END OF CURB

NTS

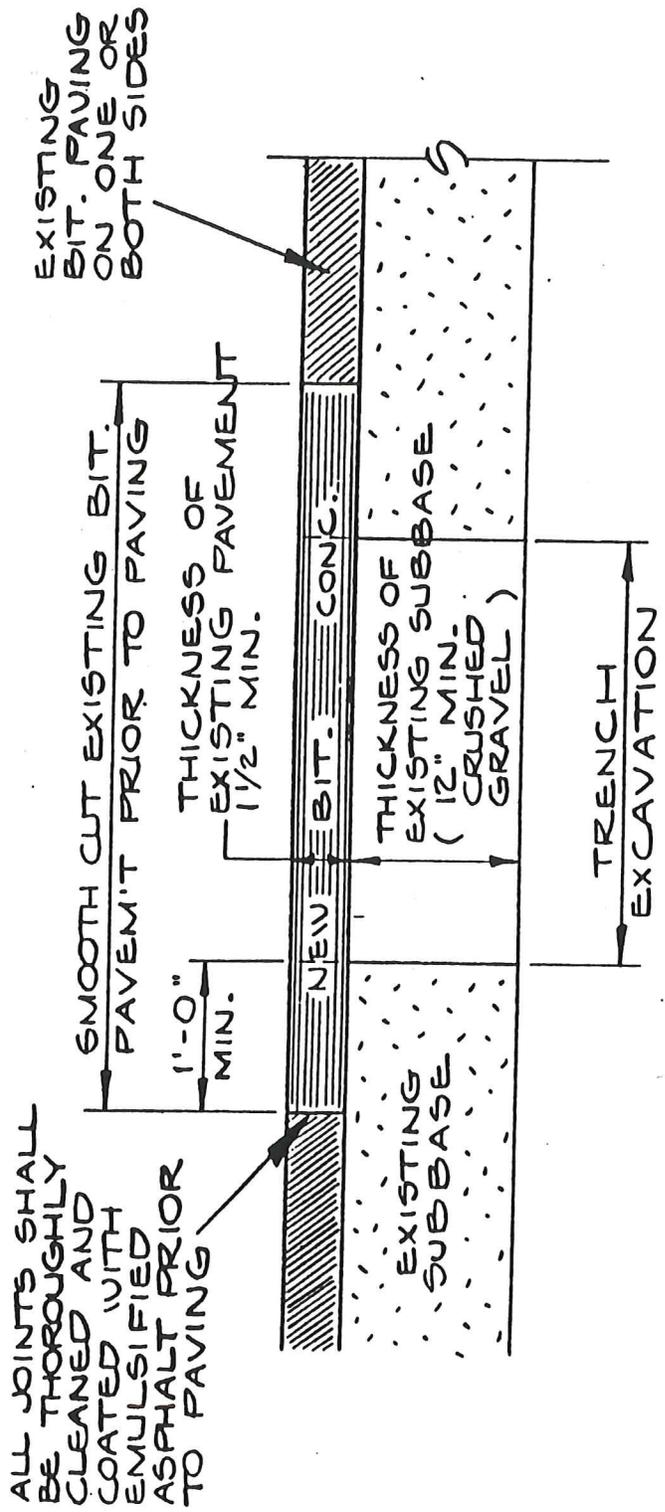
FIGURE 5



STREET DETAILS

TYPICAL CLEAN-OUT

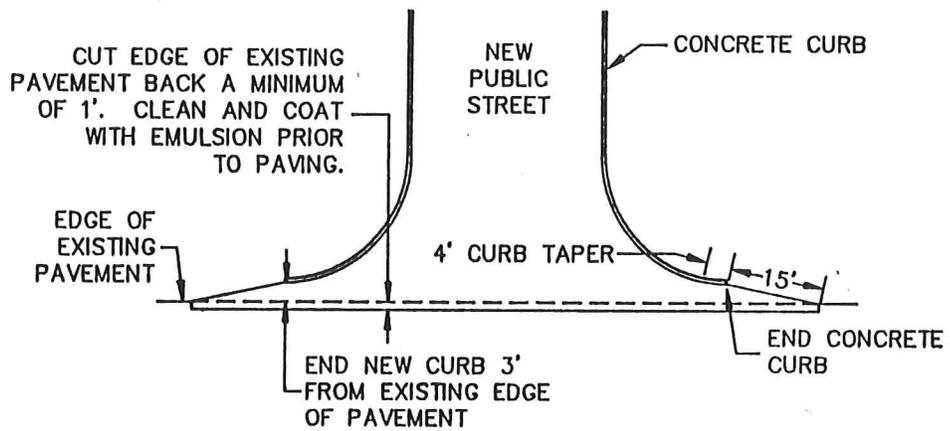
NTS



STREET DETAILS

REPLACEMENT OF EXISTING BITUMINOUS PAVEMENT

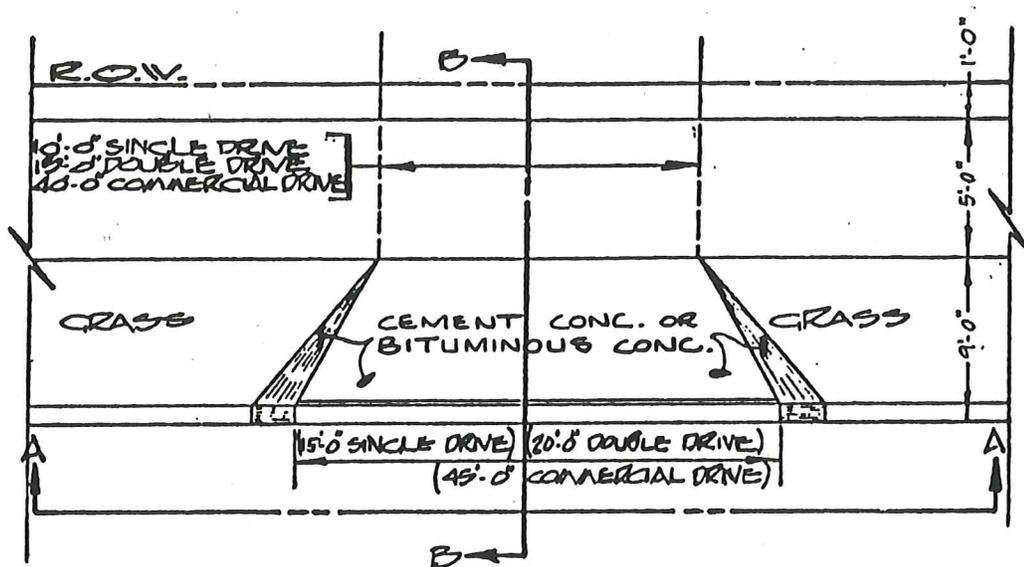
NTS



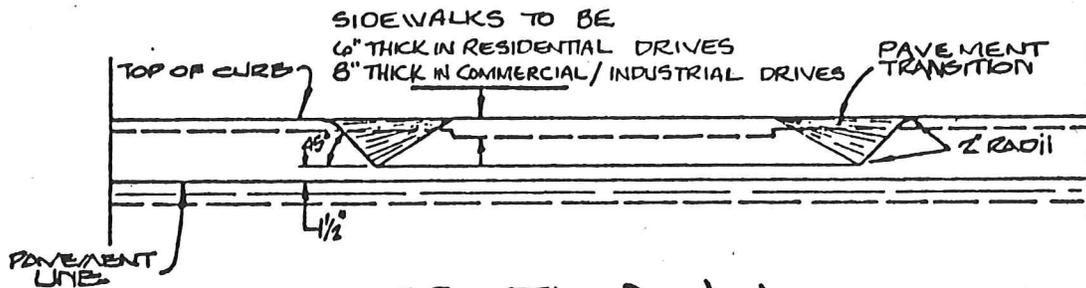
STREET DETAILS

CONNECTION TO EXISTING PAVEMENT

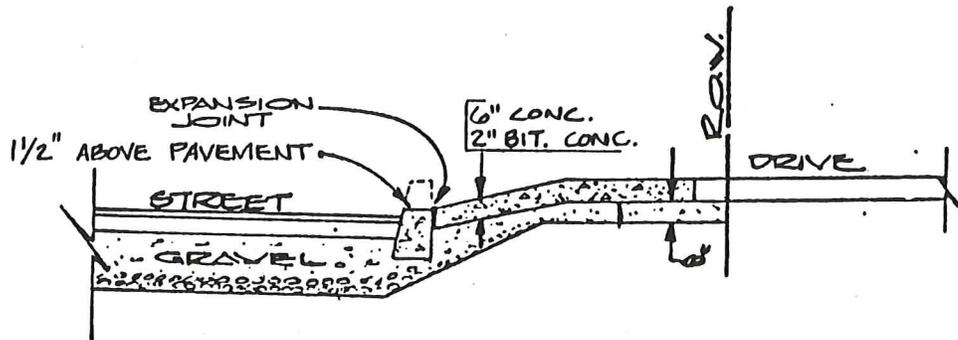
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PLAN



SECTION A-A



SECTION B-B

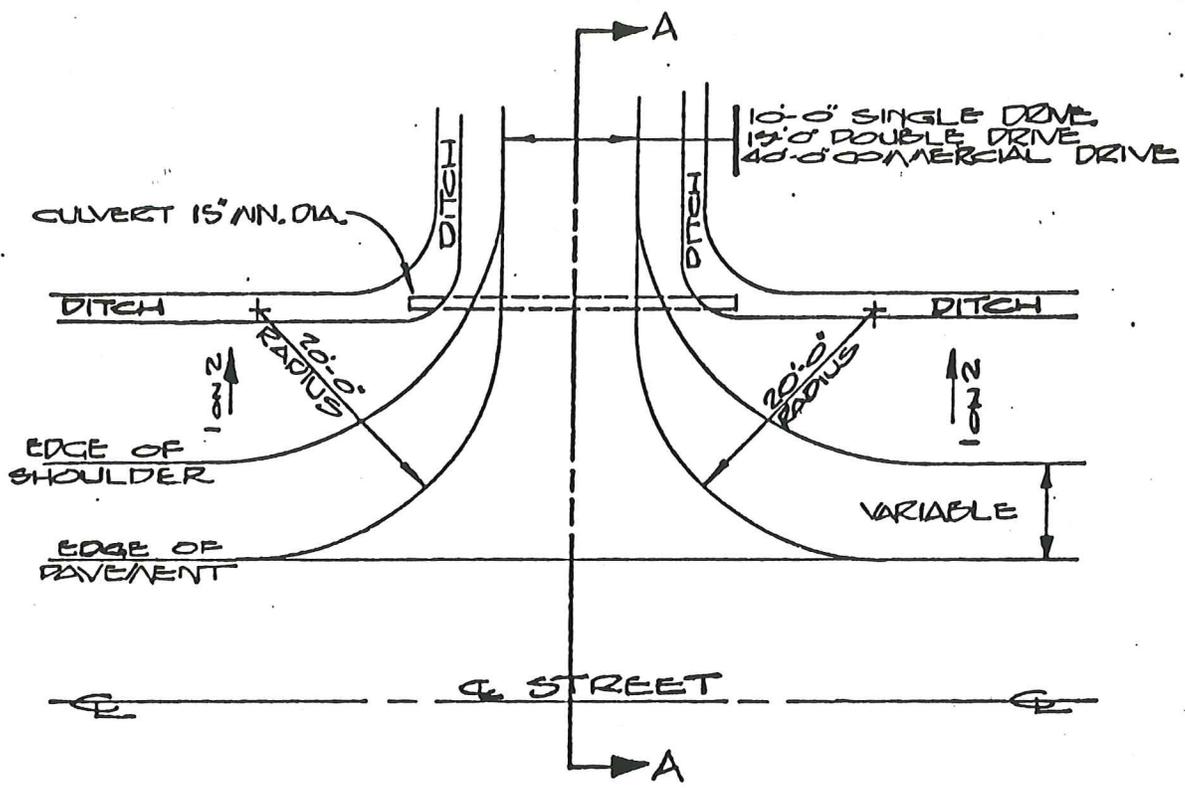
NOTE:

ALL MATERIALS AND CONSTRUCTION TO BE ACCORDING TO SPECIFICATIONS.

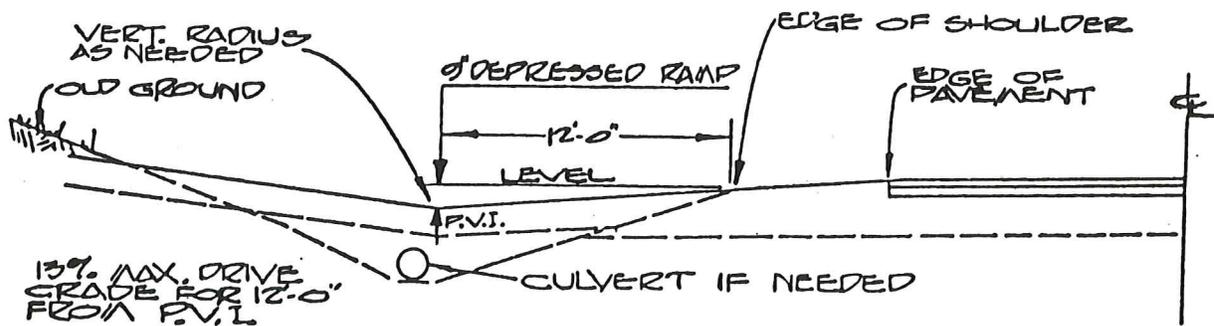
STREET DETAILS

NTS

DRIVEWAY APRONS



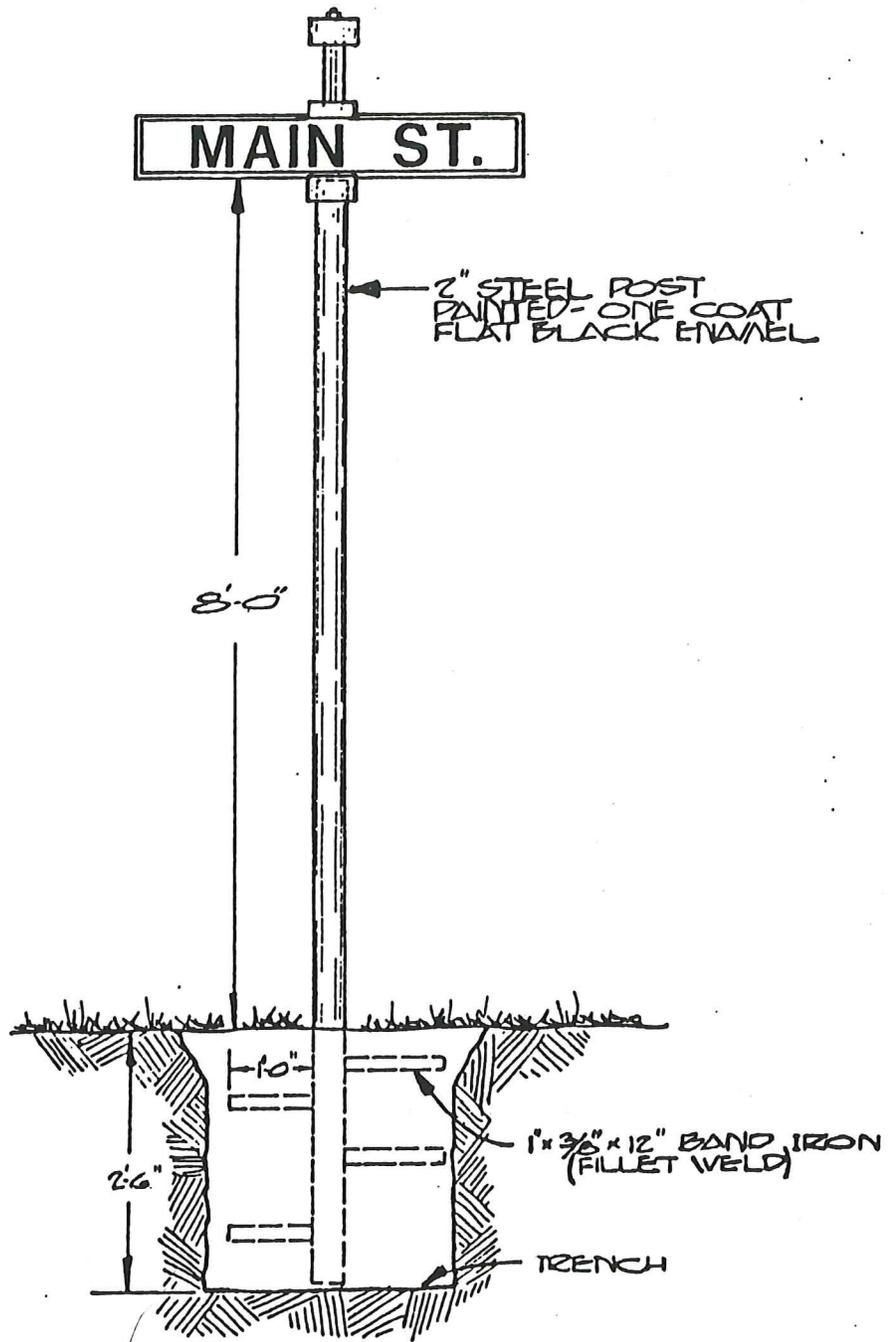
PLAN



SECTION A-A

STREET DETAILS

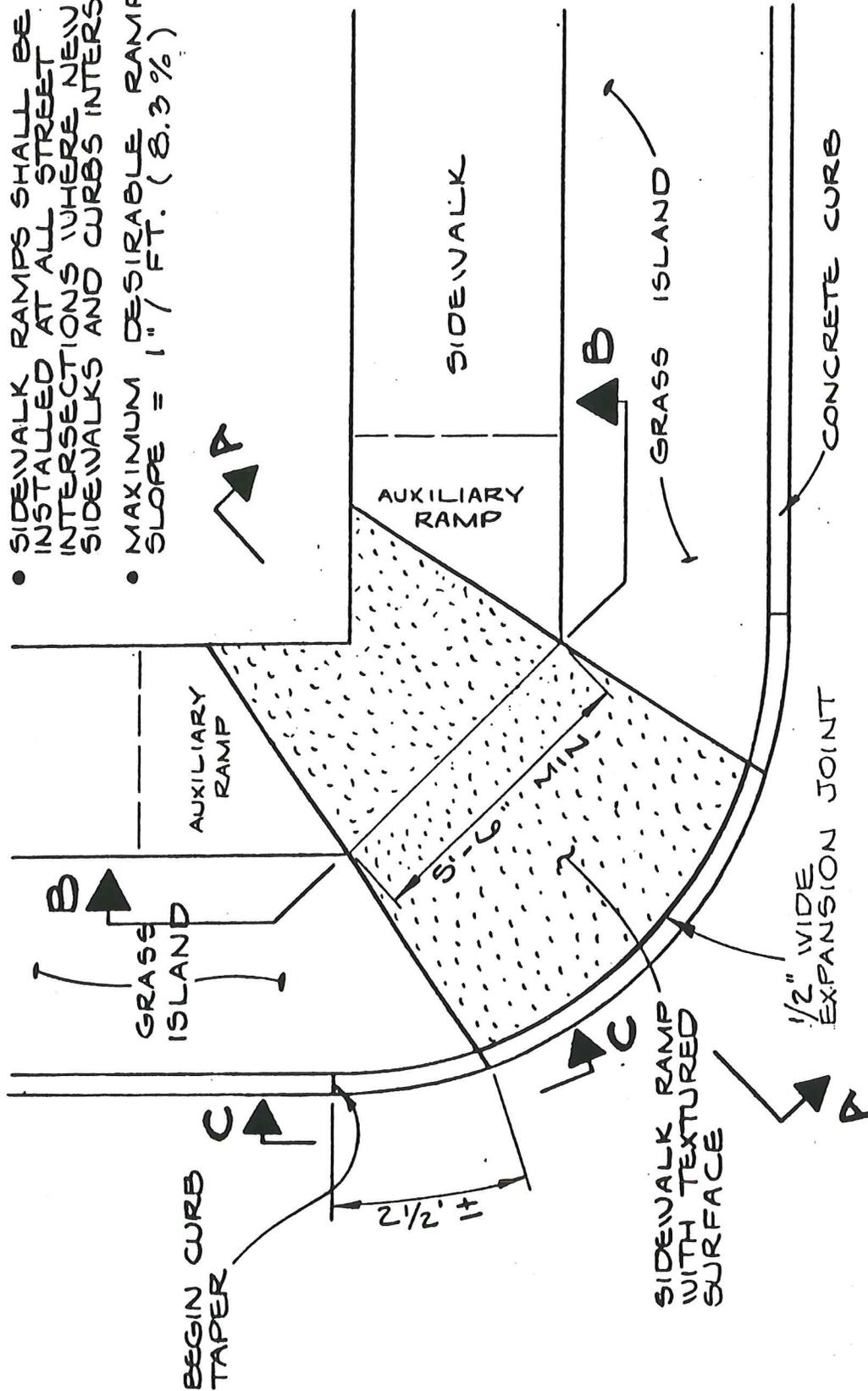
RURAL DRIVEWAY



STREET DETAILS

STREET NAME SIGNS

- SIDEWALK RAMP SHALL BE INSTALLED AT ALL STREET INTERSECTIONS WHERE NEW SIDEWALKS AND CURBS INTERSECT
- MAXIMUM DESIRABLE RAMP SLOPE = 1" / FT. (8.3%)

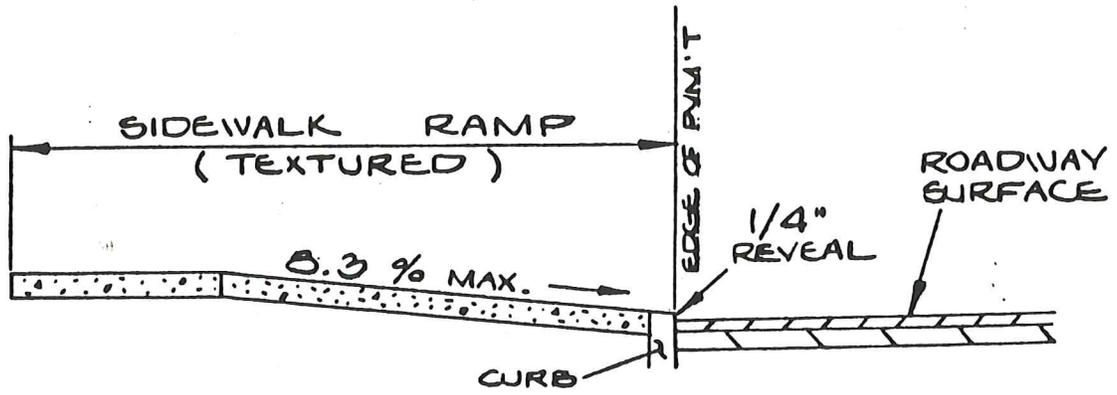


STREET DETAILS

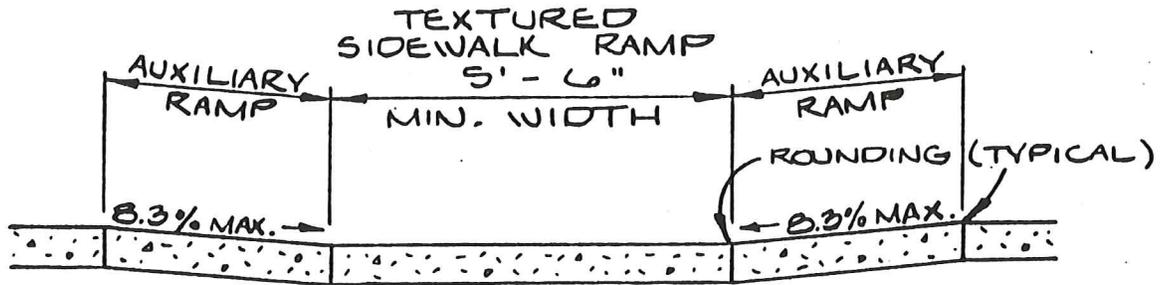
SIDEWALK RAMP

NTS

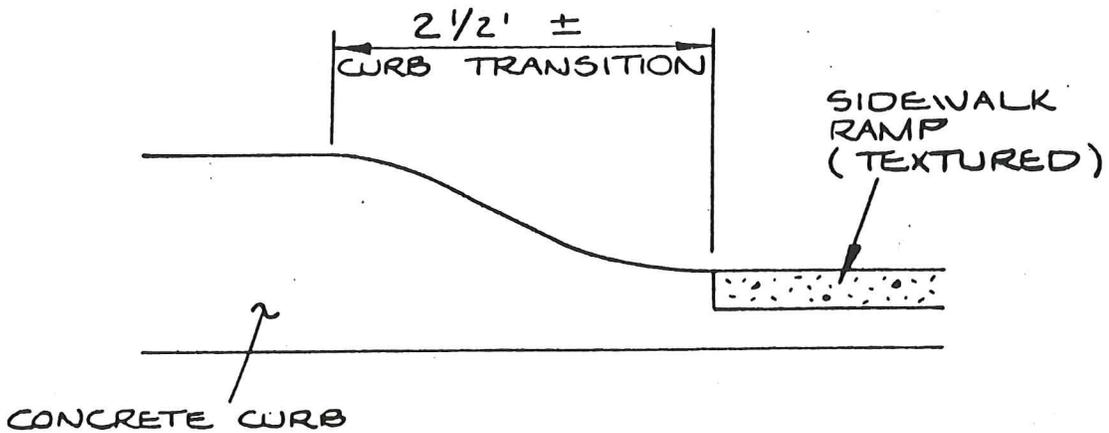
SIDEWALK RAMP SECTIONS



Section A - A



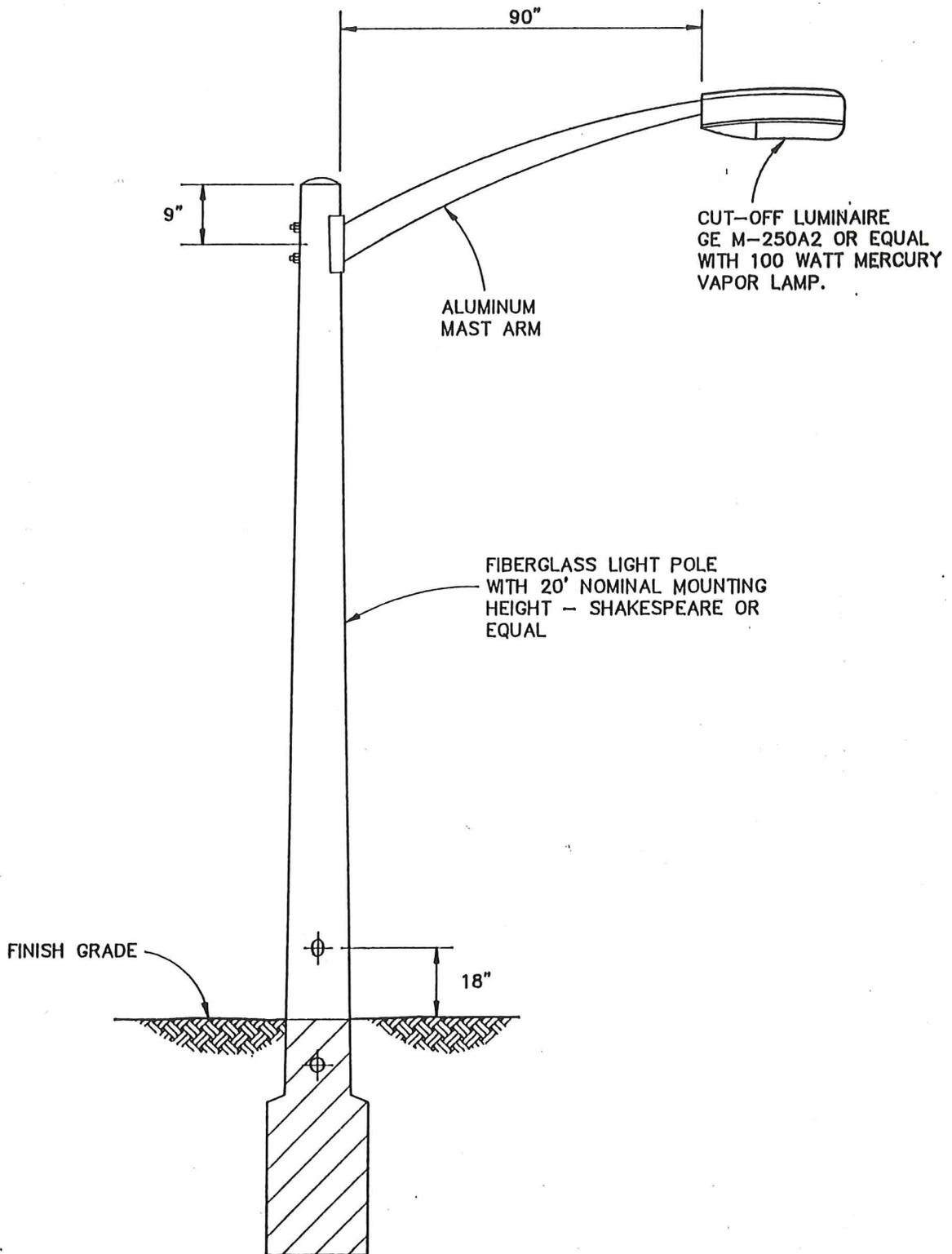
Section B - B



Section C - C

STREET DETAILS

NTS



STREET DETAILS

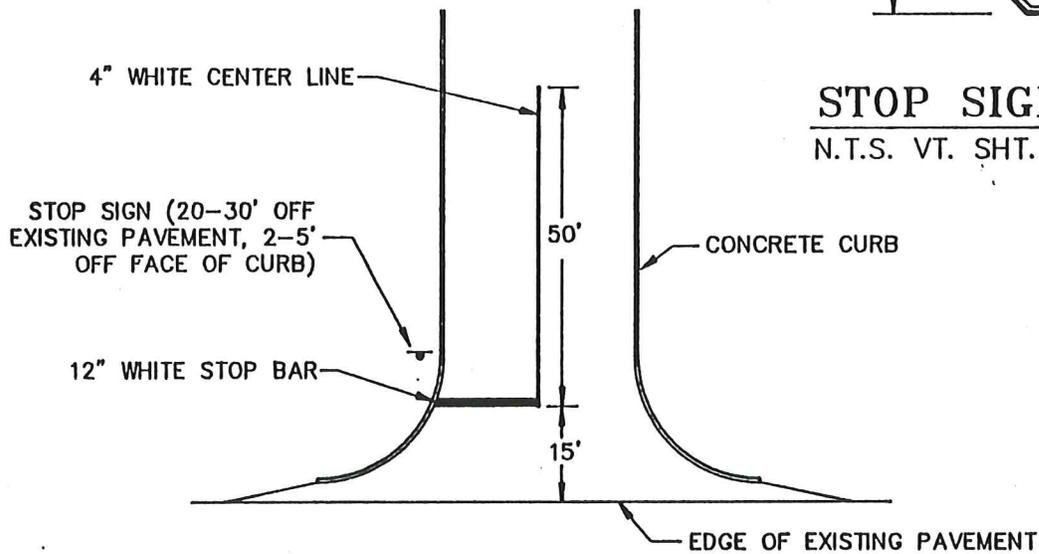
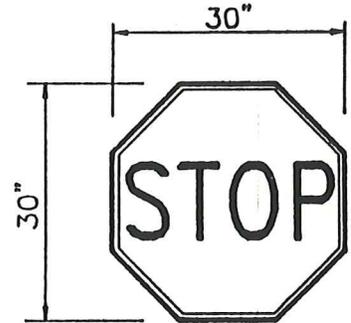
STREET LIGHT

NTS

FIGURE 14

NOTE:

NEW PAVEMENT MARKINGS SHALL BE DURABLE AND IN ACCORDANCE WITH THE LATEST VT AGENCY OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION. ALL EXISTING PAVEMENT MARKINGS CONFLICTING WITH THE NEW IMPROVEMENTS SHALL BE REMOVED BY GRINDING OR BURNING.



STOP SIGN

N.T.S. VT. SHT. E-143

STREET DETAILS

TRAFFIC SIGN and MARKINGS

NTS

CB FRAME AND GRATE
LeBARON LK 120 OR
LK 120A FOR ENTRANCE
GRADES EXCEEDING 5%

HIGH STRENGTH
NON-SHRINK
GROUT

CURB

FINISH GRADE

GROUT

BRICK
ADJUSTMENT
2 COURSES (MIN.)
6 COURSES (MAX.)

S.T. GRISWOLD
#530 OR
APPROVED
EQUAL (4000
P.S.I CONC.)

#4 BARS @
6" E.W.

O-RING OR
BUTYL ROPE

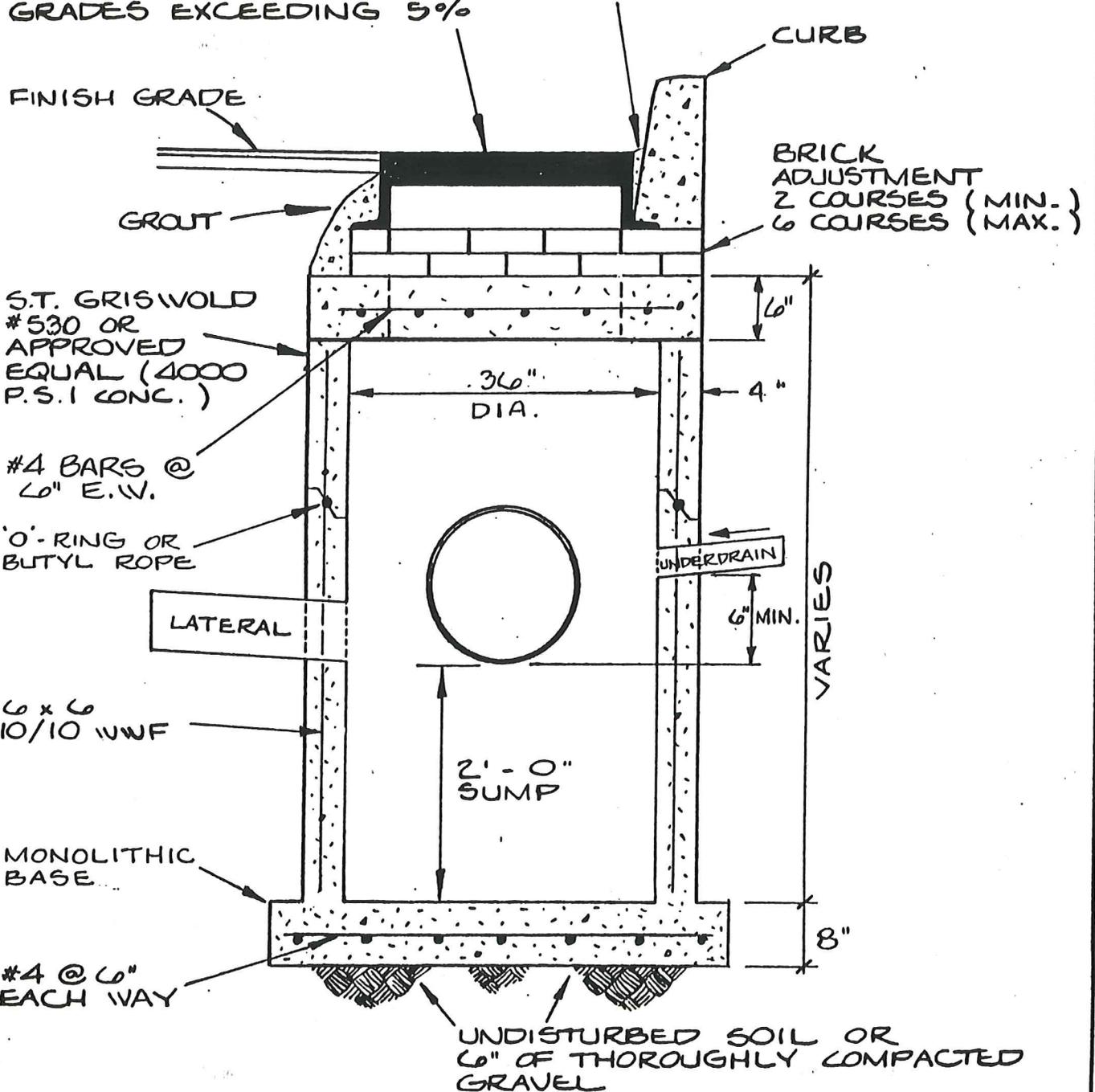
LATERAL

6 x 6
10/10 WWF

MONOLITHIC
BASE

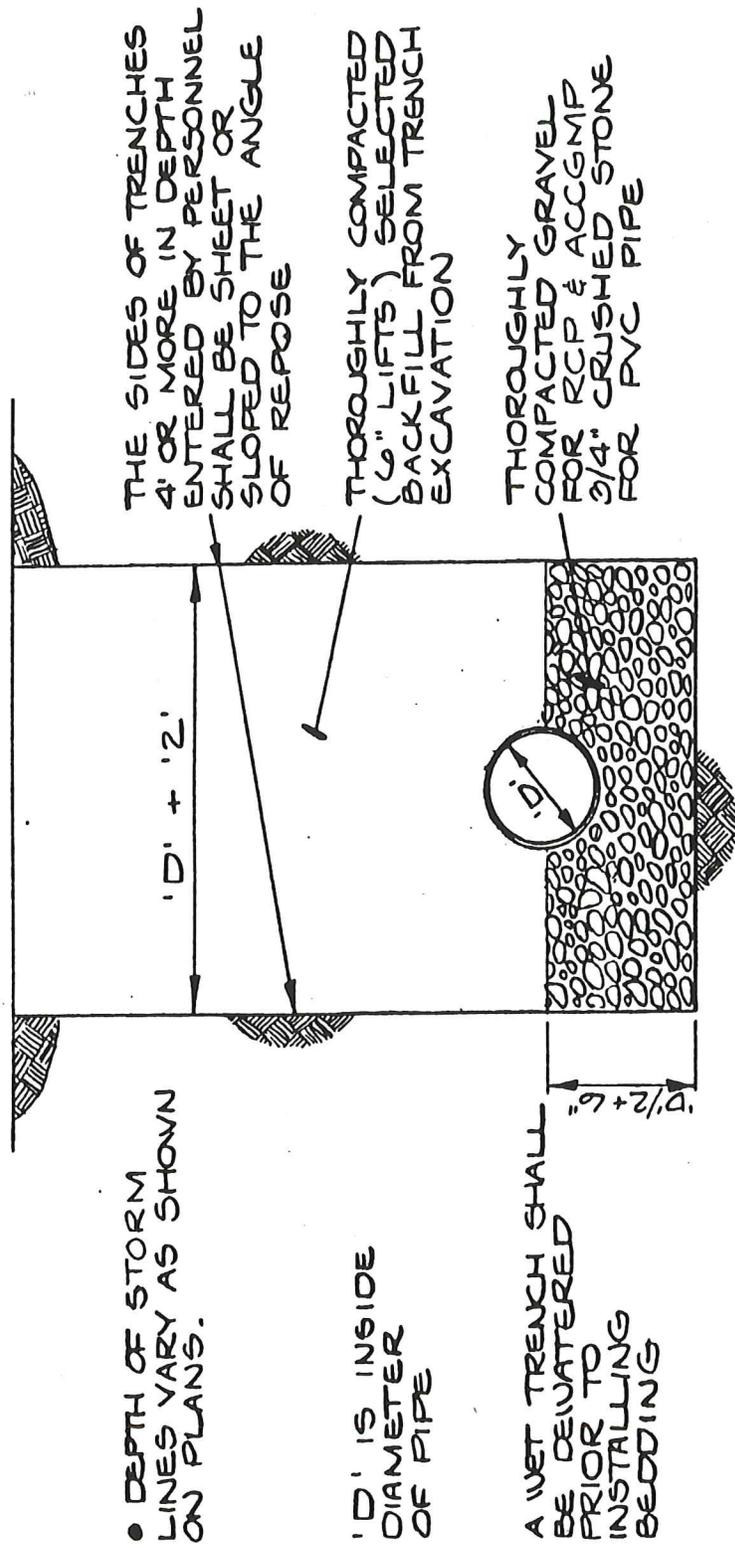
#4 @ 6"
EACH WAY

UNDISTURBED SOIL OR
6" OF THOROUGHLY COMPACTED
GRAVEL



STORM DRAINAGE DETAILS

PRECAST CATCH BASIN



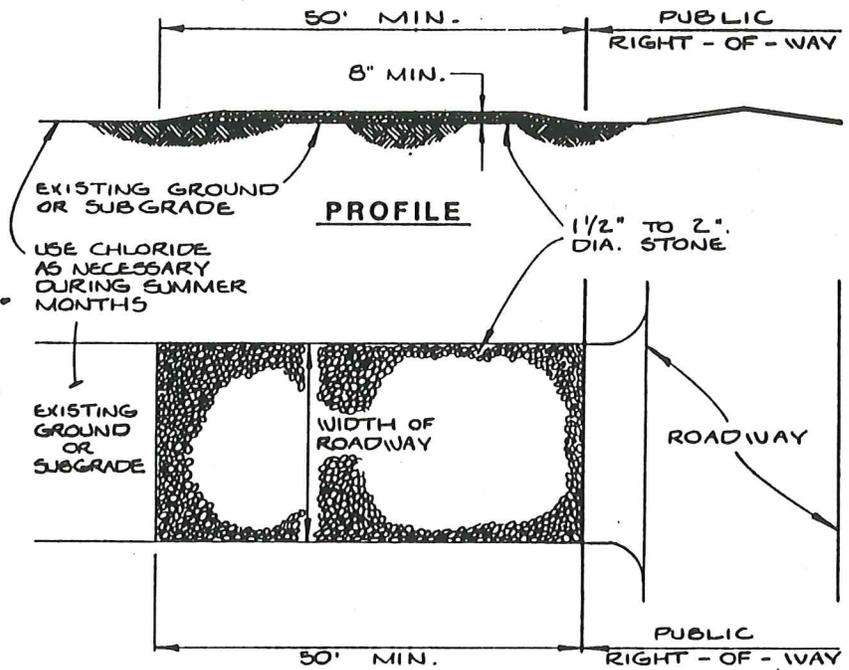
STORM DRAINAGE DETAILS

STANDARD TRENCH for STORM DRAINS

NTS

MAINTENANCE REQUIREMENT :

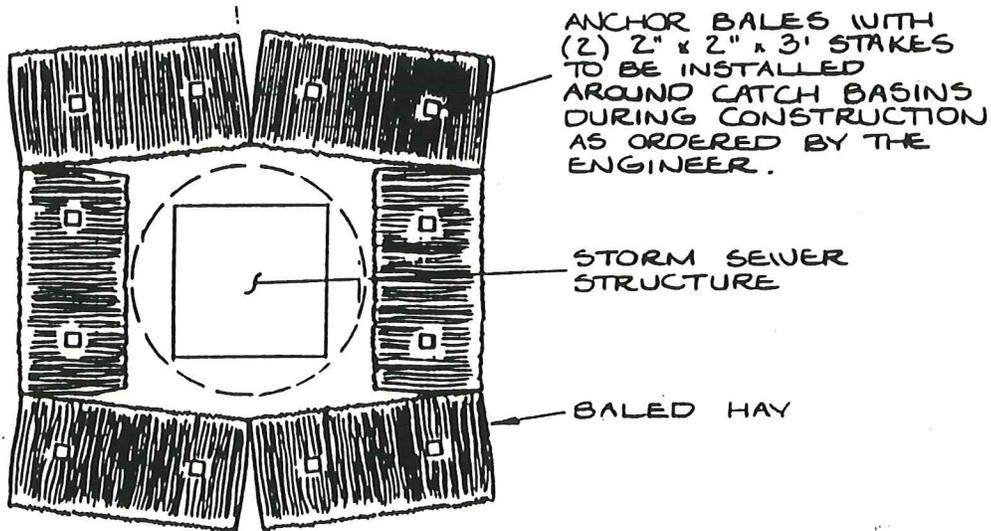
THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS MAY DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT TRACKED, SPILLED OR WASHED ONTO PUBLIC RIGHTS-OF-WAY SHALL BE REMOVED IMMEDIATELY.



PLAN

• PROVIDE APPROPRIATE TRANSITION BETWEEN STABILIZED CONSTRUCTION ENTRANCE AND PUBLIC RIGHT-OF-WAY

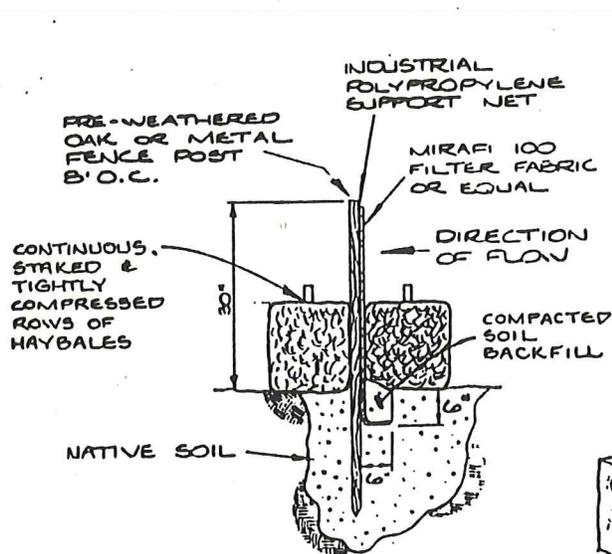
STABILIZED CONSTRUCTION ENTRANCE



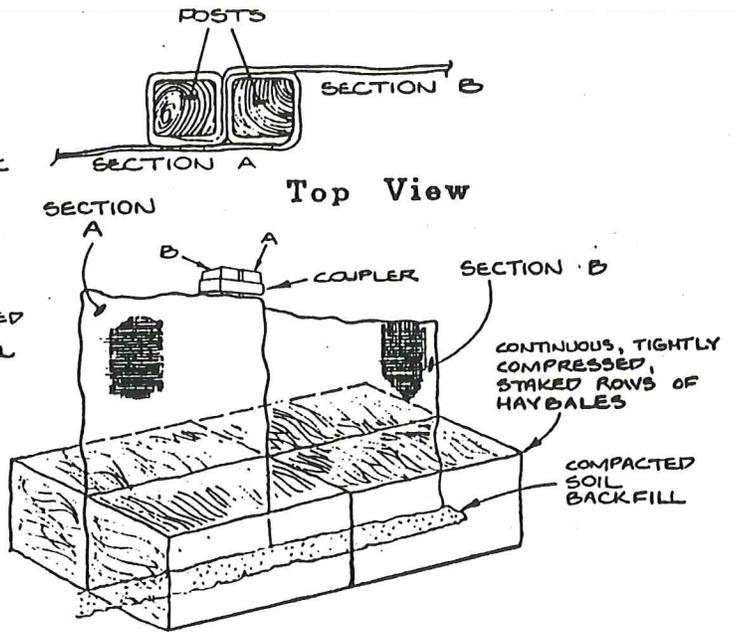
INLET PROTECTION

STORM DRAINAGE DETAILS

(TEMPORARY EROSION CONTROL)



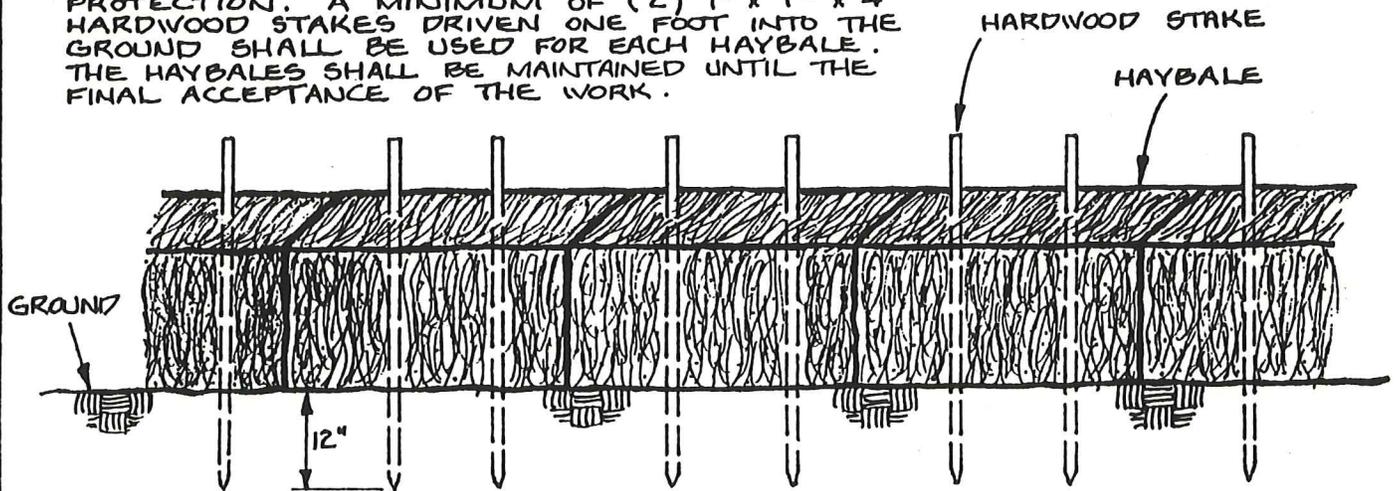
Installation Detail



Joining Sections of Fence

Silt Fence Erosion Control Barrier

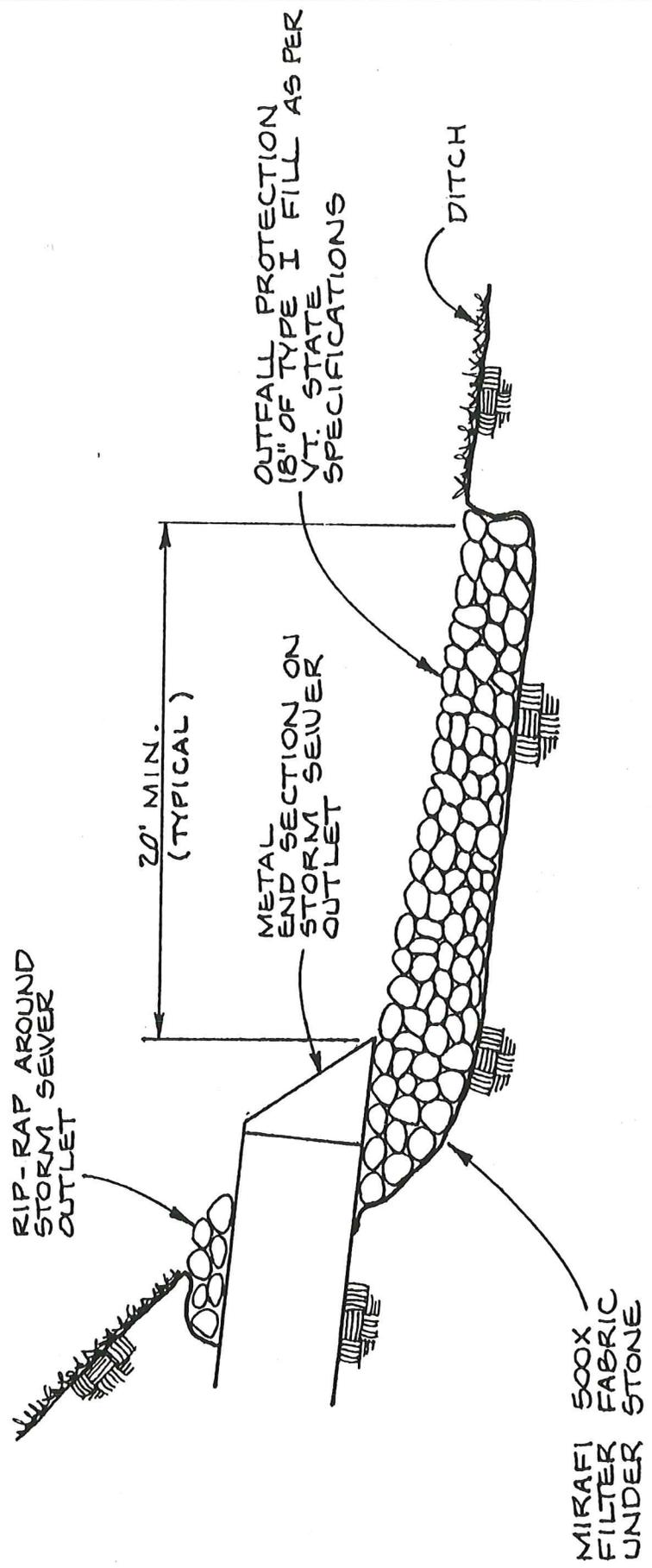
- PRIOR TO THE START OF CONSTRUCTION, A SINGLE ROW OF STAKED, TIGHTLY COMPRESSED HAYBALES IS TO BE INSTALLED FOR EROSION PROTECTION. A MINIMUM OF (2) 1" x 1" x 4' HARDWOOD STAKES DRIVEN ONE FOOT INTO THE GROUND SHALL BE USED FOR EACH HAYBALE. THE HAYBALES SHALL BE MAINTAINED UNTIL THE FINAL ACCEPTANCE OF THE WORK.



Haybale Erosion Control Barrier

STORM DRAINAGE DETAILS

(TEMPORARY EROSION CONTROL)

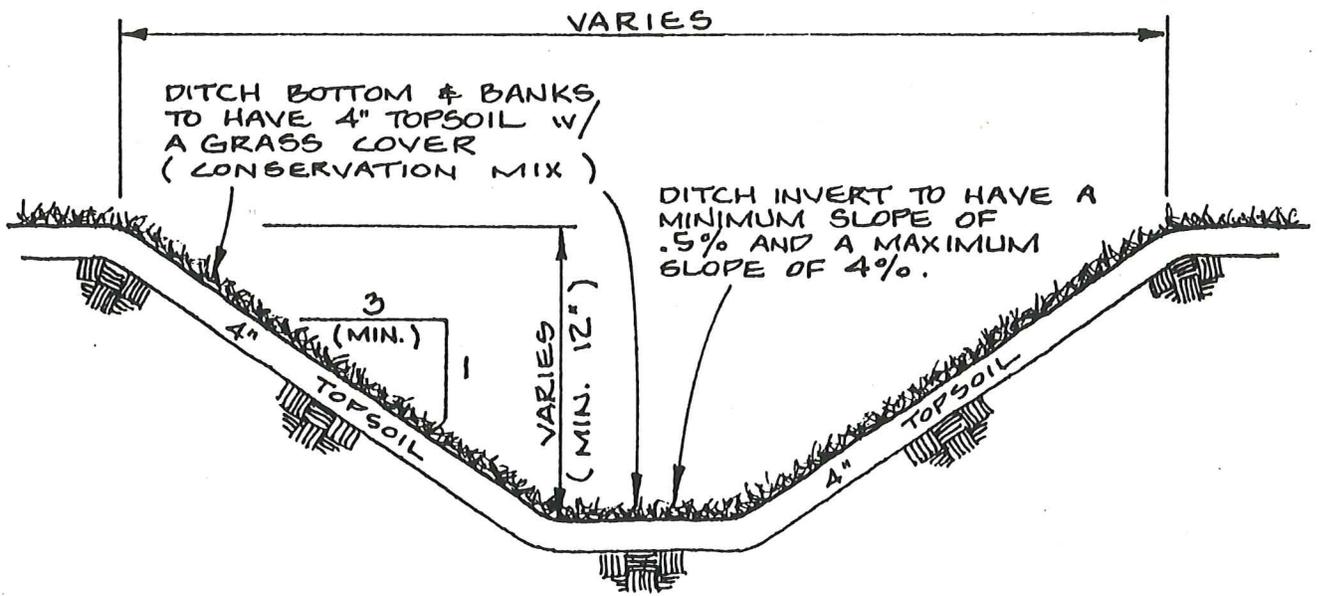


STORM DRAINAGE DETAILS

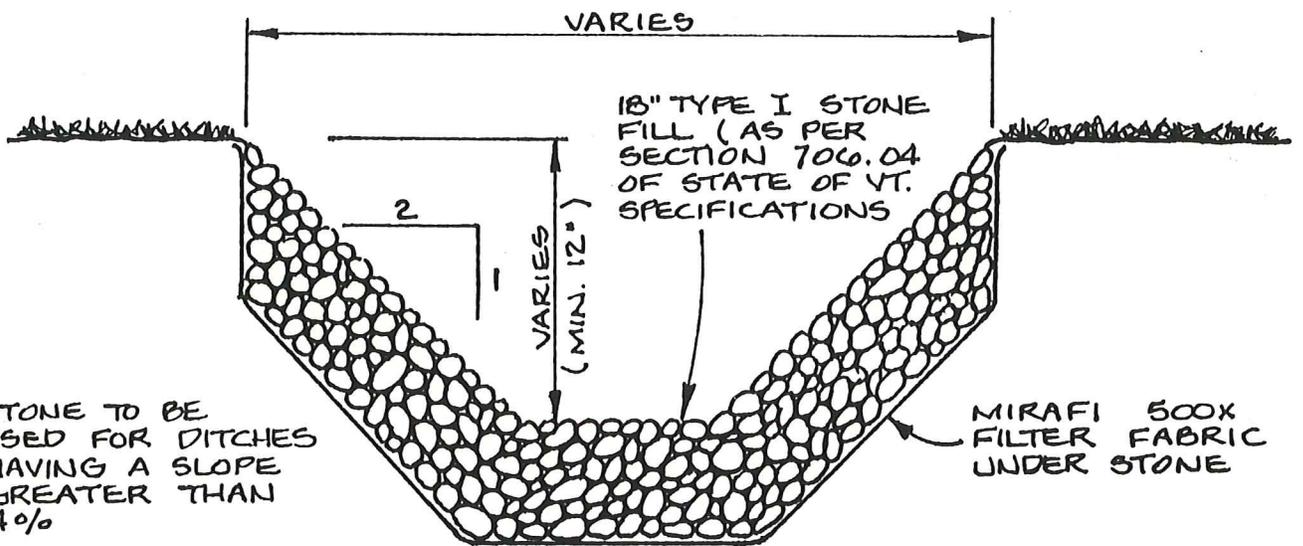
STORM SEWER OUTLET

NTS

FIGURE 20



UNPAVED DITCH



STONE-LINED DITCH

STORM DRAINAGE DETAILS

NTS

BOLTON PUBLIC WORKS SPECIFICATIONS - APPENDIX

APPENDIX II

<u>Document No.</u>	<u>Type of Form</u>
1.	Project Modification Form
2.	Construction Estimate Form

TOWN OF BOLTON
CONSTRUCTION ESTIMATE FORM

Project Name _____

Project Location _____

Section _____ Phase _____

Owner's Name and Address: _____

Name and Address of Person Responsible for Preparation of Estimate: _____

Date: _____ ENR _____

Town Representative approving estimate: _____

Item	ESTIMATE Quantity	Unit of Measurement	Unit Price	Total Price
Clearing & Grubbing	1	Lump Sum		
Rough Grading	2	Lump Sum		
Sub-Base Gravel: Bank Run	3	Cubic Yards		
Crusher Run - Plant Mix	4	Cubic Yards		
Paving: Base Course	5	Square Yards		
Top Course	6	Square Yards		
Driveway Aprons	7	Square Yards		
Sidewalks	8	Linear Feet		
Bike Paths	9	Linear Feet		
Bike Lanes	10	Linear Feet		
Curbs	11	Linear Feet		
Storm Drainage: Pipe	12	Linear Feet		
Catch Bains	13	Each		
Dry Wells	14	Each		
Slope Pipes	15	Linear Feet		
Outfall Pipes	16	Linear Feet		
Slope Protection	17	Lump sum		
Headwalls	18	Each		
End Sections	19	Each		
Boring	20	Linear Feet		
Water: Mains	21	Linear Feet		
Hydrants	22	Each		
Valve & Shutoffs	23	Each		
Air Release Valves	24	Each		
Boring	25	Linear Feet		
Sewer: Main	26	Linear Feet		
Man Holes	27	Each		
Boring	28	Linear Feet		
Sheathing	29	Square Feet		
Landscaping	30	Lump Sum		
Traffic Improvement:				
Stripping	31	Linear Feet		
Signs	32	Each		
Utilities: Electric	33	Lump Sum		
Telephone	34	Lump Sum		
Gas	35	Lump Sum		
Miscellaneous	36	Lump Sum		
Total		N/A	N/A	