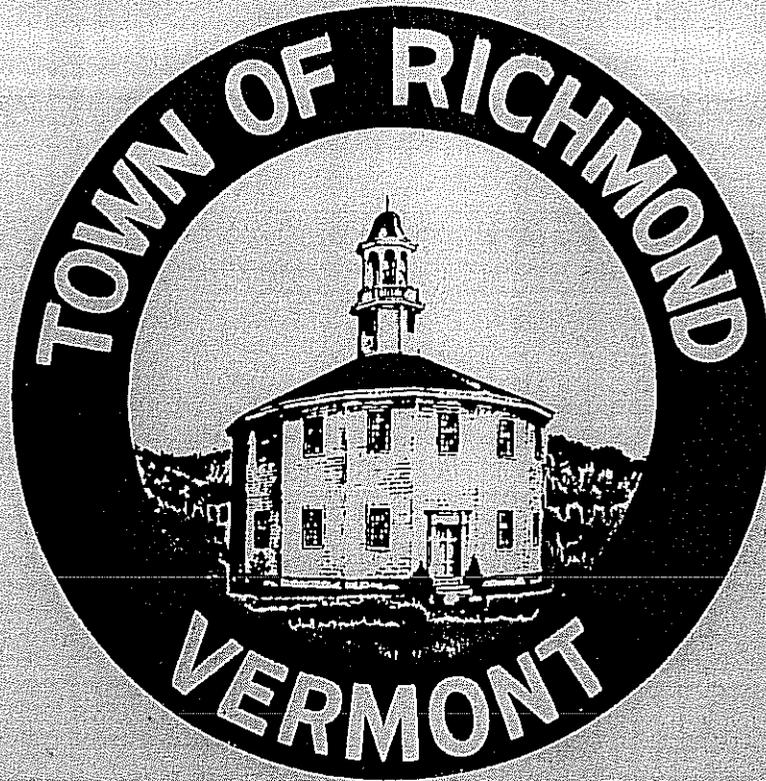


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# PUBLIC WORKS SPECIFICATIONS for the



## Town and Village of Richmond, Vermont

LAMOUREUX

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Essex Junction, Vermont 05452  
(802) 878-4450

Consulting Engineer and Land Surveyor

May 16, 1988  
amended Feb 19, 1990

## PREFACE

This manual, entitled "Public Works Specifications and Details for the Town and Village of Richmond," is intended to serve a long-established need. Its major usefulness lies in the design and construction of streets, water distribution, sanitary sewers, storm sewers, and related work. These specifications are also supplemented by the Town of Richmond Subdivision 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 and Village of Richmond Public Works Specifications."

The term "Engineer" shall be understood to be the person or persons appointed by the Municipality as authorized to act in that capacity. Before any variation from approved plans is done a site "Project Modification Form" (see Appendix IV) must be submitted to the Municipality and approved by the Zoning Administrator, Engineer, and Planning Commission when applicable.

Acknowledgments 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 updated and revised Public Works Specifications;

Dennis Lutz, P.E., the Director of Public Works for the Town of Essex, for the use of the specifications prepared for the Town sanitary sewer system; and

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

Leonard Lamoureux, P.E.  
November, 1987

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AMENDMENT NO. 1  
TO THE PUBLIC WORKS SPECIFICATIONS  
FOR THE TOWN OF RICHMOND

The location of all accesses, including those for individual single-family houses, shall be approved by the Richmond Highway Superintendent and Engineer. Single driveways serving up to 3 dwellings shall be permitted provided they are constructed to allow ingress and egress for emergency vehicles.

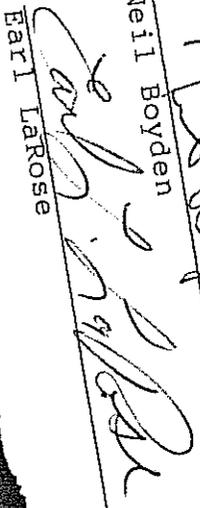
1990.

Dated at Richmond, Vermont, this 19<sup>th</sup> day of February,

BOARD OF SELECTMEN

  
Roger Bombardier, Chairman

Neil Boyden

  
Earl Larose

Town of Richmond  
Supplemental Policy for Transportation Construction and Improvements

The Selectboard of the Town of Richmond, County of Chittenden, State of Vermont hereby adopts the following policy: Supplemental Policy for Transportation and Improvements.

The below standards are supplemental to the March 1990 Public Works Specifications for the Town of Richmond, Vermont, where conflicting, the stricter standard shall apply.

Construction and Improvements:

1. A road is, 1) a traveled way for vehicles within a public highway right-of-way serving any number of properties or residential units, or 2) a traveled way for vehicles within a private right-of-way serving four or more residential units. Commercial or industrial access roads are roads, not driveways, from the point they leave a public highway to the designated commercial parking and loading areas.
2. Residential driveways serve no more than three residential units.
3. Road and road related improvements shall be constructed or installed in accordance with sound engineering practice and this policy.
4. The standard specifications contained as part of this policy and the current Public Works Specifications for the Town of Richmond, Vermont, are considered minimum and may be exceeded to meet traffic or other conditions.
5. All new bridges and culverts will meet the 25-year event or "Q-25" standard.
6. All bridges shall have a minimum two-lane width.
7. The following construction guidelines are incorporated into this policy:
  - a. A-21 Class 3 Town Highway guidelines for ADT 0 - 250
  - b. A-22 Class 3 Town Highway guidelines for ADT 251 - 400
  - c. A-23 Other than Class 3 Highway guidelines for ADT 0 - 400
  - d. A-24 Guidelines for All ADT Highways 401 - 750
  - e. A-25 Guidelines for All ADT Highways 751 + and <50 mph
  - f. A-76 Design Standard for Town and Development Roads
  - g. B-11 Design Standard for Underdrain
  - h. B-71 Design Standard for Residential and Commercial Drives
  - i. D-2 Design Standard for Headwalls and other reinforcement
  - j. D-3 Design Standard for Treated Gutters

Any new road, whether or not that road is proposed to be conveyed to the town, shall be constructed according to the minimums of this policy.

This policy is subject to modifications by the Selectboard only if it can be shown that enforcement would cause undue hardship due to unusual conditions, provided the general objectives are satisfied after a study of local conditions requiring such changes.

The Selectboard shall make final decisions over all significant questions arising during construction of new roads and shall approve all substantial field changes, however, minor field changes may be approved by the town road foreman, after consultation with the town engineer. The Selectboard shall be notified of all minor field changes as soon as possible.

Passed and adopted by the Selectboard of the Town of Richmond, State of Vermont on the 11<sup>th</sup> day of September 2000.

Virginia M. Clarke  
Virginia M. Clarke, Chair

Frederick M. Barrett  
Frederick M. Barrett, Vice-Chair

David C. Johnson  
David C. Johnson, Member

Linda Andrews  
Linda Andrews, Member

Robert Marquis  
Robert Marquis

Section 1.0  
GENERAL SPECIFICATIONS

1.1 PUBLIC STREETS AND DRIVEWAYS

All new proposed streets, utilities, and other public improvements shall be designed and constructed in accordance with 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 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 surface of any curbed street may not be less than thirty feet (30'). The Municipality may require sidewalks and/or bike paths in new developments. 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 (15') 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, unless agreed to by the Municipality; and no intersection shall be at an angle of less than 80 degrees.

A cul-de-sac is a street terminating in a turnaround 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 a maximum of one thousand eight hundred feet (1,800). All dead-end streets shall have a cul-de-sac.

The turnaround on a dead-end street (cul-de-sac) shall have a minimum diameter of right-of-way of one hundred twenty feet (1.20') and a minimum outside diameter of traveled way of one hundred feet (100'). If a cul-de-sac is not feasible the use of other types of turnarounds will be reviewed by the governing board. 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 streets are approved by the Planning Commission after consultation with the Municipal Engineer and Administrator.

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 Plat "Reserved for Road Alignment and/or Widening Purposes or Future Road". Areas shown in this manner shall be dedicated to the Municipality.

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

Driveways and street intersections shall be designed to meet the latest requirements of the Transportation and Traffic Engineering Handbook by the Institute of Transportation Engineers for site distances.

Driveway culverts at a minimum diameter of 18 inches shall be required unless the Superintendent 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 reviewed and approved by the Superintendent or Engineer. The maintenance of driveways and culverts shall be the responsibility of individual property owners or a homeowner's association.

The location of all accesses, including those for individual single-family houses, shall be approved by the Richmond Highway Superintendent and Engineer. Single driveways, serving up to 3 dwellings, shall be permitted providing they are constructed to allow ingress and egress for emergency vehicles.

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

All road cuts shall be returned to original or better condition within one week of initial cut. The repair work shall be approved by the Highway Superintendent prior to release of any deposits by the Municipality. Restored road cuts shall be guaranteed by the applicant for a period of two years.

## 1.2 PRIVATE ROADS

Private roads, if approved by the Town Road Commissioners, shall be developed to the same standards as public roads. Provisions for a possible future sixty foot (60) public roadway shall be made, including locating any proposed structures with a minimum front yard setback equal to that permitted in the Zoning Ordinance.

## 1.3 GENERAL CONSTRUCTION REQUIREMENTS

All materials, design, and workmanship must meet with nationally accepted standards and practices and, when applicable, those of the State or Municipality.

Side slopes in street embankments shall descend one foot (1') vertically for at least three feet (3') horizontally (1 on 3). Side slopes in excavation in rock shall ascend six feet (6') vertically for at least each one-foot (1') horizontally (6 on 1). Where rock cuts have a face higher than ten feet (10') vertically a three-foot (3') berm shall be provided at each ten-foot (10') level above the grade at the edge of the pavement.

Poles, brackets, and lights for street lighting are to be approved as to size, type, and location by the Planning Commission. They shall be complete and fully energized prior to acceptance of the street by the Municipality.

All of the public works improvements to be dedicated to the Town of Richmond shall be guaranteed by a bond provided to the Town at no cost. The bond shall be in an amount sufficient to cover the total estimated costs of the improvements as approved by the Municipality and shall be conditioned upon the satisfactory condition of the improvements for a period of three years from the date of acceptance by the Municipality. Before the bond is set, a "Project Cost Estimate Form" shall be completed and submitted to the Municipality. See Appendix for all forms.

The workmen and 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 are to be guarded by the use of adequate barricades or flagmen. All barricades left in position overnight are to be properly lighted. Kerosene pots are not acceptable. When work narrows the useable pavement, flagmen 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 workmen and the general public and all damages to property occurring from or upon the work occasioned by negligence or otherwise growing out of a failure on the part of the Contractor to protect persons or property from 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 OSHA regulations, Title 19, Parts 1926.651 and 1926.652, and applicable to VOSHA regulations.

Construction approach signs shall appear at each end of the highway under construction and on all interesting public highways. The exact placement of any sign will depend upon the alignment of the highway and the character of the roadsides. The location, measurements, and minimum spacing is to be observed by the Engineer in determining exact locations.

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 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 on wood or metal posts set securely in the ground.

#### 1.4 SANITARY SEWAGE DISPOSAL

Sanitary disposal systems shall be of a design and use which will meet the latest standards of the State of Vermont of Health, Environmental Conservation, and Water Resources.

**Section 2.0**  
**STREET SPECIFICATIONS**

**2.1 EXCAVATION FOR STREETS**

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 shown on the construction standards. 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.

**2.2 EMBANKMENTS**

Embankments shall be constructed by the Contractor with either approved surplus excavated material or with approved material obtained elsewhere.

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.

The excavated rock, ledge, boulders, and stone, except where required in the construction of other items or otherwise directed, shall be used in the construction of embankments to the extent of the project requirements and generally shall be placed so as to form the base of an embankment.

Frozen material shall not be used in the construction of embankments, nor shall the embankments or successive layers of the embankments be placed upon frozen material. 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, muck, or areas of unstable soils, the unsuitable materials shall be excavated to reach soils of adequate bearing capacity and the embankment. 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 (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 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 as 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 shall be less than that quantity that will cause the embankment to become unstable during compaction. Sponginess, shoving, or other 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.

Compaction of the layer of wet material shall be deferred until the layer has dried to the required moisture content by evaporation.

Upon completion of filling and excavating, the subgrade shall be formed to the required grade and contour; and the entire surface again 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.

### 2.3 FILTER FABRIC

Where required on the plans or where directed by the Municipality, the Contractor shall install filter fabric, such as Mirafi 500X or 140N as manufactured by Celanese Corporation, or TYPAR as manufactured by DuPont Corporation, or an approved equal, over the subgrade or prior to placement of fill, the gravel base, or around drains.

Prior to placement of the filter fabric, the surface shall be smoothed to remove all objectionable material, which could damage the fabric. Where more than one width of filter fabric must be employed, the edges shall be overlapped to establish approximately two feet (2') at the edges and joined by overlapped strip to the ground surface with six inch (6") minimum U-shaped wire pins, single-shaft steel pins with metal disc fasteners, or similar devices. Fasteners should be placed six feet (6') apart on the overlap. Where utilized in underdrains, channels, or streams, the fabric should be overlapped in the direction of water flow. Toeing may be required to ensure that the fabric, a four-inch (4") bedding blanket of gravel, shall be carefully placed over the filter fabric so as not to damage the fabric.

## 2.4 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 as shown on the accepted drawings or as ordered by the Municipality or Engineer.

### B. Materials:

- Perforated Polyvinyl Chloride (PVC): PVC SDR 35 pipe shall conform to ASTM F75B or AASHTO, M278.
- Perforated Corrugated Steel Pipe: Pipe shall conform to AASHTO, M36. Minimum sheet metal thickness required is 0.052 inch for six inch diameter underdrain and 0.064 inch for eight inch diameter or larger.
- Perforated Corrugated Aluminum Alloy Pipe: Pipe shall conform to AASHTO, M196.
- Stone: Stone fill shall be clean, durable, three-fourths inch to one and one-half inch ( $\frac{3}{4}$ " to  $1\frac{1}{2}$ ") stone.
- Filter Fabric: The fabric shall be Mirafi 140N or equal.

### 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 three-fourths inch to one and one-half inch ( $\frac{3}{4}$ " to  $1\frac{1}{2}$ ") clean stone. Placing shall begin at the outlet end and proceed toward the upper end. The underdrain 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 otherwise 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 six-inch (6") fabric overlap at the top. (See underdrain detail.)

## 2.5 SAND

### A. Description:

This item shall consist of a subbase course of sand as approved by the Municipality or 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 Borrow, # 703,03. It shall be obtained from approved sources and shall meet the requirements set forth in this table:

Sieve Designation	Percentage By Weight Passing Square Mesh Sieve
2"	100
1 1/2"	90 - 100
1/2"	70 - 100
No. 4	60 - 100
No. 100	0 - 20
No. 200	0 - 6

## 2.6 GRAVEL BASE

### A. Description:

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

### B. Materials:

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. The gravel shall be uniform in grade from course to fine and shall meet the grading requirements set forth in this table:

Sieve Designation	Percentage By Weight Passing Square Mesh Sieve	
	<u>Total Sample</u>	<u>Sand Portion</u>
No. 4	20 – 60	100
No. 100		0 – 12
No. 200		0 – 6

All bottom course material shall be deposited and spread so as to distribute the 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 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, and compacted to a 95 percent dry density by the AASHTO-T-99 Method A (Standard Proctor) test.

If necessary where there is a high ground water 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.

## 2.7 CRUSHER RUN 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 on the accepted drawings. Material shall meet Vermont Standard Specifications for Construction, # 704.05, Crushed Gravel for Subbase.

### 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, foreign matter, dirt or other objectionable matter. The grading requirement shall conform to the following table:

Sieve Designation	Percentage By Weight Passing Square Mesh Sieve
2"	100
1 ½"	90 – 100
No. 4	30 – 60
No. 100	0 – 12
No. 200	0 – 6

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

## 2.8 BITUMINOUS CONCRETE (ASPHALT) PAVEMENT

### A. Description:

This type of pavement shall be composed of mineral aggregate material 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, and typical cross-sections shown on the drawings.

### B. Materials:

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

The fine material 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 vegetation matter or other harmful substances.

The asphalt cement shall conform to all the requirements as set forth in Section 702 and 704.10 of the Vermont Standard Specifications for Construction.

### 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, 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, RS1.

- **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 3/16 of an inch between any two contacts shall be satisfactorily eliminated. A 10-foot straightedge 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 out the existing pavement along a straight line a minimum one-foot (1') into the existing pavement over the existing gravel base. The smooth cut shall be thoroughly cleaned and coated with Emulsified Asphalt, RS1, just prior to paving.

## 2.9 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.

### 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 concrete curbing shall be built to the required line and grade on a bed of gravel a minimum of six inches (6") in depth, which shall be fully compacted.

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. The concrete, mixed to the proper consistency, 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.

Expansion and contraction joints: One-half inch (1½") expansion joints shall be placed at intervals of 20 feet. At intervals not greater than 10 feet nor less than five feet, the concrete curbs 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 (3) days, and longer if the Engineer deems necessary, and shall be protected from the elements in an approved manner. If the contractor elects, an approved curing compound may be applied 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 Proposed Recommended Practice for Cold Weather Concreting, ASI 306. In hot weather, 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 .025 gallons per square yard and the second at a rate of .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, which shall be constructed as outlined in Sections 2.11 and 2.12 and as in the Details section of this manual.

## 2.10 CEMENT CONCRETE SIDEWALK

### A. Description:

This item shall consist of sidewalk made of one course Portland cement concrete not less than five inches (5") thick and with a width of not less than five feet (5'). 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 driveways. The sidewalk shall be constructed in accordance with these specifications and the cross-sections as shown on the accepted drawings. All sidewalks shall have ramps where they intersect with streets to provide for handicapped access.

### B. Materials:

Same as for Cement Concrete Curb.

### 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 subgrade 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 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. The concrete mixed to the proper consistency 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. 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: One-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.

Seasonal limits: Same as for Concrete Cement Curb.

## 2.11 CEMENT CONCRETE DRIVEWAY APRONS

### A. Description:

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

### B. Materials:

Same as for Cement Concrete Curb.

C. Construction Methods:

Preparation of subgrade: Same as for Cement Concrete Sidewalk.

Form for concrete: Same as for Cement Concrete Curb.

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

Expansion joints: One-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.

## 2.12 BITUMINOUS CONCRETE DRIVEWAY APRONS

A. Description: Same as for Bituminous Concrete Pavement.

B. Materials: Same as for Bituminous Concrete Pavement.

C. Construction Methods:

Preparation of subgrade: Same as for Cement Concrete Sidewalk.

Curbs: Same as for Cement Concrete Driveway Aprons.

## 2.13 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:

The monuments shall be set vertically and to a 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 to practice in the State of Vermont.

## 2.14 PLANTING OF TREES

The Planning Commission of the Town of Richmond 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 in which substantial loss of trees has or will occur in the process of 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.

## 2.15 STREET GUARD RAILS

This item shall consist of the construction of twelve gauge, standard steel beam and post guardrail, conforming to the design indicated on the accepted drawings, Sections 621 and 728 of the Vermont Standard Specifications for Construction, and pages G-1 and G-1d of the Vermont Design Standards. A guardrail shall be erected when the height of fill at the shoulder point is more than five feet (5') with a slope steeper than 1 on 3 or as ordered by the Municipality.

## 2.16 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 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.

### C. Construction:

The signpost shall have a total length of ten feet, six inches (10'6") with an approximate exposed length of eight feet, zero inches (8'0"). The remaining 21 x 6" length shall have four 12-inch 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 post shall have one coat of flat black enamel paint applied before erection. (See Sign Detail Sheet.)

### D. Erection:

The sign-post shall be set 2'6" in the ground, and the backfill material shall be tamped to maximum density so that the post shall be plumb and rigid. The sign post shall be located in the mall between the sidewalk and curb at a point which will not interfere with pedestrian or vehicular travel.

## **2.7 STREET LIGHTING**

Streets and roadways shall be illuminated by standard streetlights, approved by the Municipality, a maximum of six hundred feet (600') apart and at all street intersections. The streetlights will be installed on the sidewalk side of the street.

## **2.18 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 Town's Public Safety Agencies for review of any possible duplication with existing developments, subdivisions, streets, roads, or businesses within the Town of Richmond. The final street names shall be submitted in writing to the Richmond Police Dispatch Center at least one month prior to anyone taking occupancy on a new street or road.

## **2.19 STREET NUMBERS**

Homes within single-family subdivisions shall be numbered by the Contractor prior to occupancy in accordance with the U.S. Post Office; and the Municipality's street numbering system.

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 of a color contrasting to the surface on which they are placed or on a self-contained contrasting background. Curbside mailboxes shall conform to the Town Highway Specifications for the placement of such mailboxes.

## **2.20 EMERGENCY VEHICLE ACCESS**

In order to provide adequate police and fire protection, any plans submitted for consideration to the Town of Richmond for any type of commercial or industrial building will have an access road at least fourteen feet (14') wide completely around the building.

The 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.

Any such access road shall be lit in accordance with the lighting specifications of public roadways. Access roads must be passable year round.

## 2.21 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 be seeded, fertilized, limed, and mulched in accordance with the following:

- A. Seed mixture in all areas shall be urban mix conforming to the table below. For seeding between September 1 and October 1, winter rye shall be used at an application rate of 100 pounds per acre.
- B. Fertilizer shall be a standard commercial grade conforming to the State Fertilizer Law and to the Standards of the Association of Official Agricultural Chemists. Dry fertilizer, if used, shall be applied at the rate of 500 pounds per acre. Liquid fertilizer, if used, shall be applied in a 12:1 ratio with the minimum rate to include 100 pounds of nitrogen, 200 pounds of phosphate, and 100 pounds of potash per acre.
- C. Limestone shall conform to all State and Federal regulations and to the Standards of the Association of Official Agricultural Chemists. The limestone shall be applied at a rate of one ton per acre as directed.
- D. Within 24-hours of application of fertilizer, lime, and seed the surface shall be mulched with a hay mulch. Mulch shall be spread uniformly over the area at a rate of two tons per acre or as ordered by the Engineer.
- E. All turf establishment shall be performed in accordance with the Vermont Standard Specifications for Construction, Section 651.

URBAN MIX GRASS SEED

Percentage By Weight	Pounds Live Seed Per Acre	Type of Seed
37.50%	45.0	Creeping Red Fescue
37.25%	37.5	Kentucky Blue Grass
31.25%	37.5	Winter Hardy, Perennial Rye (variety Pennfine, Manhattan, or similar varieties)
100%	120 pounds live seed per acre	

**Section 3.0**  
**STORM SEWER SPECIFICATIONS**

**3.1 DESCRIPTION**

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. Except where approved by the Municipality, storm drainage systems for new developments shall be underground. Storm drainage calculations shall be provided as a part of the submittal of a site plan or preliminary subdivision plan. The Municipality may also require a detailed hydrological analysis for proposed developments. Developments that adversely impact existing storm drainage facilities will be expected to upgrade these facilities as a part of their development.

**3.2 MATERIALS**

Types of pipe: Types of pipe which may be used for storm drain lines are Reinforced Concrete Pipe (R.C.P.), Corrugated Galvanized Metal Pipe (C.G.M.P.), Polyvinyl Chloride Pipe (P.V.C.), or an approved equal. Types of pipe which may be used for culverts are Reinforced Concrete Pipe (R.C.P.), Corrugated Galvanized Metal Pipe (C.G.M.P.), or an approved equal. The Municipality will approve the types of pipe used.

Size: The minimum size of storm drain lines shall be fifteen inches (15"), including driveway culverts.

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

Corrugated galvanized metal pipe: Pipe shall conform to standard specification for C.G.M. pipe to AASHTO, M190. Spiral metal pipe will not be allowed.

Polyvinyl chloride pipe: Pipe shall conform to ASTM Specification D3034 or F679, (PVC) Sewer Pipe and Fittings, SDR35.

Manholes: Where indicated on the plans, the contractor shall furnish and install manholes, which meet the requirements of the sanitary sewer manholes of the specifications.

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 five percent), or an approved equal. Precast risers and base sections shall conform to the Vermont Standard Specifications for Construction, Section 604. 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 plaster being carried up as the brickwork progresses.

Joints between pipes and catch base sections shall be caulked with oakum and sealed with cement mortar, smoothed on the inside, and built up with a heavy bead of excess mortar on the outside. All brickwork shall be constructed in accordance with the masonry specifications for sanitary sewers in these specifications.

The grating frames shall be set to final grade only after the base course of paving has been completed.

### 3.3 CONSTRUCTION METHODS

Laying pipe: Storm drains and culverts shall be constructed in accordance with the Vermont Standard Specifications for Construction, Section 601, and on a trench bottom, 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 and 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 hands, concrete pipe joints shall be a rubber gasket type, and PVC pipe shall be joined with standard push-on type using electrometric 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 Municipality.

Backfilling: All material for backfilling shall be free of roots, stumps, and frost. Backfill for all pipe lines 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 AASHTO-T-99, Method A, Standard Proctor by a means approved by the Engineer. PVC pipe shall have a minimum of three feet (3') of cover.

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 backfilled 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.

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 asphalt-coated corrugated galvanized metal end sections, of concrete, or of 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 of 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.

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 predevelopment quantities for a minimum ten year, twenty-four hour storm event.

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

Dry Wells: Dry well storm disposal systems may be permitted in areas of deep native sands as approved by the Municipal Engineer. The developer's engineer will submit the system design and calculations to the Municipal Engineer for review and approval.

Section 4.0  
WATER DISTRIBUTION SPECIFICATIONS

4.1 DESCRIPTION

This item shall consist of the excavation and backfilling required for the complete construction of the water mains and services which shall include valves, tees, hydrants, elbows, reducers, and all other appurtenances necessary for a complete water main system as indicated in the accepted drawings. All material and installations shall be approved by the local fire district water authority or Town Engineer.

4.2 GENERAL WATERLINE MATERIALS

A. Ductile Iron Water Pipe:

Pipe shall be ductile iron with a minimum diameter of eight inches (8") and conform to current ANSI Specification A21.51. Push-on joint pipe shall be minimum thickness Class 52. Push-on joint accessories shall conform to applicable requirements of ANSI Specification A21.11.

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

Pipe shall be given an interior bituminous coating in accordance with ANSO Specification A21.4 and an exterior bituminous coating of coal tar or asphalt base in accordance with ANSI Specification A21.51.

B. Fittings:

Ductile iron fittings shall conform to AWWA C110 and ANSI Specification A21.10, 350 pounds working pressure, and be of a compact body design. Ductile iron fittings larger than twelve inches (12") shall have a standard body length equal to Class 250 cast iron fittings. Cast Iron Class 250 fittings will be allowed in lieu of ductile iron fittings in sizes larger than twelve inches (12").

C. Gate Valve Resilient Seat:

Valves shall be manufactured to meet all requirements of AWWA Specifications C509-80. Valves twelve inches (12") and smaller shall be bubble-tight, zero leakage at 200 psi working pressure. Valves shall have non-rising stems, open counter-clockwise, and be provided with a two-inch (2") square-operating nut with arrow cast in metal to indicate direction of opening.

Each valve shall have maker's name, pressure rating, and year in which manufactured, cast on the body. Prior to shipment from the factory, each valve shall be tested by hydrostatic pressure equal to twice the specified working pressure. Buried valves shall be installed with a valve box.

D. Valve Boxes:

Cast iron three-piece slide-type; five and one-quarter inch (5 1/4") shaft; six-foot (6') trench depth.

Cast iron cover; shall be marked "WATER" and shall indicate the direction of opening.

E. Fire Hydrants:

Fire hydrants shall be Mueller Centurion, Figure A423, or Kennedy Model K-81A, and shall conform to AWWA C502 with the following specifications:

Main Valve Opening: 5 1/4 inches  
Nozzle Arrangement: Two 2 1/2-inch hose nozzles with National Standard thread  
One 4 1/2-inch pumper nozzle with National Standard thread  
Inlet Connection: 6-inch mechanical joint  
Operating Nut: Standard 1 1/2-inch pentagon  
Direction of Opening: Counterclockwise  
Color: Enameled hydrant red  
Department of Bury: Hydrant shall be installed to the manufacturer's instructions with nozzles about 18 inches above finish grade.

F. Hydrant Branches:

Hydrant assemblies shall consist of a six-inch (6") mechanical joint valve, the appropriate length of six-inch (6") ductile iron cement-lined Class 52 pipe, and the fire hydrant.

The hydrant shall have at least 15 inches between the bottom of the steamer cap and the ground. For single-family house subdivisions, there will be at least one hydrant at each intersection and a maximum of 450 feet between hydrants with a minimum water flow of 500 gallons per minute with a 20 p.s.i. residual pressure from each hydrant. There shall be a 10-foot by 10-foot (10' x 10') easement around each hydrant, which shall not be located within the public right-of-way.

#### 4.3 TAPPING SLEEVES:

##### A. For Existing Asbestos Cement or Gray Cast Iron Pipe:

Tapping sleeves shall be of the split sleeve design constructed with two solid half-sleeves bolted together. Sleeves shall be constructed of cast iron or fabricated steel and shall have a working pressure of 150 psi. Cast iron sleeves shall have mechanical joint ends with side gasket seals. Fabricated steel sleeves shall have end and side gasket seals, and all exterior exposed surfaces shall be fusion-bonded, epoxy-coated to a minimum of 10-mil thickness.

All bolts and nuts used with fabricated steel sleeves shall be AISI type 304 or 302 stainless steel. All bolts used with all pipe sleeves shall, upon final tightening and testing, be brush-coated heavily with bitumastic cold-applied material to thoroughly cover all exposed surfaces of the bolts and nuts.

##### B. For Existing Ductile Iron Pipe:

Tapping sleeves shall be of the split sleeve design constructed with two solid half-sleeves bolted together. Sleeves shall be constructed of cast iron or fabricated steel and shall have a working pressure of 150 psi. Cast iron sleeves shall have mechanical joint ends with side gasket seals. Fabricated steel sleeves shall have end and side gasket seals; and all exterior exposed surfaces shall be fusion-bonded, epoxy-coated to a minimum of 10-mil thickness. Where the branch outlet is not greater than 50 percent of the main size, an "O" ring seal is acceptable with fabricated steel sleeves.

#### 4.4 WATER SERVICE CONNECTION:

##### A. General requirements:

The Contractor shall install three-fourths inch to two inch ( $\frac{3}{4}$ " - 2") copper services as indicated on the Contract Drawings or as directed by the Engineer. Each service shall consist of a corporation, curbstop, copper tubing, and a curb box with service rod. Corporation shall be attached to the ductile iron pipe by means of a direct tap.

##### B. Corporations:

Corporations shall be Waterworks Brass and manufactured in accordance with AWWA C800. Corporations shall have Mueller threads, adopted as AWWA Figure 1, at the inlet and a compression-type fitting at the outlet. Both inlet and outlet shall be of the same size.

Corporations shall be directly tapped into ductile iron pipe larger than two inches (2") in diameter. In no other instance, except when a tapping sleeve and valve is used, shall a tap be made without a corporation. Corporations shall be Mueller H15009 or equal.

##### C. Curbstops:

Curbstops shall be a quarter-turn, plug-type valve with an "O" ring-type seal and manufactured of Waterworks Brass in accordance with AWWA C800. The curbstop shall open left and have a positive stop. No curbstop shall have the ability to drain the service line. Both inlet and outlet of the curbstop shall have compression-type fittings. The tee head of the curbstop shall have provision for the connection of a service rod. Curbstops shall be Mueller H-1504-2 or equal.

##### D. Copper

Copper tubing shall be Type '1K', soft temper, conforming to ASTM B88. The name of trademark of the manufacturer and type shall be stamped at regular intervals along the pipe.

##### E. Curb Boxes and Rods:

Curb boxes shall be of the sliding adjustable-type capable of adjusting from five feet to six feet (5' - 6'). The base of the box shall be arch-type so as to prevent the box from resting directly on the curbstop. The adjustable upper section shall be one inch (1") in diameter for use with three-fourths inch and one inch ( $\frac{3}{4}$ " and 1") curbstops.

For larger curbstops, the upper section shall be one and one-fourths inches (1¼") in diameter. Stationary rods affixed to the key of the curbstop shall be thirty inches (30") in length for three-fourths inch and one-inch (¾" and 1") curbstops and twenty-four inches (24") for larger curbstops.

The cover of the box shall have counter-sunk brass pentagon plug. The word "WATER" shall be inscribed on the cover of the box. Both the cover and the upper section of the box shall be able to be located with an aqua-type metal locator.

F. House Services Construction Methods:

House Services: The Contractor shall make all necessary taps into the watermain and, for each lot, will install an approved brass corporation stop. The Contractor shall also connect the three-fourths inch (¾") type "K" copper service pipe to the flanged joint, which shall be connected to the three-fourths inch (¾") type Brass curbstop with inlet and outlet for three-fourths inch (¾") type "K" copper service pipe. Such curbstop shall be located not less than five feet six inches (5'6") below the ground surface and shall be accessible from the surface through an approved valve box.

House Connections: The house connections shall be made by installing three-fourths inch (¾") type "K" copper pipe or approved equal on the end of the approved brass curbstop and proceeding through the cellar wall to an approved three-fourths inch (¾") stop and drain. A three-fourths inch (¾") meter spacer with spuds is to be purchased through the Water Department and installed by the contractor in accordance with good plumbing practices (see House Services Detail Sheet).

4.5 GENERAL CONSTRUCTION METHODS:

A. Inspection and Testing:

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

B. Installation:

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

All pipe showing cracks shall be rejected. If cracks occur in the pipe, the contractor may, at his own expense and with the approval of the Engineer, cut off the cracked portions at a point at least 12 inches from the visible limits of the crack and use the sound portion of the pipe.

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

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

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

Concrete thrust blocks shall be installed on all plugs, tees, and bends deflecting  $11\frac{1}{4}$  degrees or more. Care shall be taken to ensure that concrete will not come in contact with flanges, joints, or bolts. The required area of thrust blocks are indicated on the plans or shall be as approved by the Engineer. In lieu of thrust blocks, ductile iron retainer glands for mechanical joint pipe may be used. They shall be Figure U-585 as manufactured by U.S. Pipe, Clow, or equal.

Conductivity bonds or wedges shall be installed at every pipe joint.

Whenever sewers cross under watermains, the watermain shall be laid at such an elevation that the bottom of the watermain is at least 18 inches above the top of the sewer. This vertical separation shall be maintained for that portion of the watermain located within 10 feet horizontally of any sewer it crosses.

When it is impossible to obtain horizontal and vertical separation, both the watermain and sewer shall be constructed with watertight joints and shall be pressure tested to assure water tightness before backfilling. No watermain shall pass through, or come in contact with, any part of a sewer manhole.

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

In instances where the use of different types of pipe require joining, the contractor shall furnish and install all necessary adapters.

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

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

After the various pipelines have been installed, the trenches and other areas to be filled shall be backfilled to subgrade with, wherever possible, material excavated from the trench. No backfilling will be allowed until any concrete masonry has set sufficiently, as determined by the Engineer.

All material for backfilling shall be free of roots, stumps, and frost. Materials used for backfilling trenches shall be free of stones weighing over thirty (30) pounds. No stones measuring over one and one-half inches (1 ½") in the longest dimension shall be placed within one foot (1') of the pipeline being backfilled.

Backfill for all pipelines shall be placed in six inch (6") layers, each layer being thoroughly compacted to not less than that of 95 percent maximum dry density as determined by the AASHTO-T-99 Standard Proctor. Particular precautions shall be taken in the placement and compaction of the backfill material in order not to damage the pipe or structure. The backfill shall be brought up evenly.

Surplus excavated materials not used for backfill shall be disposed of in a manner satisfactory to the Engineer. All surplus material or spoil shall be removed promptly and disposed of so as not to be objectionable to abutters or to the general public.

Valve boxes are to be installed on all buried valves. The boxes shall be cast iron, with a minimum five and one-quarter inches in diameter (5 ¼") and long enough to extend from the valve to finished grade. The boxes shall enclose the operating nut and the stuffing box of the valve. Valve boxes shall not transfer loads into the valve.

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

Valve boxes shall be three-piece screw-type manufactured by Kennedy, Figure 121, or equal.

#### C. Disinfection:

Chlorination of the watermain shall be conducted only after the main has been flushed and a clear stream is obtained as determined by the Engineer.

The contractor shall furnish all labor, equipment, materials, and tools necessary to disinfect the pipe and appurtenances in accordance with AWWA Standard for Disinfecting Watermains, C601.

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

The pipeline and appurtenances shall be maintained in an uncontaminated condition until final acceptance. Disinfection shall be repeated when and where required at no expense to the Owner until final acceptance by the Owner.

#### D. Field Testing:

Except as otherwise directed, all pipelines shall be tested. Pipelines laid in excavation or bedded in concrete shall be tested prior to backfilling or the placing of concrete, and any exposed piping shall be tested prior to field painting.

The Contractor shall furnish all gauges, testing plugs, caps, and all other necessary equipment and labor to perform leakage and pressure tests in sections of an approved length. All water required for testing shall be potable. All testing shall be conducted in the presence of the Engineer.

For the pressure test, the Contractor shall develop and maintain for two hours 125 percent of the working pressure measured in pounds per square inch. Failure to hold the designated pressure for the two-hour period constitutes a failure of the section tested.

The leakage pressure shall be performed concurrently with the pressure test. During the test, the Contractor shall measure the quantity of water required to maintain the test pressure. Leakage shall not exceed the quantity given by:

$$L = ND (\text{square root of } P) / 7,400$$

where: L = leakage in gallons/hour  
N = number of joints in the tested line  
D = diameter of pipe in inches  
P = average test pressure in psi

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

Should any section of pipe fail either the pressure or leakage tests, the contractor shall do everything necessary to locate and repair and replace the defective pipe, fittings, or joints at no expense to the Owner.

If, for any reason, the Engineer should alter the foregoing procedures, the contractor shall remain responsible for the tightness of the line with the above requirements.

#### E. Frost Protection of Shallow Waterlines:

Waterlines with less than five feet six inches (5'6") of cover over the crown, or where indicated on the plans, shall be protected against freezing by installation of three inch (3") thick Styrofoam SM insulating sheets with a width of three feet (3') or twice the pipe diameter, whichever is greater.

The sheets shall be placed six inches (6") above the crown of the main after compaction of the six-inch (6") lift immediately above the crown. Care shall be exercised by the Contractor during backfill and compaction over the Styrofoam sheets to prevent damage to the sheets. Styrofoam SM sheets shall meet the compressive strength requirements of ASTM D1621-73 and shall be as manufactured by Dow Chemical Company, Midland, Michigan, or equivalent.

**Section 5.0**  
**SANITARY SEWER SPECIFICATIONS**

**5.1 DESCRIPTION:**

This item shall consist of the excavation backfilling in required for the complete construction of gravity sanitary sewers, force mains, and all appurtenant construction related thereto, including chimneys, service connections, thrust blocks, and other items necessary for a complete sanitary sewer system as indicated on the drawings. Sewer mains from more than one dwelling unit shall be a minimum pipe diameter of eight inches (8").

**5.2 MATERIALS:**

A. Types of Pipe:

Types of pipe which shall be used for the various parts of work are as follows:

1. Gravity sewers shall be Acrylonitrile-Butadiene-Styrene (ABS), PVC solid wall pipe meeting ASTM Specifications D3034 or F679, ductile iron pipe, or an approved equal.
2. Force mains shall be ductile iron with push on Joints or PVC SDR21.

B. Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe:

ABS composite pipe fittings shall conform to ASTM Standard Specifications for Acrylonitrile-Butadiene-Styrene Composite Sewer Piping, Designation D2680, for eight inch (8") diameter and larger ABS pipe. ABS solid-wall pipe and fittings for four-inch and six-inch (4" and 6") diameter extra-strength pipe and for sewer and drain pipe shall conform to the latest manufacturer's specifications for solid wall ABS pipe. The pipe shall be of the sizes indicated on the drawings.

ABS composite and solid-wall sewer pipe shall be furnished in nominal laying lengths of not less than twelve and one-half feet (12.5') long; however, enough half lengths and short lengths shall be provided for use as required at connections, manholes, and chimneys.

The pipe shall be free from visible cracks, holes, foreign inclusions, or other imperious defects. The pipe shall be as uniform as is possible in color, opacity, density, and other physical properties.

Unless otherwise approved by the Engineer, couplings and fittings shall be chemically welded to the pipe in the factory. Fittings to be assembled in the field shall be constructed in accordance with the manufacturer's instructions and as directed by the Engineer. The use of saddle fittings will not be allowed. Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

ABS sewer pipe and fittings shall be jointed in accordance with the recommendations of the latest ASTM standards and detailed instructions of the manufacturer. All joints shall be Type SC (solvent cemented). The primer for solvent welding and the cement shall conform to ASTM D-2680.

The manufacturer of the ABS pipe shall be required to certify in writing as to the air tightness of the pearlite filler with respect to the application of the air test isolation technique. All butt ends of pipe supplied shall have two coats of solvent applied to seal the pearlite.

The butt end of all pipe, field cut, shall receive two coats of solvent cement. The first coat shall be allowed to dry before the application of the second coat. All field cuts must be made with the use of a mitre box.

The male end of each pipe shall be provided with a homing marker such that it can be determined if the pipe is seated properly once installed. All pipe and fittings must be stored under cover such that no exposure to sunlight will occur. All stored pipe shall be adequately supported to prevent any possibility of pipe deformation.

Care shall be taken in the handling of pipe and fittings since they are brittle. Extreme caution must be exercised during cold-weather construction to prevent any damage to either pipe or fittings. The manhole water stop gasket and stainless steel clamp assembly must be approved by the Engineer prior to use.

Deflection tests shall be performed on the ABS pipe. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of five percent (5%). If the deflection test is to be run using a rigid ball or mandrel, it shall have a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

### C. PVC Sewer Pipe:

PVC sewer pipe shall conform in all respects to the latest revision of ASTM Specifications D-3034 or F679, Type PSM, Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, SDR35. Wall thickness of all PVC pipe shall meet ASTM Specifications for SDR35 pipe. All pipe and fittings shall be clearly marked as follows:

Manufacturer's Name and Trademark  
Nominal Pipe Size  
Material Designation 12454C PVC  
Legend "Type PSM SDR35 PVC Sewer Pipe" or  
"PS 46 PVC Sewer Pipe"  
Designation ASTM D-3034 or F679

Joints shall be push-on type using elastomeric gaskets and shall conform to ASTM D-3212. The gaskets shall be factory installed.

The pipe shall be furnished in nominal 13-foot lengths. Sufficient numbers of short lengths and full machine fittings shall be provided for use at manholes, chimneys, and connections. All connections will require the use of manufactured fittings. Field fabricated, saddle-type connections will not be considered acceptable.

Any pipe or fitting having a crack or other defect or which has received a severe blow shall be marked rejected and removed at once from the work site.

All field cuts are to be made with saw and 90 degree mitre box. Bevel the cut end to the same as the factory bevel and remove all interior burrs. Measure and place a homing mark on the pipe before assembling. The pipe installed under this specification shall be installed so that the initial deflection, measured as described below, shall be less than five percent (5%).

Deflection tests shall be performed on all flexible pipe after the final backfill has been in place for at least 30 days. The deflection test shall be run using a rigid ball or mandrel having a diameter equal to 95 percent of the inside diameter of the pipe. No mechanical pulling devices shall be used during the deflection tests. All pipe not meeting the deflection test shall be re-excavated and replaced at the Contractor's expense.

The manhole water stop gasket and stainless steel clamp assembly must be approved by the Engineer prior to the installation of any pipe.

The Contractor will submit certification that the materials of construction have been sampled, tested, inspected, and meet all the requirements including wall thickness in accordance with ASTM D3034 or ASTM F679 for all pipe and fittings to be included in the project work.

PVC pipe shall not be installed when the temperature drops below 32 degrees Fahrenheit or goes above 100 degrees Fahrenheit. During cold weather, the flexibility and impact resistance of PVC pipe is reduced. Extra care is required when handling PVC pipe during cold weather.

PVC pipe shall not be stored outside and exposed to prolonged periods of sunlight, as pipe discoloration and reduction in pipe impact strength will occur. Canvas or other opaque material shall be used to cover PVC pipe stored onsite.

#### D. Ductile Iron Pipe:

Ductile iron pipe shall be the thickness class designated on the plans. All ductile iron pipe shall be centrifugally cast in molds and shall conform to the latest revision of ANSI Standard A21.51 (AWWA C151); ANSI Standard A21.11 (AWWA C111), Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings; and ANSI Standard A21.10 (AWWA C110), Gray-Iron and Ductile Iron Fittings Two Inch Through 48 Inch of Water and Other Liquids. All ductile iron pipe shall be cement-lined and shall conform to ANSI Standard A21.4 (AWWA C104), Cement-Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water.

All fittings shall be push-on joint fittings unless noted otherwise on the plans with body thickness and radii of accordance with Sections 11-2 through 11-5 and 11-7 through 11-8 of ANSI A21.11. Mechanical joint, ductile iron pipe, shall be the thickness class designated on the plans and shall be installed where specified on the plans.

Mechanical joint ductile iron pipe shall conform to the specifications of ductile iron pipe, except for fittings which shall be mechanical joint with body thickness and radius of curvature conforming to ANSI A21.10 and mechanical joints which shall be in accordance with Sections 11-2 through 11-6 of ANSI A21.11.

#### E. Polyethylene Encasement for Ductile Iron Pipe:

Where indicated on the plans and for the purpose of corrosion, an 8 mil. thick polyethylene wrap shall be provided for the pipe. All material and installation shall be done in accordance with the latest version of AWWA Standard C105.

## F. Manholes:

The Contractor shall construct reinforced concrete manholes and drop manholes to the dimensions at the locations shown on the contract drawings. All precast reinforced concrete manhole sections shall conform to the latest version of the ASTM Specification C478. The footing may be either cast-in-place with Class B concrete or precast and shall conform to the dimensions indicated on the plans.

Shelves shall be constructed with Class B concrete as defined in Section 501 of the Vermont Standard Specifications for Construction. Inverts for sewer manholes shall be as shown on the plans and details and shall be constructed with Class B concrete or, for straight runs, segments of pipe cut in half longitudinally. Inverts shall have the exact shape of the sewer to which they are connected, and any change in size or direction shall be gradual and even. All construction of sewer manholes must be carried out to ensure watertight work. Any leaks in manholes shall be caulked and completely repaired to the satisfaction of the Engineer or the entire structure shall be removed and rebuilt. The entire exterior surface of the manholes shall be coated with a watertight sealant.

All manholes are to be provided with copolymer polypropylene plastic rungs with steel reinforced eight inches (8") on center. All manholes shall be provided with tough, gray, cast iron manhole frames and covers. All iron castings shall be thoroughly cleaned and then coated with hot tar before being delivered. Frames and covers shall be LeBaron LC 266 Type C, or an approved equal, and have a minimum weight of 400 pounds.

Precast risers and bases for manholes shall conform to ASTM Specification 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 manhole cover frames shall be set to final grade only after the base course paving has been completed. Manholes shall be constructed to grade with as least two, and not more than six, courses of brick. With the exception of inverts, all surfaces of manhole brickwork shall be plastered with cement mortar (all plaster being carried up as the brickwork progresses) and all manhole lift holes shall be grouted inside and out with expandable grout.

Manholes shall be placed at all changes in slope, size, alignment of pipe, at the ends of each line, and at intervals no greater than three hundred feet (300').

#### G. Masonry:

Each brick shall be wetted and completely bedded in mortar at its bottom, sides, and ends in one operation with care being taken to fill every joint. Brickwork shall be well-bonded, and joints shall be as close as practicable. No brick masonry shall be laid in water nor shall any water be allowed to rise on or around any brick masonry until it has set at least 24 hours. No masonry shall be laid in freezing weather.

The brick for ordinary brickwork shall be common hard-burned clay brick. All brick shall be regular and uniform in shape and size with plane, parallel beds, and faces. Ordinary brick shall conform to ASTM Specification C-62, latest version, and shall be Grade SW.

Brick masonry shall be laid in Portland cement mortar composed of one part Portland cement and two parts of sand, measured by volume, to which not more than 10 pounds of lime shall be added for each bag of cement. Water for mortar shall be clean and only an amount sufficient to produce a workable mortar shall be used. Mortar shall be used within one hour from the time the cement was added to the mix.

The sand for mortar for brick masonry shall be uniformly graded, clean, sharp, and contain no grains larger than will pass a one-eighth inch (1/8") mesh screen.

### 5.3 CONSTRUCTION METHODS:

#### A. Excavations:

Excavations shall be made to a point at least six inches (6") below the pipe invert to accommodate the bedding material. All excavations, are to be kept dry while pipe is being laid and until each joint and pipe has been inspected by the Engineer and approval given to commence backfilling operations.

#### B. Laying Sewer Pipe:

The bed end of the pipe shall face upgrade at all times and be placed in such a position as to make the invert even when the succeeding section is inserted. Where required by adverse grading conditions, the Contractor shall fill any gully to make a suitable bedding for the sewer pipe. The fill shall be pneumatically compacted to a 95 percent dry density by the AASHTO-T-99, Method A (Standard Proctor) test, upon which the six inches (6") of bedding material shall be placed.

Any pipe which is not laid to grade and alignment shall be re-laid to the satisfaction of the Engineer. The bedding material shall be placed and compacted on each side of the pipe to a height equal to one-half the pipe diameter and for the full width of the excavated trench and as shown on the accepted plans.

C. Backfill:

Backfill shall consist of approved material placed in six-inch (6") layers with each layer being thoroughly compacted to not less than 95 percent of maximum dry density as determined by the AASHTO-T-99 Standard Proctor by means approved by the Engineer. No stones in excess of one and one-half inch (1 ½") diameter shall be placed within two feet (2') of the outside of the pipe. Particular precautions shall be taken in placement and compaction of the backfill material in order not to damage and/or break the pipe. The backfill shall be brought up evenly on both sides of the pipe for its full length.

Walking or working on the completed pipeline, except as may be necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a height of at least two feet (2') on the top of the pipes. During construction, all openings to the pipelines shall be protected from the entering of earth or other materials.

D. Concrete Cradle and Encasement for Pipe:

Where required on the plans or as directed by the Engineer, a concrete cradle shall be used to bolster and strengthen pipe. Where required on the plans or as directed by the Engineer, concrete encasement of the sewer line will be made to protect nearby wells or waterlines for stream crossings or for similar purposes. All concrete will be Class B as defined in the State of Vermont Standard Specifications for Construction, Section 501, and will meet the requirements of that section.

E. Frost Protection for Shallow Sewers:

Sewers with less than five and one-half feet (5.5') of cover over the crown or where indicated on the plans shall be protected against freezing by installation of three inch (3") thick Styrofoam SM insulating sheets with a width of three feet (3') or twice the pipe diameter, whichever is greater. The sheets shall be placed six inches (6") above the crown of the sewer after compaction of the six-inch lift immediately above the crown.

Care shall be exercised by the Contractor during backfill, and compaction over the Styrofoam SM sheet shall meet the compressive strength requirements of ASTM D1621-73 and shall be as manufactured by Dow Chemical Company, Midland, Michigan or equal.

F. Leakage Tests and Allowances for Gravity Sewers:

The low-pressure air test will be used to simulate infiltration or exfiltration rates into or out of all gravity sewers. The Contractor will furnish all facilities and personnel for conducting the test.

Final acceptance of the sewer shall depend upon the satisfactory performance of the sewer under test conditions. The test shall be performed on pipe between adjacent manholes after backfilling has been completed and compacted.

All wyes, tees, laterals, or end-of-side sewer stubs shall be plugged with flexible-joint caps, or an acceptable alternate, securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible-jointed lateral connection or extension.

Prior to testing for acceptance, the pipe should be cleaned by passing through the pipe a full-gauge squeegee. It shall be the responsibility of the Contractor to have the pipe cleaned.

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

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

1. the total rate of air loss from any section tested in its entirety between manhole and cleanout structures does not exceed 2.0 cubic feet per minute; or
2. the section under test does not lose air at a rate greater than 0.0030 cubic feet per minute per square foot of internal pipe surface.

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

Diameter (inches)	Time (sec./100 ft.)
3	10
4	18
6	40
8	70
10	110
12	158
15	248
18	356
21	485
24	634
27	765
30	851
33	935
36	1020
39	1105
42	1190

The table gives the required test time in seconds per 100 foot lengths of pipe for a given diameter. If there is more than one pipe size in the section of line being tested, compute the time for each diameter; and sum the times to find the total required test time.

If the pipe installation fails to meet these requirements, the Contractor shall determine at his own expense the source or sources of leakage and shall repair (if the extent and type of repairs proposed by the Contractor appear reasonable to the Engineer) or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of this test before being considered acceptable.

Since this test does not determine the tightness of manholes, they shall be tested separately. The exfiltration leakage allowance out of manholes shall be no greater than one gallon per day per vertical foot of depth.

The manhole shall be filled with water to a point one foot (1') above the highest point between manhole sections. In areas of high ground water, there shall be no visible leakage due to infiltration. If a vacuum test is desired, the following procedure shall be followed:

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

1. All lifting holes and exterior joints shall be filled and pointed with an approved non-shrinking mortar. The completed manhole shall not be backfilled prior to testing. Manholes which have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of a hydrostatic test.
2. All pipes and other openings into the manhole shall be suitably plugged in a manner to prevent displacement.
3. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and manhole wall.
4. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to ten inches (10") of mercury on an approved vacuum gauge. The removal of air shall then be stopped and the test time begun.
5. The vacuum must not drop to below nine inches (9") of mercury with a two-minute test period. If more than one inch (1") drop in vacuum occurs within the two-minute test period, the manhole has failed the test and shall be repaired or reconstructed and retested.
6. Following satisfactory test results, the manhole may be backfilled.

It is noted that all existing sanitary sewers shall be kept operational until new work has been tested and approved by the Engineer. At such time, existing sewers and sewer services shall be connected to the new sewers.

#### G. Leakage and Pressure Testing for Force Main:

All pipelines shall be tested in accordance with the Vermont Department of Water Resources Environmental Protection Rules (latest edition). A leakage and pressure test shall be performed concurrently. The hydrostatic test pressure shall be a minimum of 50 psi at the highest point along the test section and shall not vary by more than 5 psi during the entire two-hour test. If and when during the test, the pressure drops by 5 psi, the quantity of water required to restore the test pressure shall be measured. At the end of the two-hour test, the pressure shall be returned to the test pressure and the additional volume of water measured. The total amount of water used during and at the end of the test shall constitute the actual leakage. The maximum allowable leakage shall be determined by the following formula:

$$L = ND (\text{square root of } P) / 7,400$$

where: L = leakage in gallons/hour  
N = number of joints in the tested line  
D = diameter of pipe in inches  
P = average test pressure in psi

#### H. Cleaning Pipelines and Appurtenances:

Upon completion of construction, all dirt and other foreign material shall be removed from pipelines and their appurtenant constructions. No materials shall be left in the pipelines to impede normal flow through them.

#### I. Sewer Service Connections:

Where required on the plans, sewer service connections for one house shall be constructed of six inch (6") pipe from the main to the edge of the right-of-way and a minimum of four inch (4") pipe from the right-of-way to the house of the type material specified under this section. The pipe shall be laid and its joints made as required for sewer construction in this specification.

Open ends of pipes shall be properly sealed to prevent damage and intrusion of foreign matter where hookup to the building sewer is not coincident with sewer main construction. Additionally, the Contractor will provide a stable, temporary marker approved by the Engineer from the sewer service invert up to six inches (6") above the finished grade and seated securely into the ground for ease in relocating the end of sewer service connection for hooking up the building sewer.

In the case of reconnection of existing services, such reconnections will be made only after the new sewer main has been completed, tested, and accepted. The excavation, bedding material, installation, and backfill for service connections shall be same as for sewer mains.

#### J. Cleanouts for Sewers:

Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Engineer. Cleanout frames and covers shall be of tough gray cast iron. Castings shall be true to pattern and free from flaws.

The bearing surface of cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference. All iron castings shall be thoroughly cleaned and then coated with hot coal tar before being delivered.

K. Chimneys:

Chimneys shall be built of six-inch (6") pipe. Each chimney shall be plugged or capped at end until ready to connect to existing services. Chimneys are required where the vertical drop between the finished grade surface and the main sewer line exceeds 15 feet at the wye for a service connection.

L. Thrust Blocks and Anchors:

Concrete thrust blocks or anchors shall be placed at bends, tees, fittings, and other locations on the contract drawings or as directed by the Engineer. Concrete for thrust blocks and anchors shall be Class B concrete. Steel rods and clamps as required shall be galvanized and rust proofed or painted.

Thrust blocks and anchors shall be placed between the fitting and the trench wall with bearing on undisturbed earth. Bearing area shall be as shown on the contract drawings or as required by the Engineer.

M. Sewer and Waterline Separation:

The horizontal and vertical separation for sewer and waterlines shall be designed and installed in accordance with the latest edition of the "Ten States Standards - Recommended Standards for Sewage Works."

DEVELOPMENT FEES

1. ZONING PERMITS

Minimum filing fee	<del>\$10.00</del> <sup>4</sup> <del>15.00</del> 22. <sup>00</sup>
Residential building	<del>\$0.05</del> /square foot \$0.10
Commercial building	<del>\$0.05</del> /square foot \$0.20
Industrial building	<del>\$0.05</del> /square foot \$0.20
Agricultural building	<del>\$0.05</del> /square foot N/c
Use permits, sign permits, etc.	<del>\$10.00</del> \$15.00
Demolition permit	no charge
Recording	\$17. <sup>00</sup> per page

2. SUBDIVISION PERMITS

Four or less dwelling units	<del>\$100</del> plus <del>\$25.00</del> /unit 200 + 50
Five or more dwelling units	<del>\$250</del> plus <del>\$75.00</del> /unit 400 + 100
Boundary adjustment permit (new)	<del>\$10.00</del> 15.00

3. BOARD OF ADJUSTMENT

Conditional use application	<del>\$25.00</del> 75.00
Variance or other appeal	<del>\$25.00</del> 75.00

4. WATER DEPARTMENT

Residential hook-up fee	\$350.00 plus meter
Commercial hook-up fee	\$800.00 plus meter

Water Meter Fees:

Meter Size	Cellar Stop	Check Valve	Meter Flanges	Fee
5/8" x 3/4"	Yes	Yes	No	\$125.00
3/4"	Yes	Yes	No	\$150.00
1"	Yes	Yes	No	\$195.00
1 1/2"	No	No	Yes	\$350.00
2"	No	No	Yes	\$450.00

4. WATER DEPARTMENT (continued)

Fire hydrant damage, minimum fee	\$150.00
Meter reinstallation	\$ 25.00
Delinquency collection trips	\$ 25.00
Service reconnection	
a. regular time	\$ 25.00
b. overtime	\$ 37.50
Pavement cut (refundable)	\$400.00

5. SEWER USAGE

Residential hook-up fee	\$250.00
Commercial hook-up fee	\$800.00
Delinquent collection trips	\$ 25.00
Service reconnection	
a. regular time	\$ 25.00
b. overtime	\$ 37.50
Pavement cut (refundable)	\$400.00

6. ENGINEERING SERVICE CHARGES

see next page

6. ENGINEERING SERVICE CHARGES

Type of Project	1-4 Lots	5-9 Lots	10-50 Lots	51-120 Lots
Residential Development	\$400	\$1,400	\$2,800	\$3,600
Residential development with mechanical and/or community disposal system and commercial/industrial sites	\$900	\$1,900	\$3,800	\$5,200

NOTES:

1. The engineering service charges listed on the previous page are initial project budget estimates for review of site conditions, plans, specifications, meetings, communications, periodic and final inspection, and as-built reviews. Actual costs may be lower or higher than those outlined and will be based on actual hours expended by the Engineer.
2. The required engineering effort on each project is variable and dependent upon conformance of designs to standards, conformance of contractor to design, quality of construction, need for reinspections, length of time that a project is in design or construction, and the number of phases in the project.
3. Developments that are not the traditional residential/commercial/industrial lots (i.e., large shopping malls, etc.) will be provided individual cost estimates at the time of application submittal.
4. Full payment of the estimated Engineering Service Charges shall be at the time of submittal for initial application or at the time of approval of these specifications.
5. The applicant will submit complete copies of each submittal (site plan, concept, preliminary, and final) directly to the reviewing engineer designated by the municipality.

INSPECTION SCHEDULE

The following tests, certifications, and inspection procedures are to be followed for all projects that are to be accepted by the Town and Village of Richmond.

The tests and certifications for water, sewer, and highway work will be witnessed by the developer's engineer and will be in strict accordance with all local, state, and federal standards. All materials must be approved by the Municipality and certified by the developer's engineer that installation was in accordance with municipal standards and specifications (latest version).

A. ROADS

1. Two (2) days notice for all inspections will be given to the Municipal Engineer or authorized representative.
2. A sample of all subbase and base materials will be tested by a testing lab approved by the Municipality in accordance with Note # 3 of Figure 1, Street Details for the Subgrade, and sieve analysis to the 270 sieve for base materials for all changes in subgrade or base materials as required by the Municipal Engineer, at the developer's expense. 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 as required by the Municipal Engineer at the developer's expense. The responsibility for testing shall be the developers.
3. The Municipal Engineer or authorized representative will be notified 48 hours in advance to inspect the construction of any and all roads at the following phases of construction:
  - a. Preparation of subbase;
  - b. Installation of base material;
  - c. Completion of finished grading;
  - d. During and after the placement of the base coat of asphalt;
  - e. During and after the placement of the top coat of asphalt.

A. ROADS (continued)

4. The Municipal Engineer or other authorized representative; will inspect work during the placement of curbs, sidewalks, and driveway aprons.
5. Grades will be shot and verified by the developer's engineer after the finished grading of the road base, the placement of the base coat, and placement of the top coat. The Municipal Engineer or authorized representative will be present during the taking of grade readings.
6. A final inspection will be taken after the completion of all roads, curbs, driveways, sidewalks, and/or bicycle paths. The following roadway general checklist will be used at final inspection:
  - a. Settlement, depression, or imperfections in finish surface;
  - b. Seeding and erosion control on cut and fill slopes;
  - c. Surface drainage (during rainstorm);
  - d. General appearance;
  - e. Material testing results, lab reports, and record drawings complete and on file.
7. An inspection schedule for each project will be determined at the pre-construction meeting.

B. WATER

1. The inspection schedule of the Municipal Engineer or the Municipality's authorized representative will be tailored to each individual project and set at the pre-construction meeting.
2. Two days notice shall be given to the Municipal Water Department so they may be able to inspect all materials on the site before construction begins.
3. The Municipal Engineer shall be present when any connection to the existing water system is made and during the testing, flushing, disinfecting, and sampling of new mains.

B. WATER (continued)

4. Two days notice to the Municipal Water Department and the Municipal Engineer is mandatory before any connections are made to the existing water system and before any testing, flushing, disinfecting, and sampling of new mains.
5. The following watermain general checklist will be used at final inspection:
  - a. Valves, hydrants, and curb stops operating properly
  - b. Valve box covers set at proper elevations
  - c. General appearance
  - d. Tie information and record drawing complete
  - e. Material testing results, lab reports, manufacturer's certificates, pressure and leakage test results, and disinfection test results are complete and on file.

C. SEWER

1. An inspection schedule will be tailored for each individual project and set at the pre-construction meeting.
2. A two-day notice shall be given to the Engineer in order for him to inspect all materials on site before any work begins.
3. The Municipal Engineer shall visit the site not less than four times during the construction of the project, not including material inspection or final air test and visual inspection.
4. Two days notice shall be given to the Municipal Engineer before air testing of the pipe and manholes.
5. Project contractor shall make available all grade readings at the project site. A copy of the complete grade readings and air test results shall be given to the Municipal Engineer.

C. SEWER (continued)

6. The following sanitary sewer system general checklist will be used at final inspection:
  - a. Manholes, pipelines, and appurtenances clean;
  - b. Inverts and shelves completed to plans with smooth transitions;
  - c. Manhole frames and covers set at proper elevation;
  - d. General appearance;
  - e. Material testing results, lab reports, manufacturer's certificate, and leakage and pump test results complete and on file.

D. STORM DRAINAGE SYSTEMS

1. Two days notice for all inspections will be given to the Municipal Engineer or authorized representative.
2. No backfilling shall occur until the installation of storm drains and culverts is inspected and approved by the Municipal Engineer or authorized representative.
3. The Municipal Engineer or authorized representative shall inspect and approve all storm drain and culvert joints and connections to catch basins.
4. The Municipal Engineer or authorized representative shall inspect all catch basins during installation.
5. Other storm drainage facilities, such as detention basins and ponds, shall be inspected during construction and upon completion.
6. All storm drainage facilities will be inspected upon completion of the project using the following general checklist:
  - a. Catch basins, manholes, and pipelines clean;
  - b. Ditches and outlets clean;
  - c. Erosion control measures completed;
  - d. General appearance;
  - e. Material testing results, lab reports, manufacturer's certificates, and record drawings complete and on file.
7. An inspection schedule for individual projects will be determined at the pre-construction meeting.

SUBMITTAL OF AS-BUILTS

A building permit will not be issued for any portion of a project involving an extension of utilities or a road until an initial set of As-builts has been approved by the Municipality.

As-built drawings should include the following information:

A. ROADS

1. Accurate locations of all streets and storm drain lines, culverts, and other facilities.
2. For streets, the following shall be shown:
  - a. Width of pavement from curb to curb or shoulder to shoulder;
  - b. Right-of-way dimensions for streets;
  - c. Width of sidewalks and bike paths;
  - d. Location of street lights;
  - e. Location of driveways;
  - f. Location and size of planter islands, if any;
  - g. Typical cross-section of streets as installed;
  - h. Location of all underground electric and telephone lines.

B. WATER

1. Accurate locations of all water lines.
2. Accurate measurements to all valves, tees, elbows, curb stops, and any other fittings from permanent fixtures such as telephone poles, hydrants, buildings, transformers, etc., along with depths of waterlines.
3. All curb boxes will be marked with stakes so contractors can easily locate them before building services are connected.

All specifications are subject to change with AWWA Specification changes and by order of the Richmond Board of Water Commissioners.

C. SEWER

1. Accurate locations of all sewer lines.
2. Accurate measurements to all tees and/or wyes for building connections.
3. Location of building connections at property line and depth and location of all manholes.
4. Invert and manhole cover readings, distances between manholes, size of pipe in manholes, and pitch of pipe.
5. Results of air tests on pipe and manholes.

D. STORM DRAINAGE

For storm drainage facilities, the following shall be shown:

1. Depth, size, location, and type of all storm drain lines and culverts, including underdrains and services;
2. Location of all catch basins;
3. Location and details for all storm drainage facilities, such as detention panels;
4. Location of all drainage ways, water courses, etc.;
5. Location and width of drainage easements.

After the initial set of As-builts have been submitted, there will be a field inspection by the appointed Municipal Engineer to verify that the hydrants, valve boxes, curb boxes, etc., are properly raised to ground level. A letter of approval of the As-builts by the Municipal Engineer is a prerequisite to issuance of a building permit.

A final set of As-built drawings, including one set of mylar reproducibles and one set of prints, shall be submitted to the Municipality within 30 days of the completion of the project.

The final set of the project As-built drawings shall be stamped by the developer's Professional Engineer with a signed and dated statement by the engineer that the construction materials were installed and the work was performed substantially in accordance with the approved plans and specifications.

The As-built 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.

TOWN OF RICHMOND  
PROJECT MODIFICATION FORM

PROJECT TITLE:

DEVELOPER:

ENGINEER:

CONTRACTOR:

DESCRIPTION OF PROPOSED MODIFICATION:

REASON FOR CHANGE FROM ORIGINAL PLANS:

CHANGE IN COST ESTIMATE:

REQUESTED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
(Town Manager)

CONDITIONS OF APPROVAL:

TOWN OF RICHMOND

PROJECT COST ESTIMATES

PROJECT NAME: \_\_\_\_\_

PROJECT DESCRIPTION: \_\_\_\_\_

BETWEEN TOWN OF RICHMOND AND \_\_\_\_\_

DATE SIGNED: \_\_\_\_\_ FIRST RELEASE DATE: \_\_\_\_\_

SECOND RELEASE DATE: \_\_\_\_\_ FINAL RELEASE DATE: \_\_\_\_\_

SURETY AMOUNT: \$ \_\_\_\_\_

TYPE (cash, letter of credit, other): \_\_\_\_\_

APPROVED BY: \_\_\_\_\_  
(Town Manager)

DENIED BY: \_\_\_\_\_

ITEM	COST	AMOUNT	DATE	AMOUNT	DATE	AMOUNT	DATE
Clearing & Grubbing							
Rough Grading							
Subbase Gravel							
Bank Run							
Crusher Run							
Paving: Base Course							
Top Course							
Driveway Aprons							
Sidewalks							
Bicycle Paths							
Bicycle Lanes							
Curbs							
Storm Drainage							
Pipe							
Catch Basins							
Dry Wells							
Slope Pipes							
Outfall Pipes							
Slope Protection							
Headwalls							
End Sections							
Boring							
Earthwork							
Underdrains							
Detention Pond							
Water: Mains							
Hydrants							
Valves & Shutoffs							
Air Release Valves							
Boring							
Sewer: Mains							
Manholes							
Boring							
Sheathing							
Pump Station							
Landscaping							
Traffic Improvements							
Striping							
Signs							
Utilities							
Electric							
Gas							
Miscellaneous							
As-builts							
10% Hold Back							
TOTALS							

TOWN OF RICHMOND  
REQUEST FOR PAVEMENT CUT

NAME: \_\_\_\_\_ PERMIT # \_\_\_\_\_

DEVELOPMENT NAME: \_\_\_\_\_ LOT # \_\_\_\_\_

STREET ADDRESS: \_\_\_\_\_

REASON FOR PAVEMENT CUT: \_\_\_\_\_

CONTRACTOR RESPONSIBLE FOR REPAIR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PLANS SUBMITTED AND APPROVED BY: \_\_\_\_\_  
Highway Superintendent

Water/Sewer Superintendent

FEE: \$ \_\_\_\_\_ DATE RECEIVED: \_\_\_\_\_

TOWN TREASURER: \_\_\_\_\_

-----  
PERMIT # \_\_\_\_\_

PAVEMENT CUT RESTORED TO ORIGINAL CONDITION: \_\_\_\_\_  
Date

APPROVED BY: \_\_\_\_\_

TOWN OF RICHMOND  
REQUEST FOR PAVEMENT CUT

NAME: \_\_\_\_\_ PERMIT # \_\_\_\_\_

DEVELOPMENT NAME: \_\_\_\_\_ LOT # \_\_\_\_\_

STREET ADDRESS: \_\_\_\_\_

REASON FOR PAVEMENT CUT: \_\_\_\_\_  
\_\_\_\_\_

CONTRACTOR RESPONSIBLE FOR REPAIR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PLANS SUBMITTED AND APPROVED BY: \_\_\_\_\_  
Highway Superintendent

Water/Sewer Superintendent

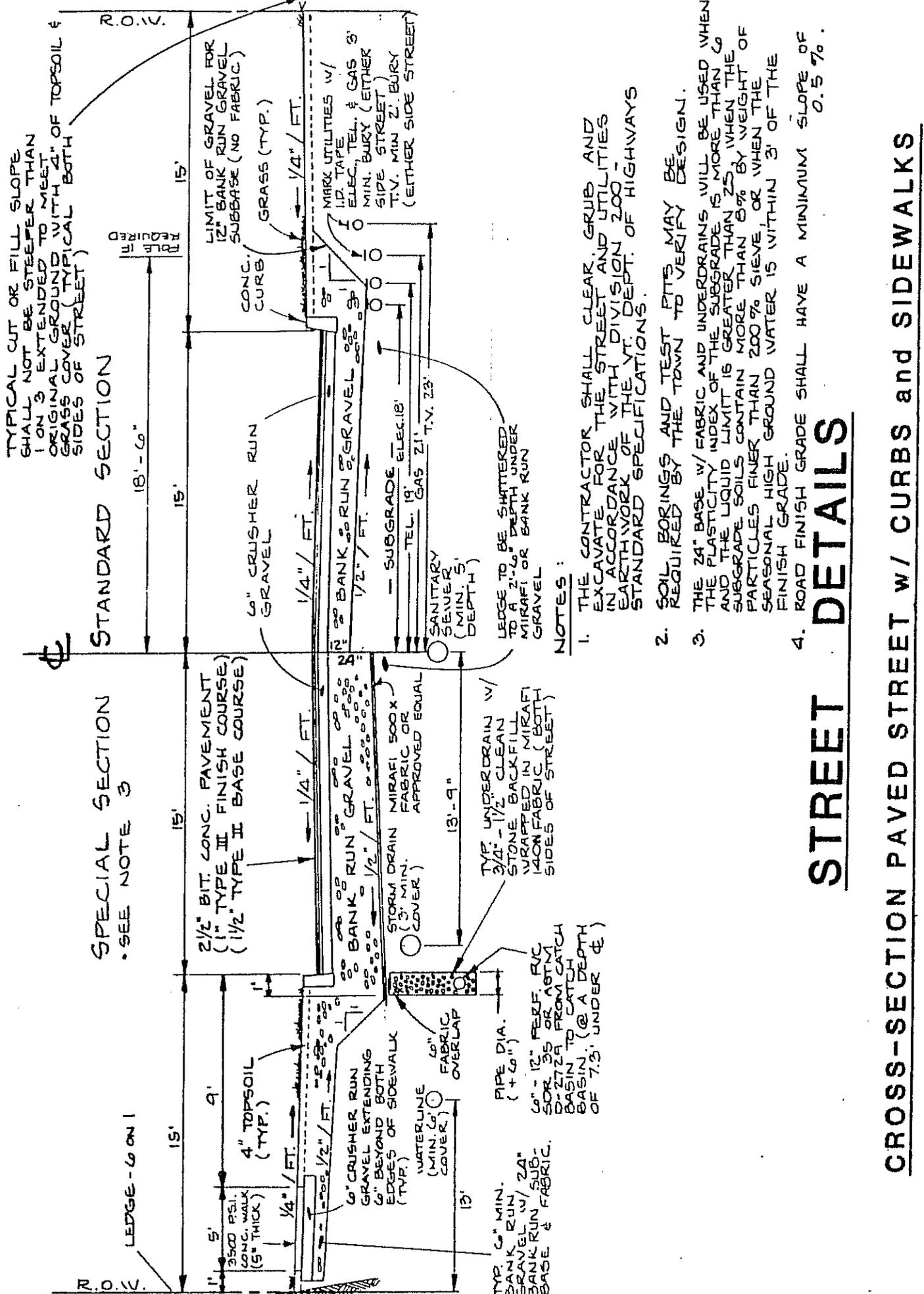
FEE: \$ \_\_\_\_\_ DATE RECEIVED: \_\_\_\_\_

TOWN TREASURER: \_\_\_\_\_

-----  
PERMIT # \_\_\_\_\_

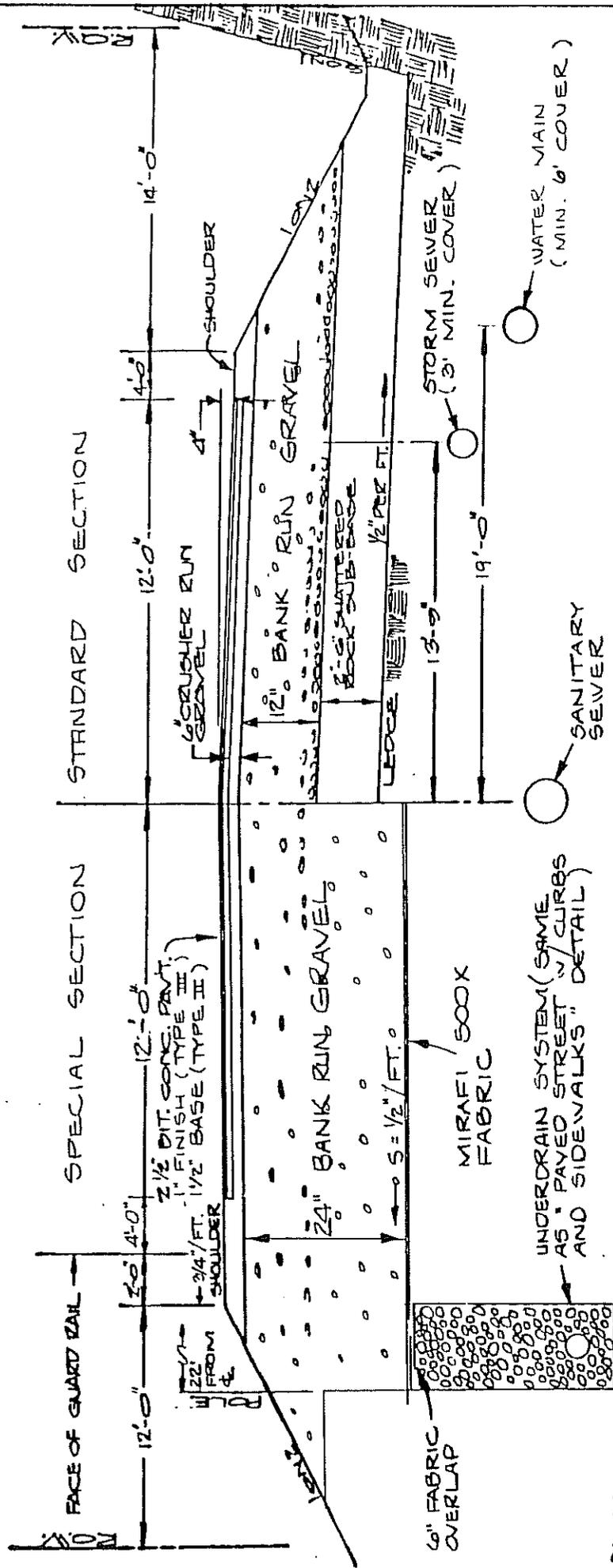
PAVEMENT CUT RESTORED TO ORIGINAL CONDITION: \_\_\_\_\_  
Date

APPROVED BY: \_\_\_\_\_



# STREET DETAILS

CROSS-SECTION PAVED STREET W/ CURBS AND SIDEWALKS

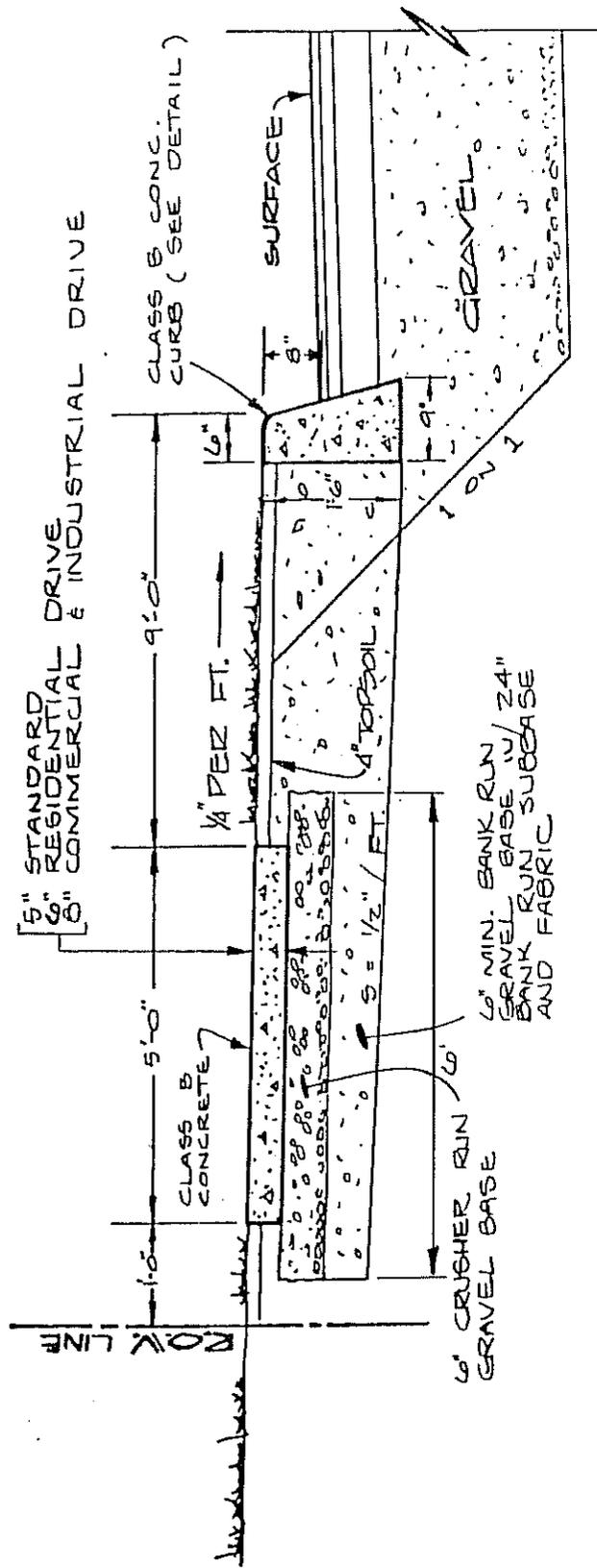


**NOTE:**

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. ALLOW TO BE 60' FT GREATER IF SO ORDERED BY THE BOARD OF SELECTMEN.
6. NOTES 1, 2, 3 & 4 OF PREVIOUS DETAIL FOR "PAVED STREET W/ CURBS AND SIDEWALKS" 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

## CROSS-SECTION PAVED STREET WITHOUT CURB



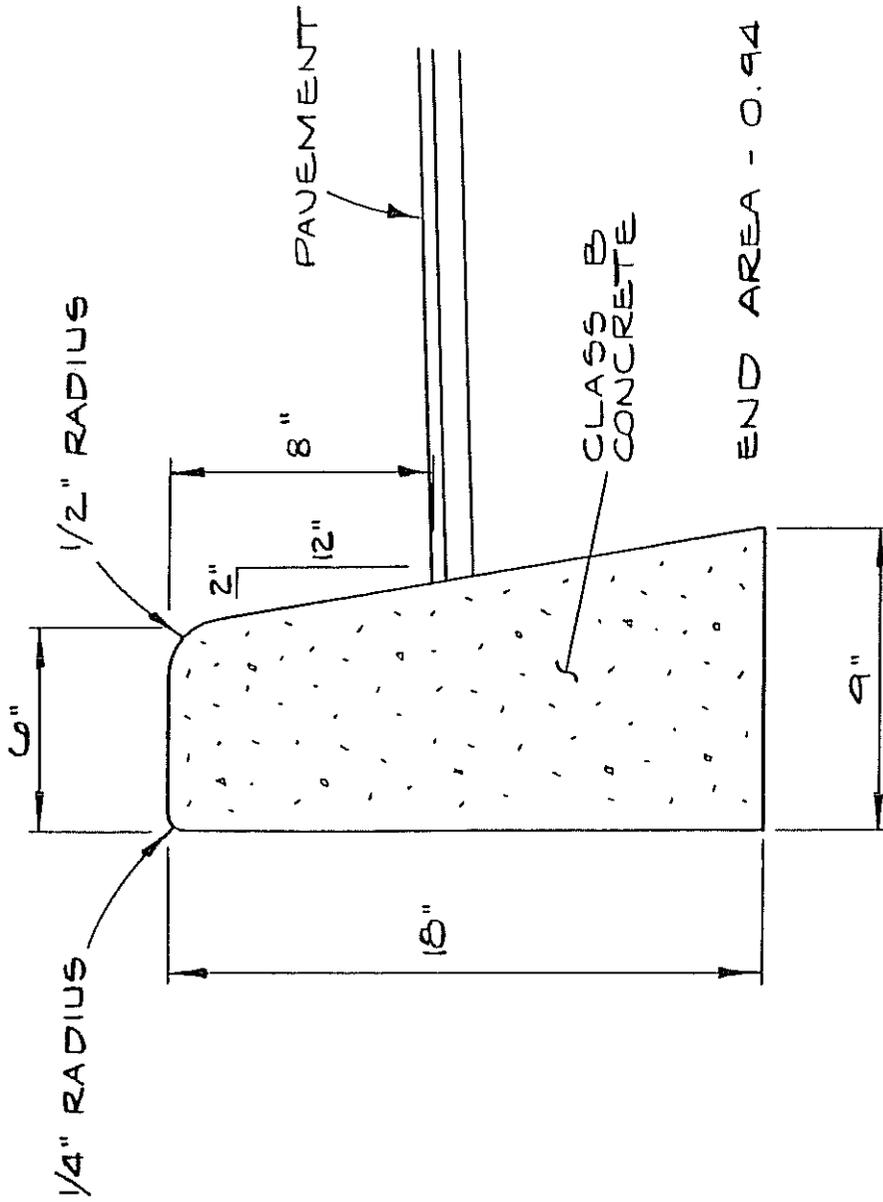
NOTE:

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

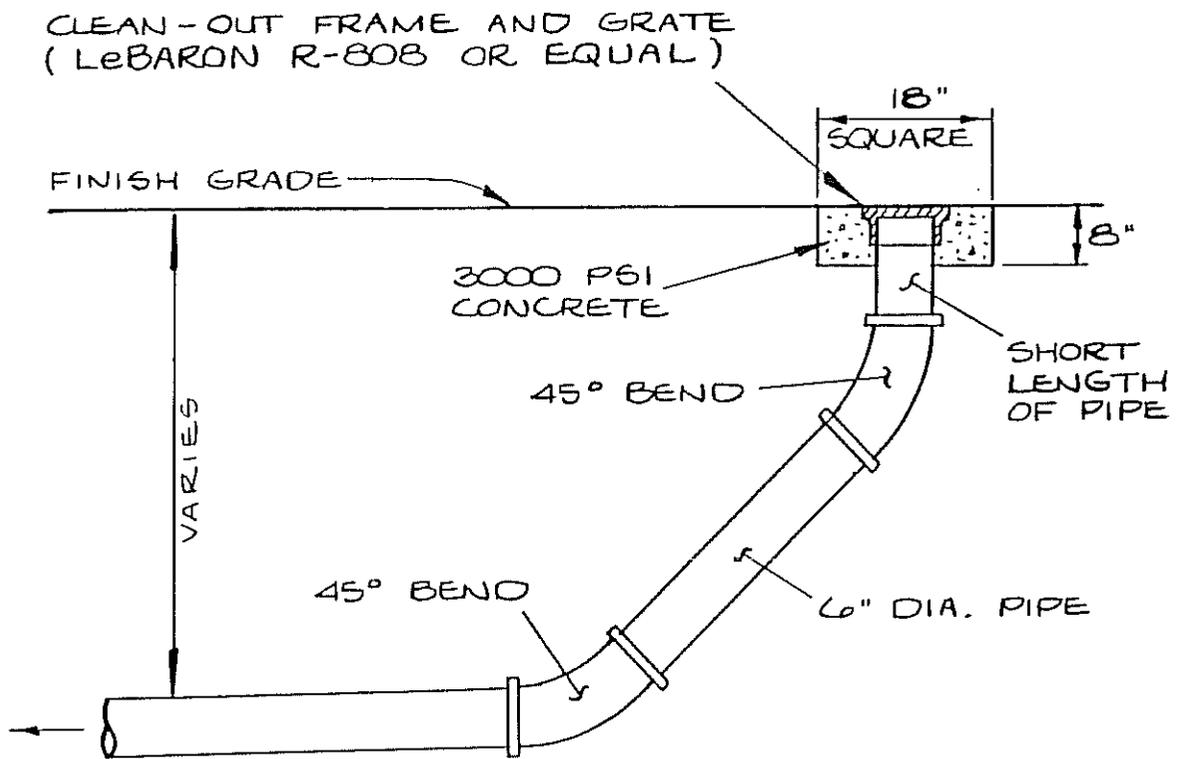


NOTES :

- 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

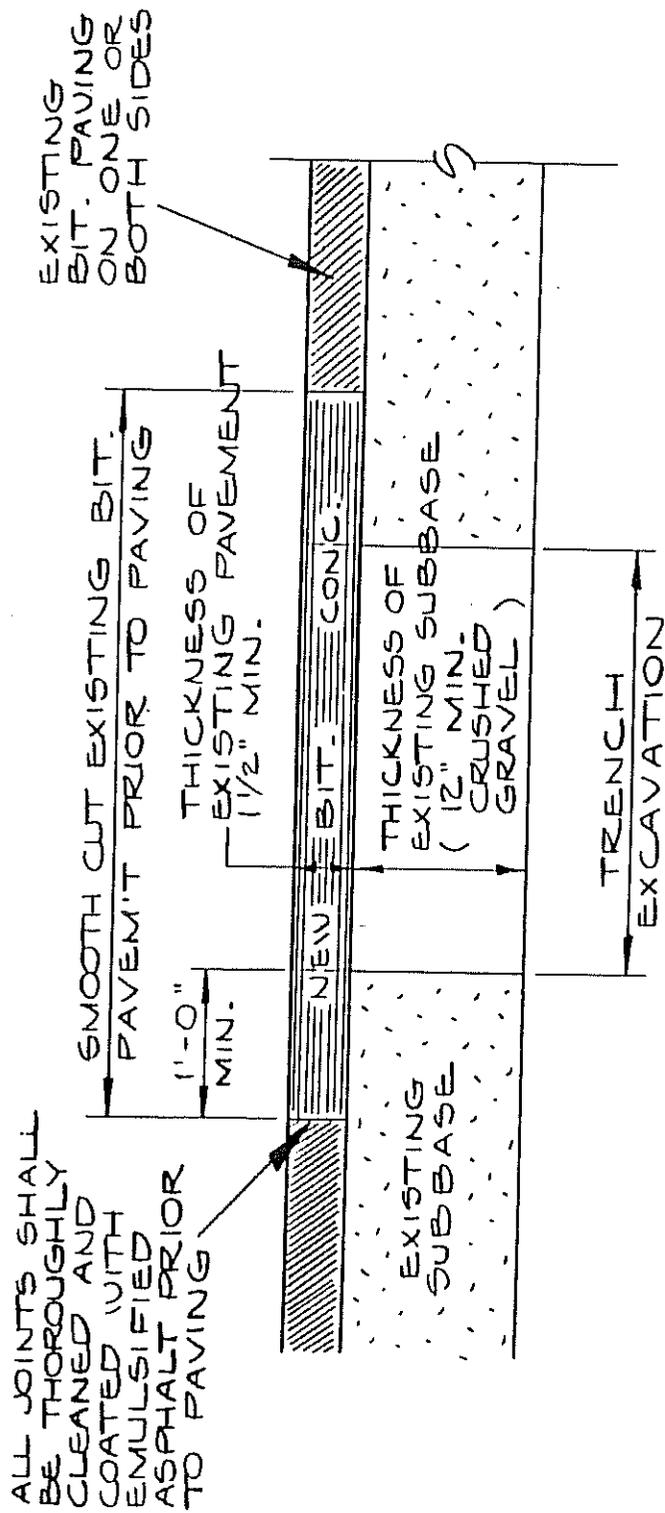
CONCRETE CURB      NTS



# STREET DETAILS

## TYPICAL CLEAN-OUT

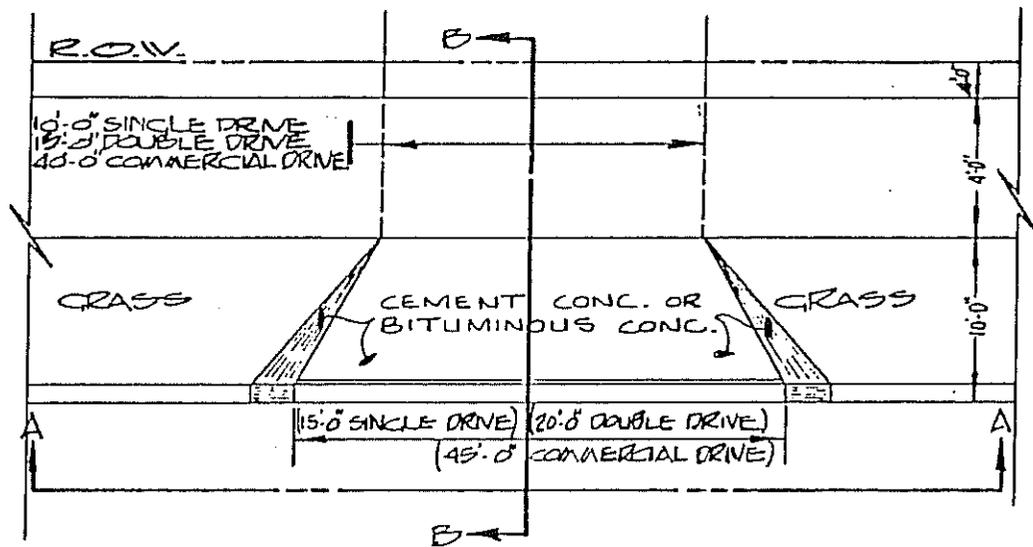
NTS



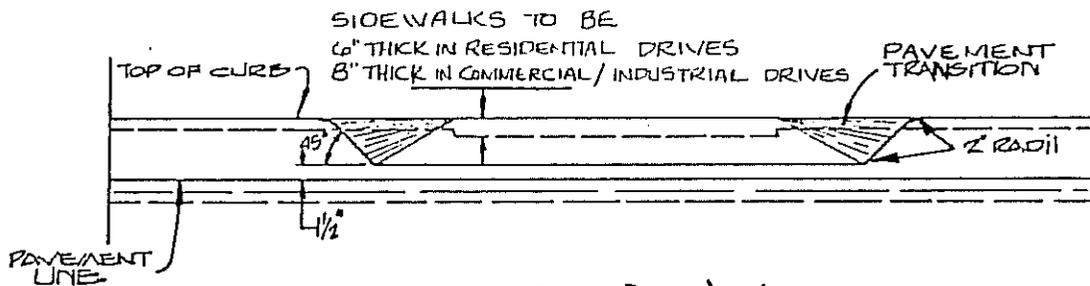
## STREET DETAILS

### REPLACEMENT OF EXISTING BITUMINOUS PAVEMENT

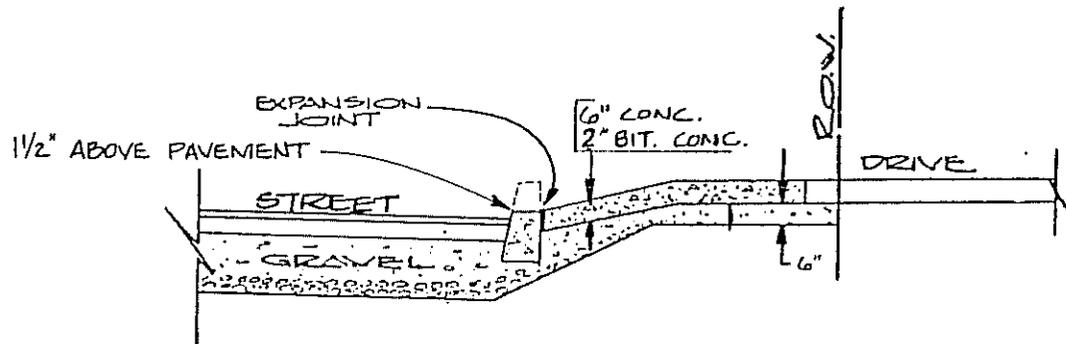
NTS



### PLAN



### SECTION A-A



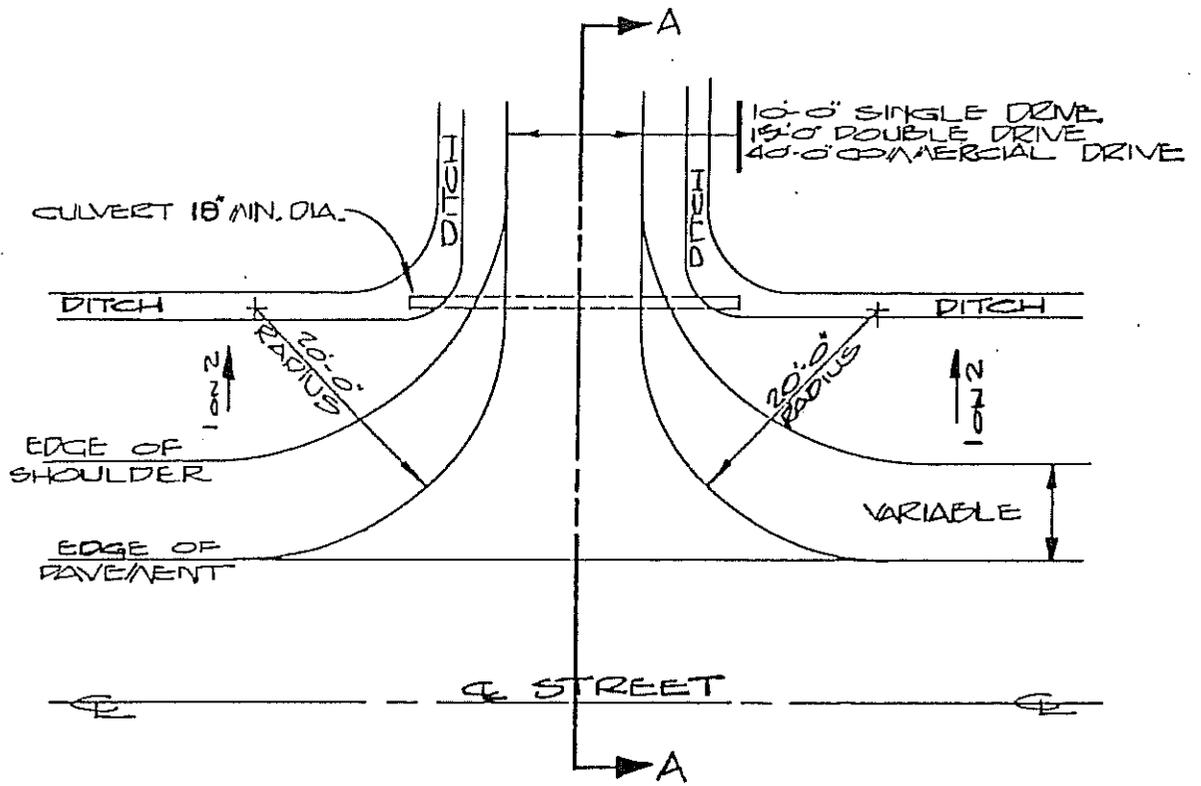
### SECTION B-B

NOTE:  
ALL MATERIALS AND CONSTRUCTION TO BE ACCORDING TO SPECIFICATIONS.

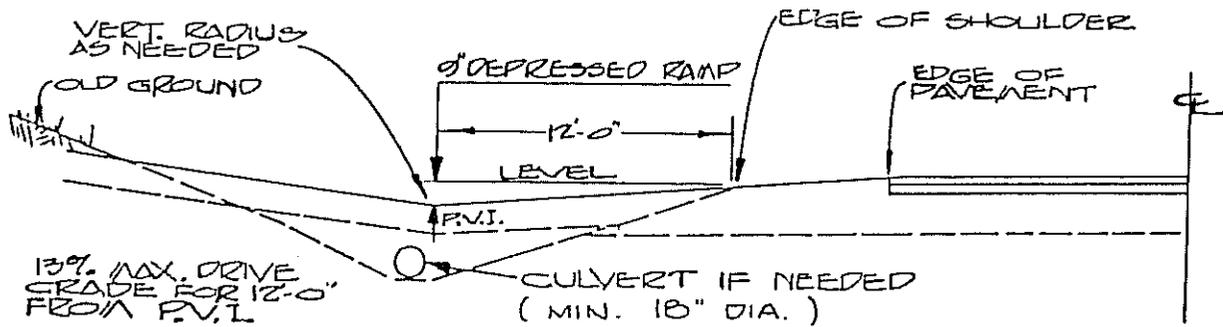
# STREET DETAILS

NT 8

## CONCRETE DRIVEWAY APRONS



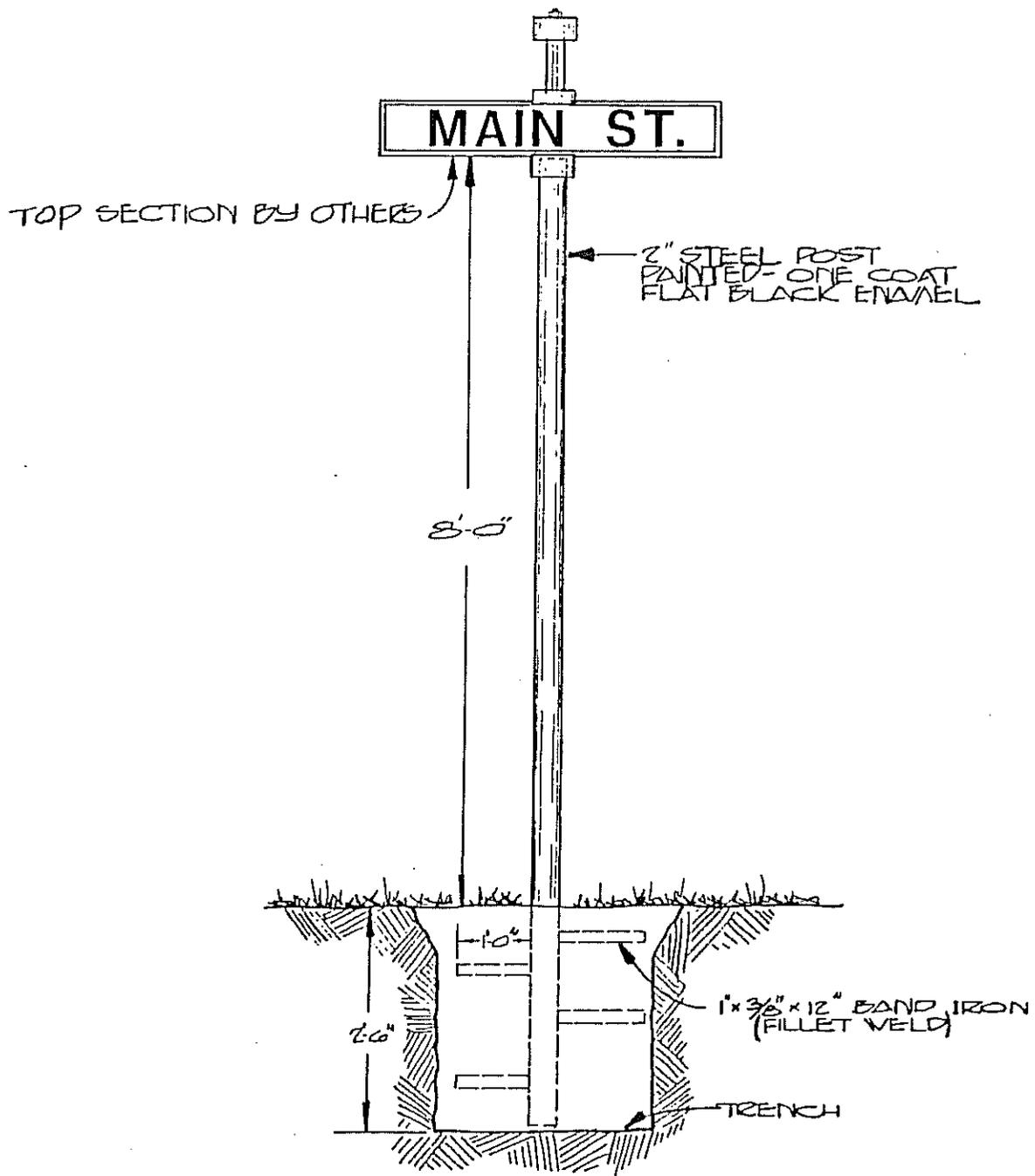
## PLAN



## SECTION A-A

# STREET DETAILS

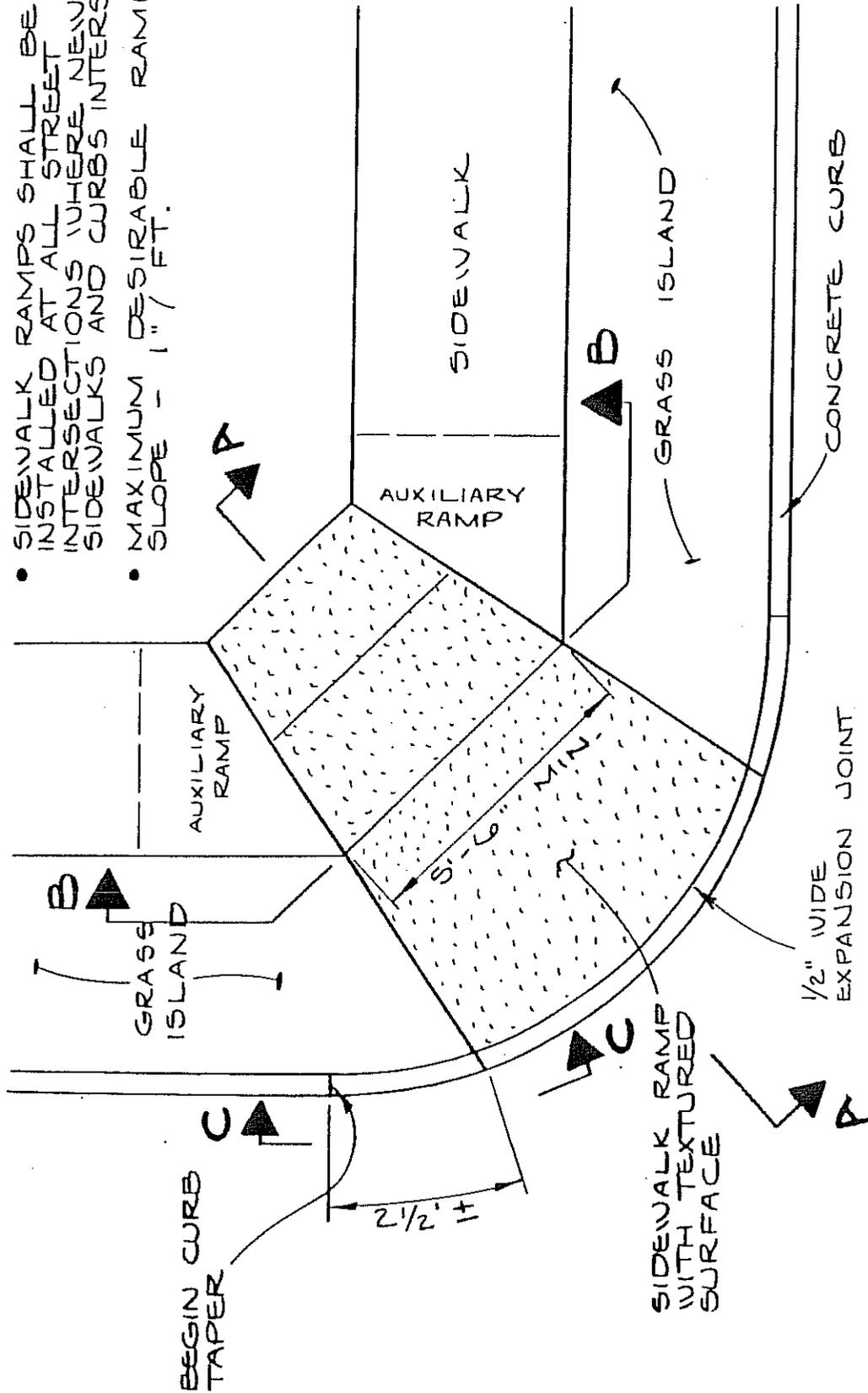
## RURAL DRIVEWAY



# 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.



# STREET DETAILS

## SIDEWALK RAMP

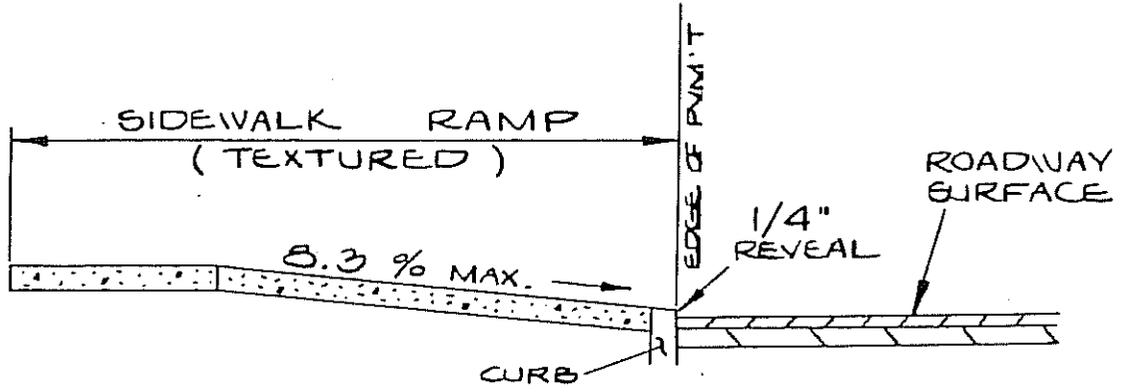
NTS

FIGURE 10

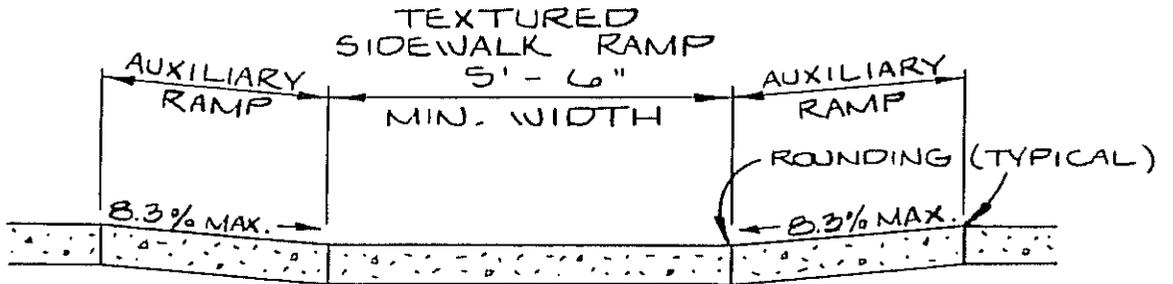
SIDEWALK RAMP SECTIONS

NTS

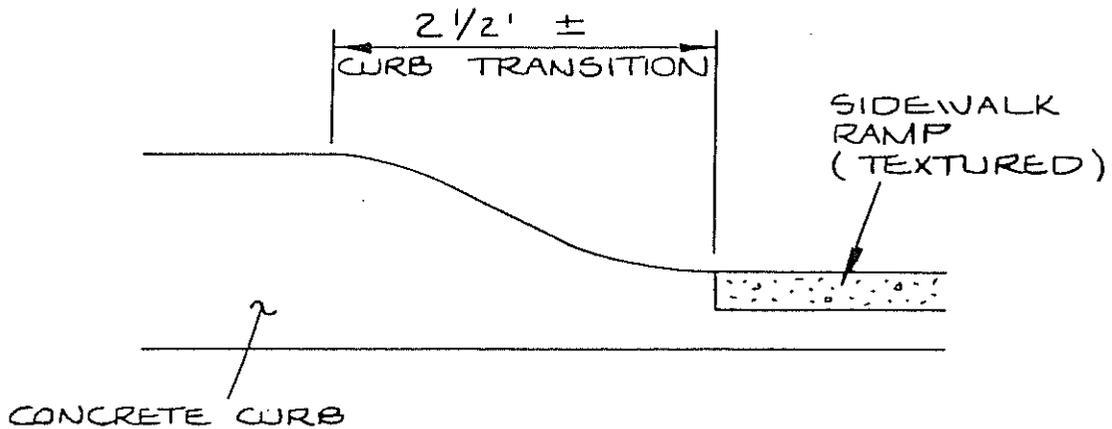
STREET DETAILS



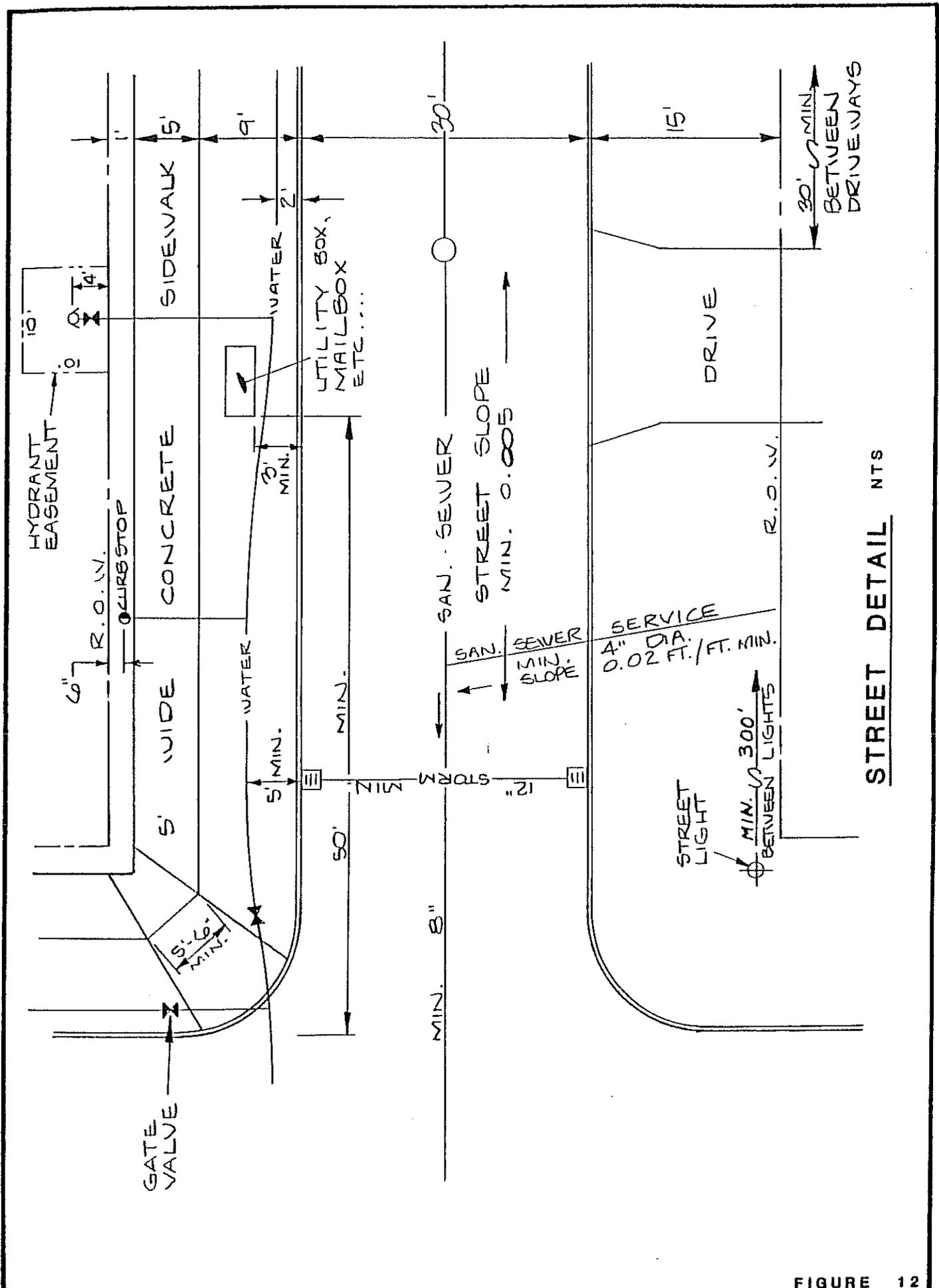
Section A - A



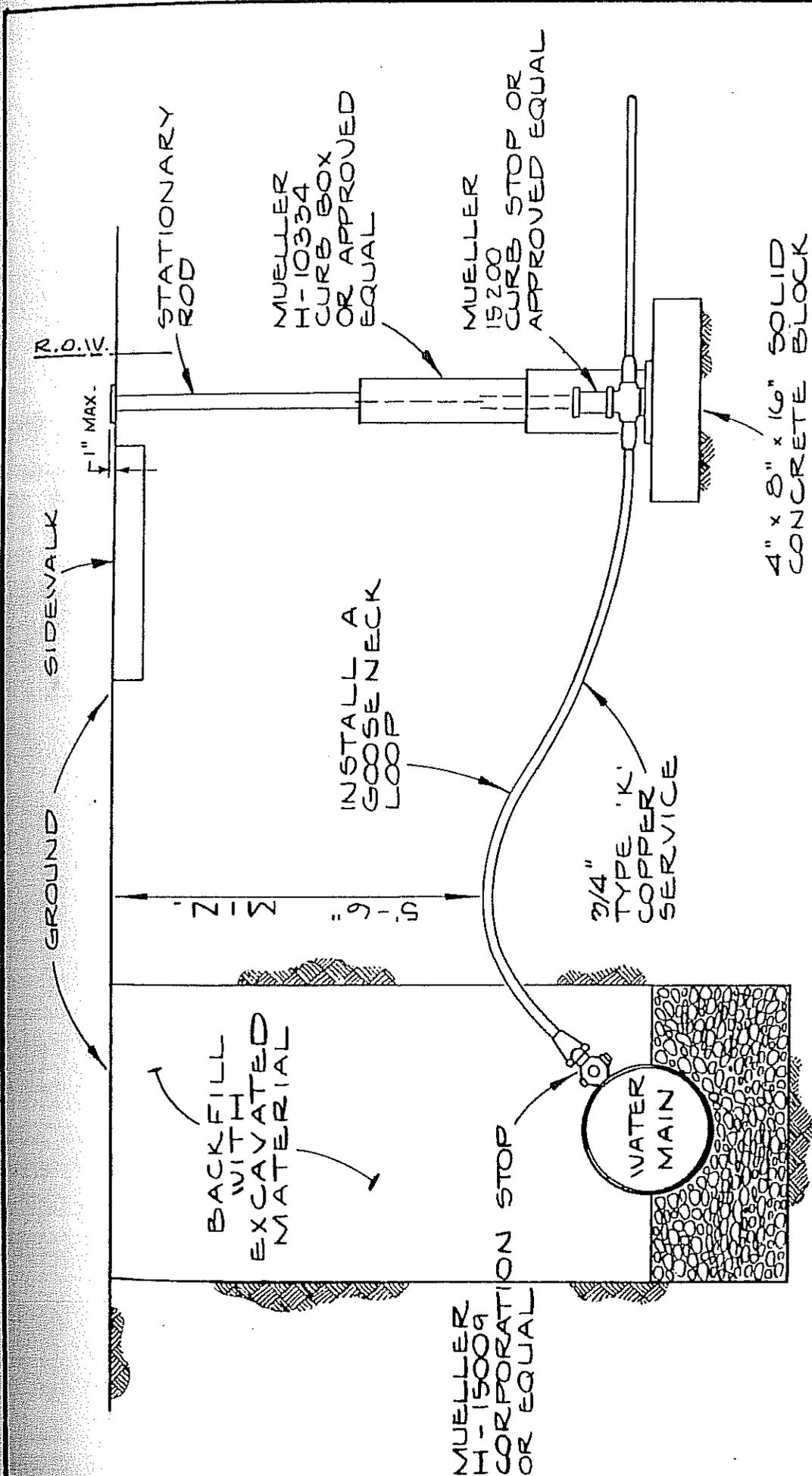
Section B - B



Section C - C



STREET DETAIL NTS

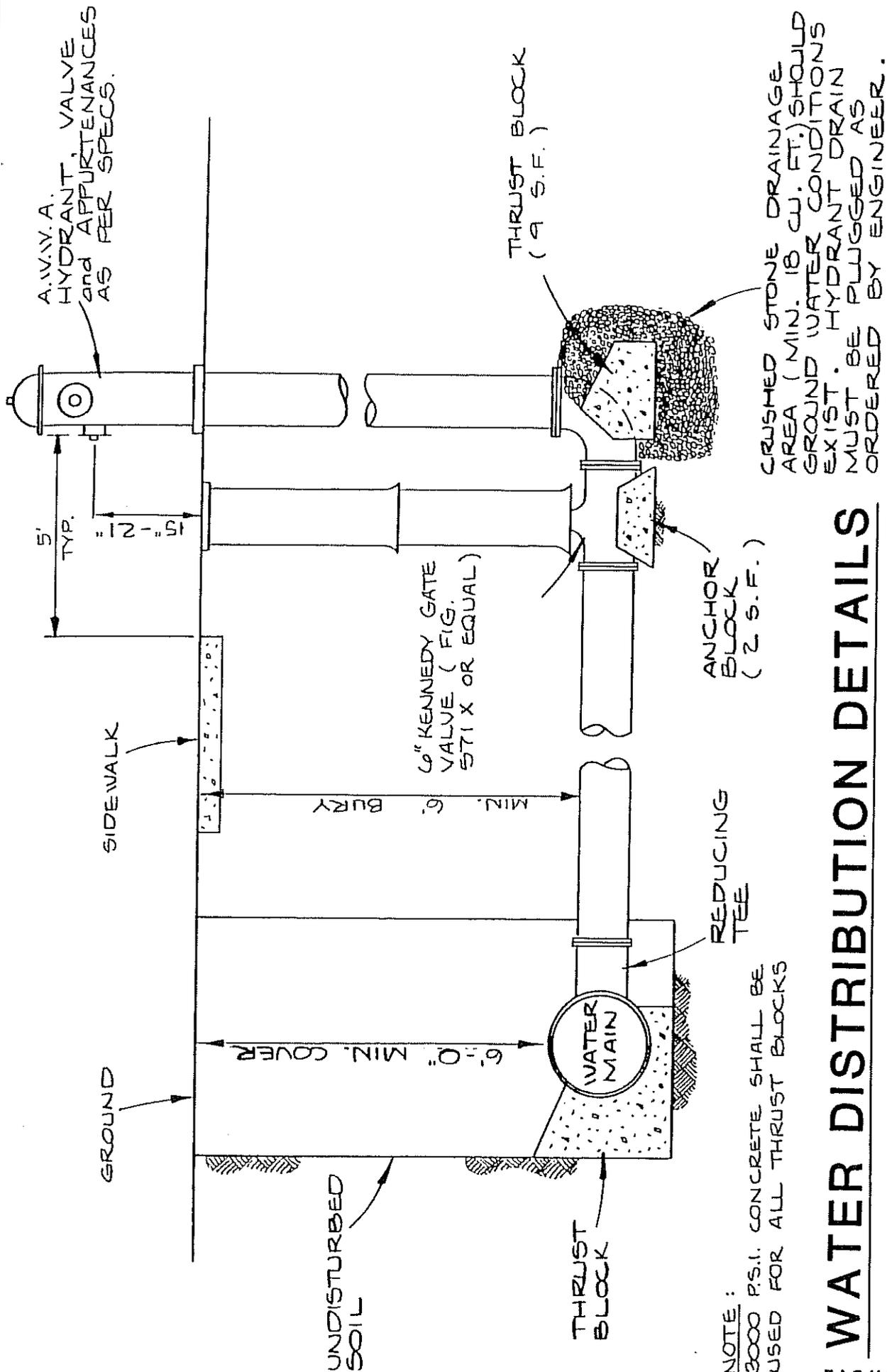


# WATER DISTRIBUTION DETAILS

HOUSE SERVICES

NTS

FIGURE 13

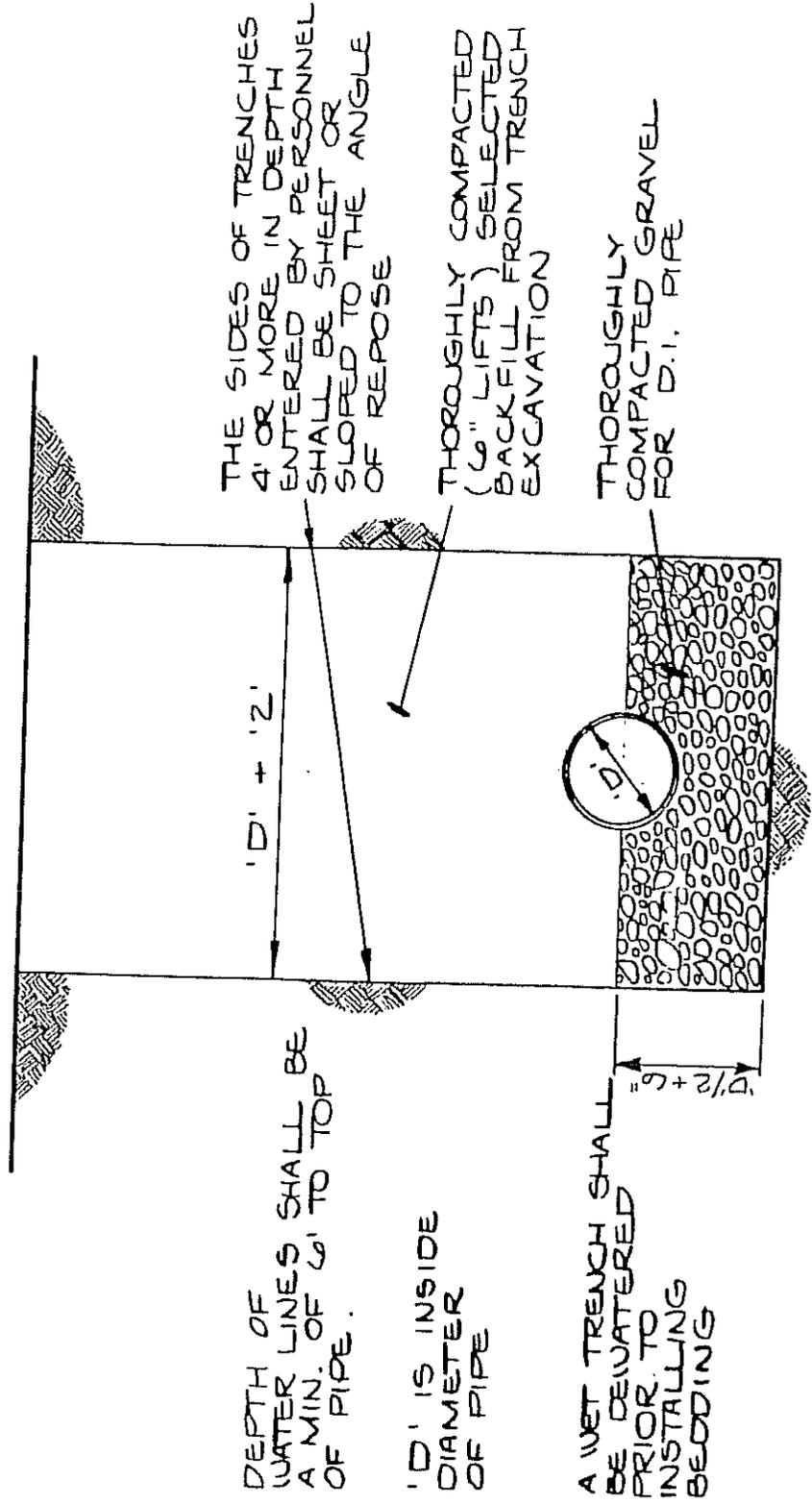


# WATER DISTRIBUTION DETAILS

## HYDRANTS

NTS

FIGURE 14



THE SIDES OF TRENCHES 4' OR MORE IN DEPTH ENTERED BY PERSONNEL SHALL BE SHEET OR SLOPED TO THE ANGLE OF REPOSE

THOROUGHLY COMPACTED (6" LIFTS) SELECTED BACKFILL FROM TRENCH EXCAVATION

THOROUGHLY COMPACTED GRAVEL FOR D.I. PIPE

DEPTH OF WATER LINES SHALL BE A MIN. OF 6' TO TOP OF PIPE.

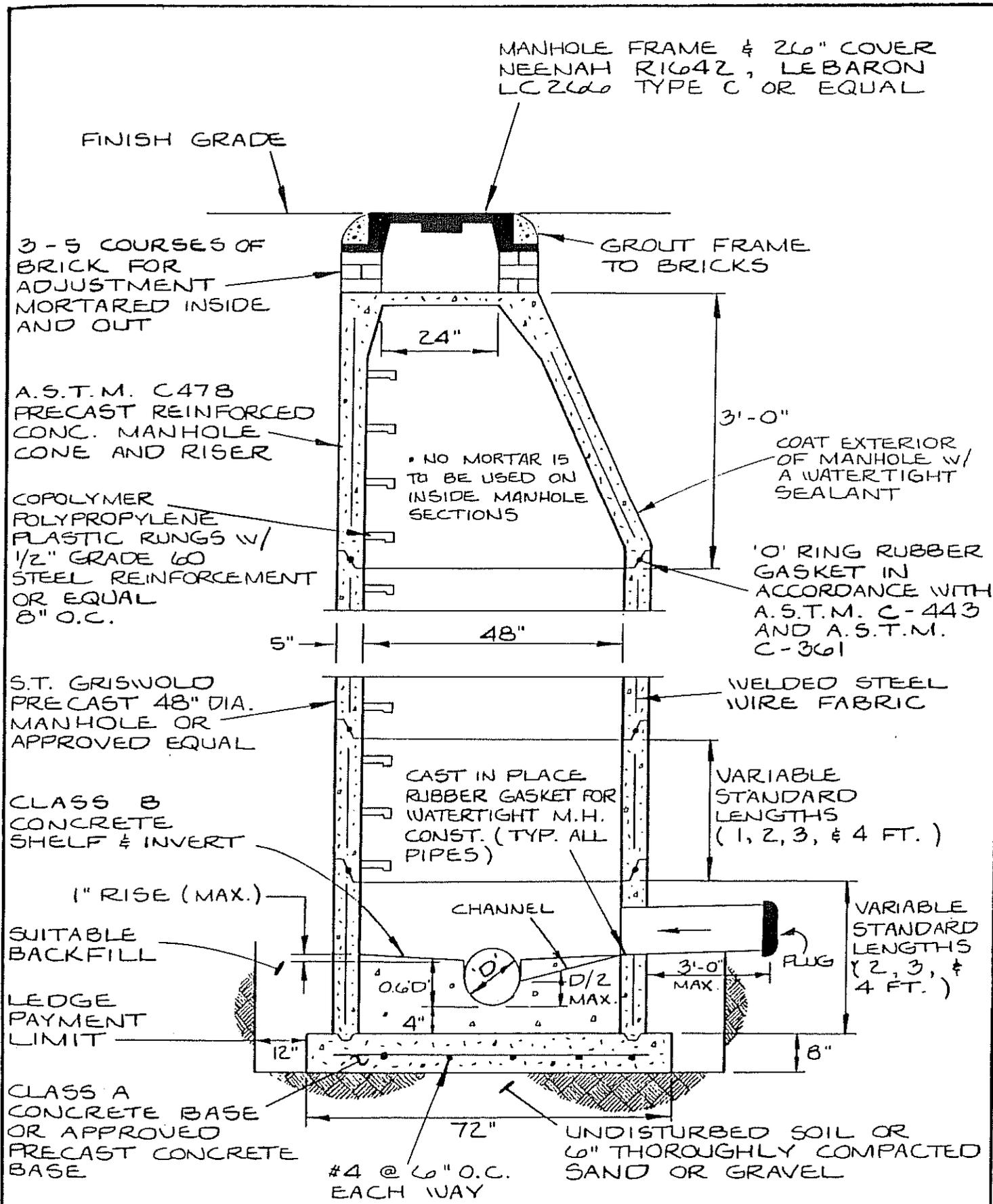
'D' IS INSIDE DIAMETER OF PIPE

A WET TRENCH SHALL BE DEWATERED PRIOR TO INSTALLING BEDDING

# WATER DISTRIBUTION DETAILS

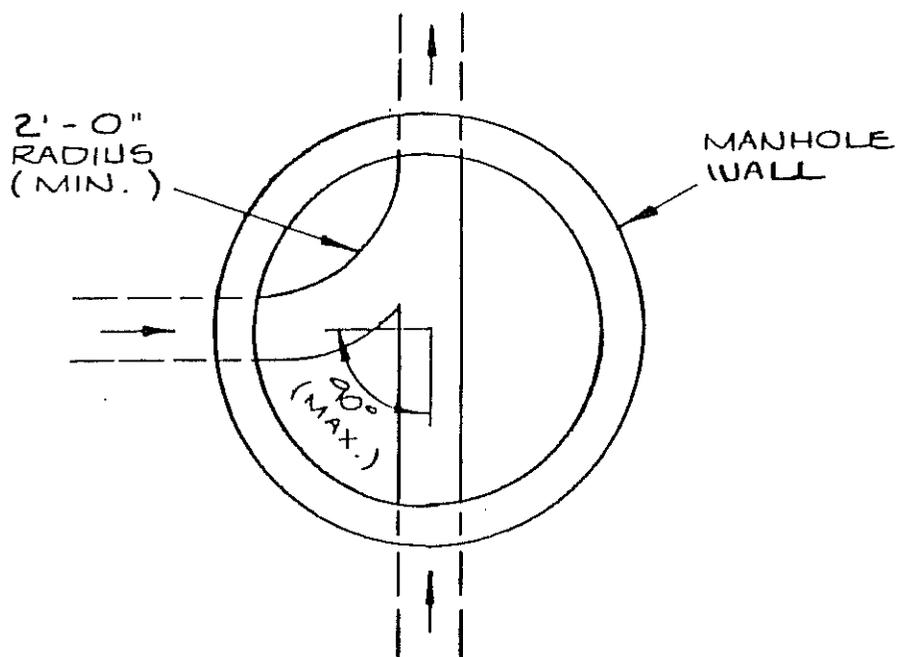
## STANDARD TRENCH for WATER

NTS



# SANITARY SEWER DETAILS

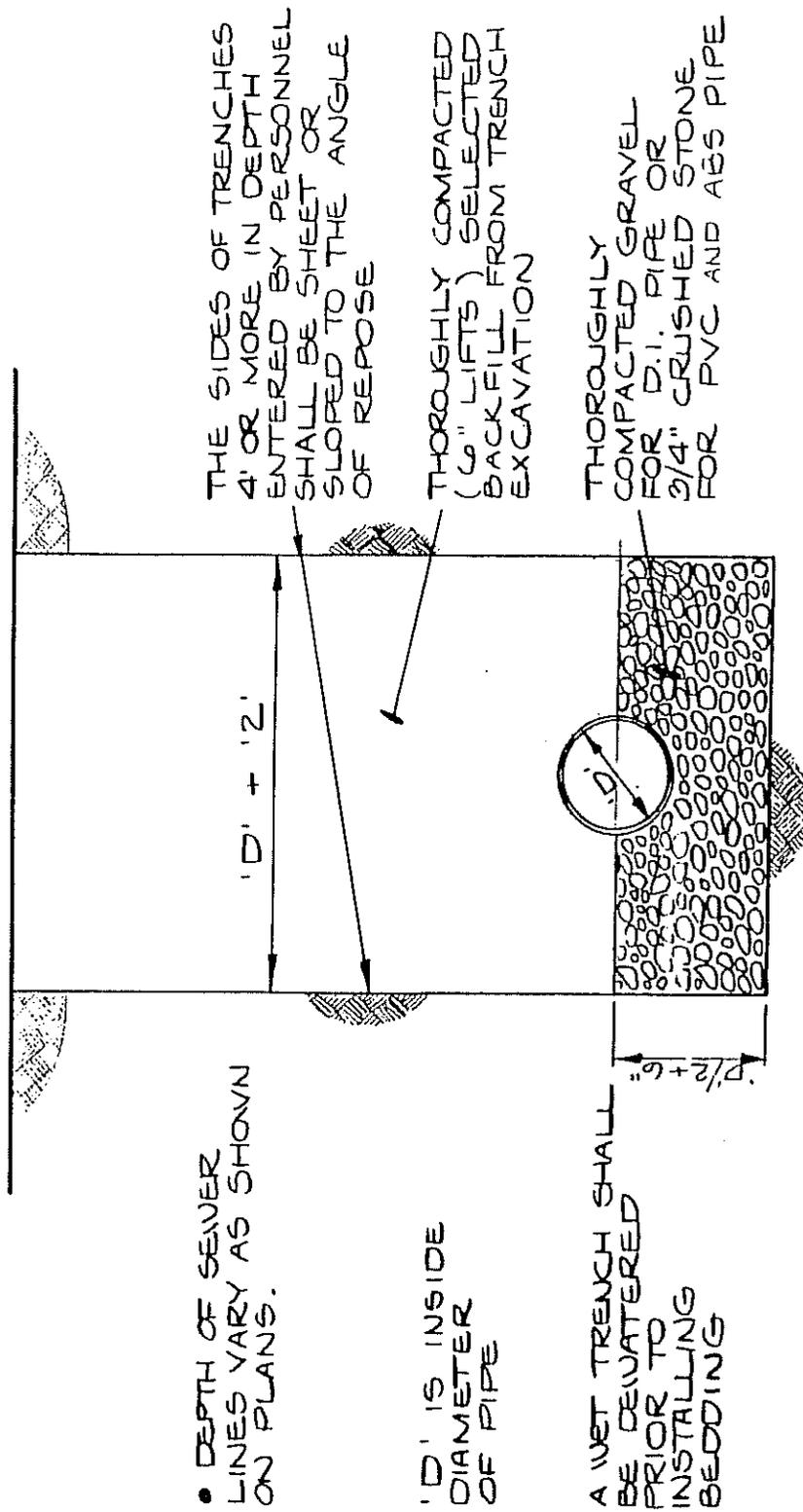
PRE-CAST MANHOLES NTS



# SANITARY SEWER DETAILS

## MANHOLE CHANNEL

NTS



THE SIDES OF TRENCHES 4' OR MORE IN DEPTH ENTERED BY PERSONNEL SHALL BE SHEET OR SLOPED TO THE ANGLE OF REPOSE

THOROUGHLY COMPACTED (6" LIFTS) SELECTED BACKFILL FROM TRENCH EXCAVATION

THOROUGHLY COMPACTED GRAVEL FOR D.I. PIPE OR 3/4" CRUSHED STONE FOR PVC AND ABS PIPE

• DEPTH OF SEWER LINES VARY AS SHOWN ON PLANS.

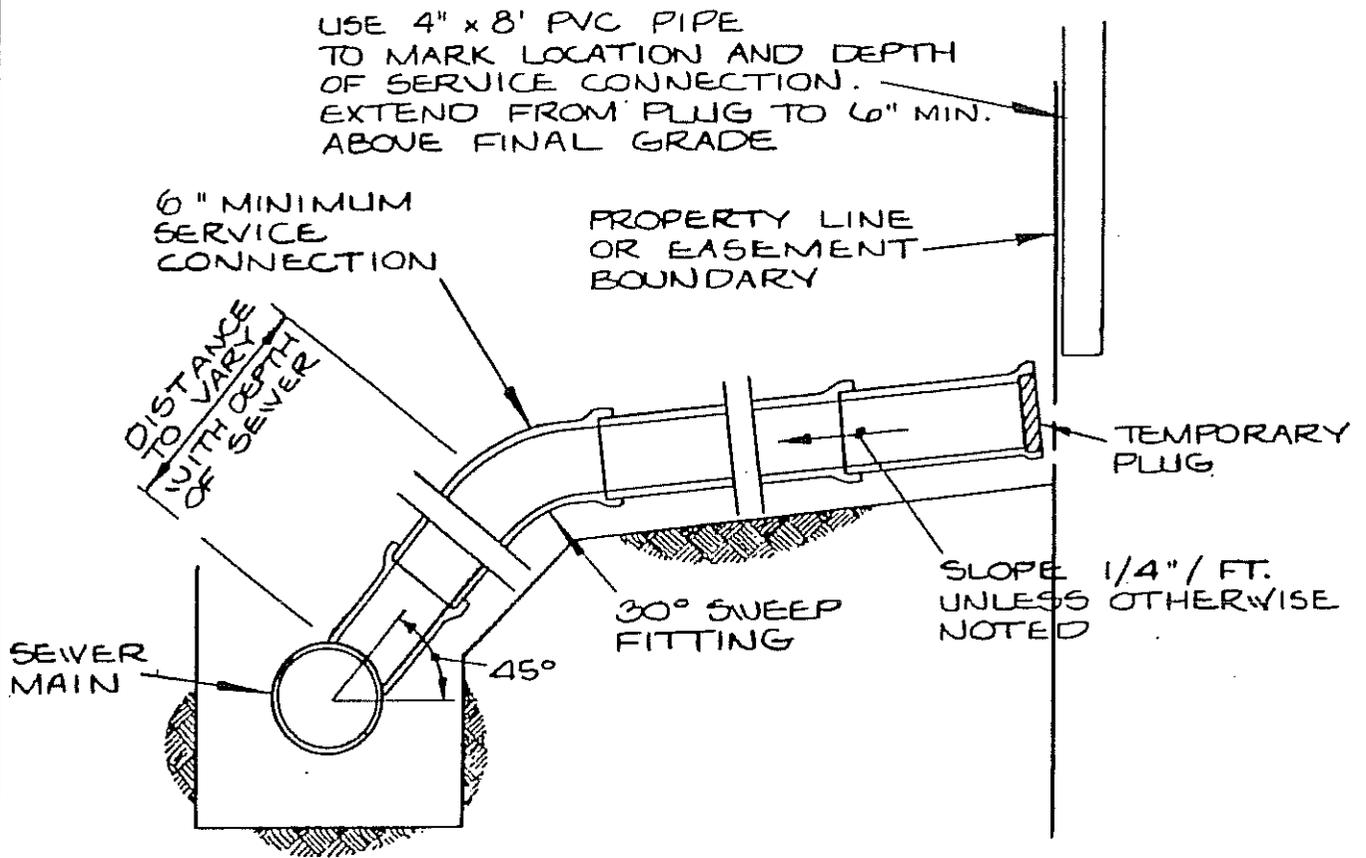
'D' IS INSIDE DIAMETER OF PIPE

A 12" TRENCH SHALL BE DEWATERED PRIOR TO INSTALLING BEDDING

# SANITARY SEWER DETAILS

## STANDARD TRENCH FOR SEWER

NTS



# SANITARY SEWER DETAILS

## SERVICE CONNECTION

NTS

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

HIGH STRENGTH  
NON-SHRINK  
GROUT

FINISH GRADE

CURB

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

(MIN.)  
36"  
DIA.

MAIN

UNDERDRAIN

6" MIN.

2'-0"  
SUMP

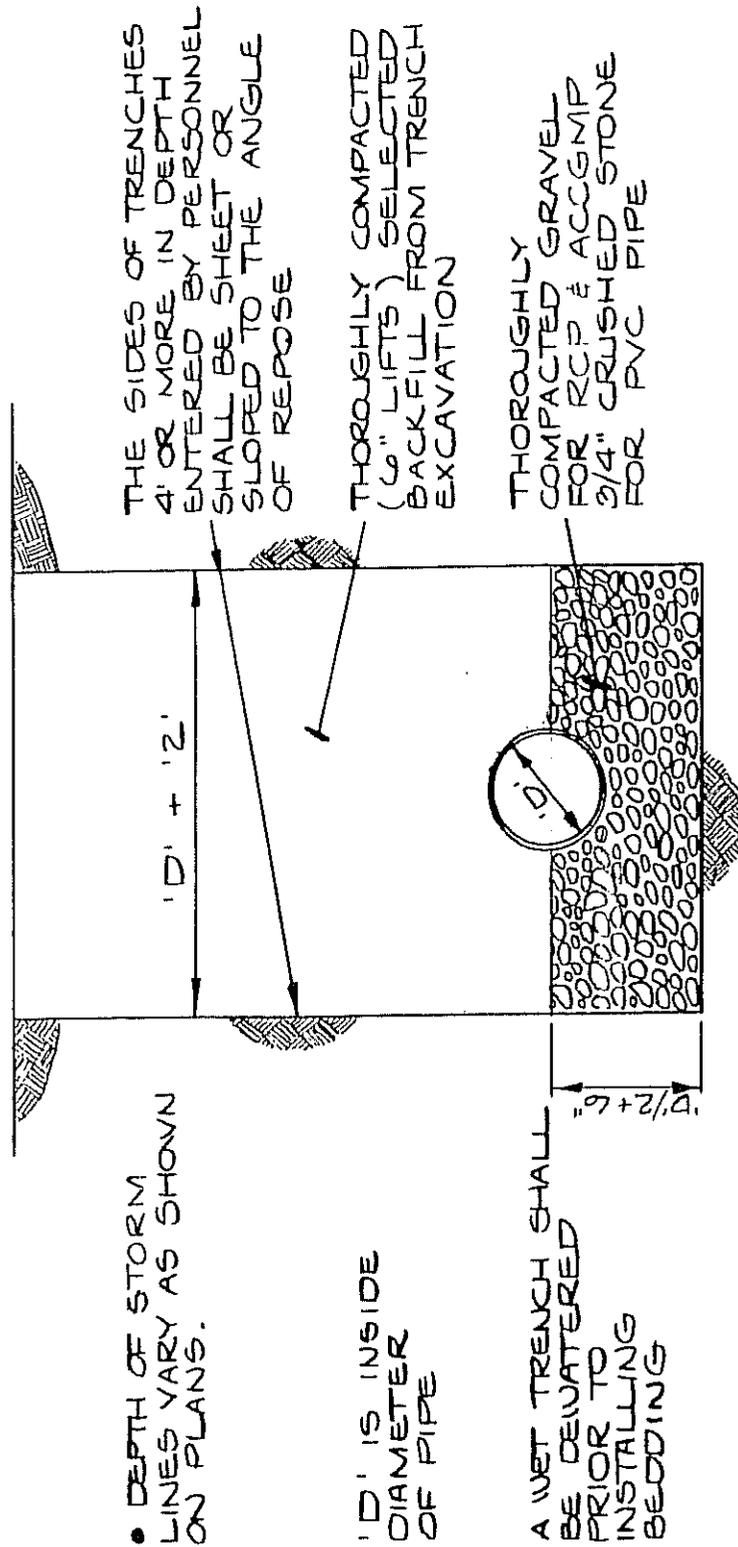
VARIES

8"

UNDISTURBED SOIL OR  
6" OF THOROUGHLY COMPACTED  
GRAVEL

# STORM DRAINAGE DETAILS

## PRECAST CATCH BASIN



THE SIDES OF TRENCHES 4' OR MORE IN DEPTH ENTERED BY PERSONNEL SHALL BE SHEET OR SLOPED TO THE ANGLE OF REPOSE

THOROUGHLY COMPACTED (6" LIFTS) SELECTED BACKFILL FROM TRENCH EXCAVATION

THOROUGHLY COMPACTED GRAVEL FOR RCP & ACCGMP 3/4" CRUSHED STONE FOR PVC PIPE

• DEPTH OF STORM LINES VARY AS SHOWN ON PLANS.

1'0" IS INSIDE DIAMETER OF PIPE

A WET TRENCH SHALL BE DEWATERED PRIOR TO INSTALLING BEDDING

# STORM DRAINAGE DETAILS

## STANDARD TRENCH for STORM DRAINS

NTS