

PREFACE

Subdivision Control became effective in the Town of North Reading September 19, 1944, and the first Rules and Regulations were put in printed form dated March 1945. There have been various amendments and several updated books printed between 1945 and 1965 until a major redraft was undertaken by the Community Planning Commission which resulted in the printed book entitled "Rules and Regulations Governing the Subdivision of Land in North Reading, Massachusetts, Effective March 20, 1973." It should be noted that subsequent to the adoption of this major redraft, there were amendments that were adopted June 27, 1973, which were effective July 1, 1973, and those amendments were incorporated into the printing of the "March 20, 1973" book.

Working from a compilation of these 1973 rules and subsequent amendments through August 1989, Municipal Code Corporation has included the amendments in their proper places, designed a consistent visual format for the material, supplied history notes which give the adoption dates of each amendment, amendment notes which describe the scope and purpose of each amendment, and a table of amendments which lists all amendments and the sections which they affected, in chronological order. This table also supplies the effective date of each amendment. MCC has created an index for the rules.

The book was designed to make it easy for the user to locate needed material and to facilitate the research into the subdivision requirements as they have existed previously. The looseleaf format of the book will allow the user to keep it up-to-date through the supplement service, which will supply updated pages with instructions for removing and inserting changed pages. Where it is anticipated that the text of the rules may expand in the future, pages have been reserved to allow expansion. A bracketed notation concerning the next page of text {The next page is _____} has been supplied preceding these reserved pages.

The publisher wishes to thank the officials of the Town of North Reading, particularly the Community Planning Commission, for their help in completing this project.

It should be noted that the complete text of all amendments and all necessary forms are available in the Community Planning Commission office.

Chapter 350

SUBDIVISION OF LAND

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[HISTORY: Adopted by the Community Planning Commission of the Town of North Reading 3-20-1973, as amended 7-27-1973. Subsequent amendments noted where applicable.]

GENERAL REFERENCES

Zoning -- See Ch. 200.

Site plan review -- See Ch. 340.

ARTICLE I

Purpose and Authority

§ 350-1. Purpose.

- A. These subdivision regulations are adopted for the purpose of protecting the safety, convenience and welfare of the inhabitants of the Town of North Reading by regulating the laying out and construction of ways in subdivisions providing access to the several lots therein, but which have not become public ways, and ensuring sanitary conditions in subdivisions and, in proper cases, parks and open areas. The powers of the Community Planning Commission and of the Zoning Board of Appeals under the Subdivision Control Law shall be exercised with due regard for the provision of adequate access to all of the lots in a subdivision by ways that will be safe and convenient for travel; for lessening congestion in such ways and in the adjacent public ways; for reducing danger of life and limb in the operation of motor vehicles; for securing safety in the case of fire, flood, panic and other emergencies; for insuring compliance with the applicable Zoning Bylaws;¹ for securing adequate provision for water, sewerage, drainage, underground utility services, fire, police and other similar municipal equipment, and streetlighting and other requirements where necessary in a subdivision; and for coordinating the ways in a subdivision with each other and with the public ways in the town and with the ways in neighboring subdivisions.
- B. It is the intent of the Subdivision Control Law (under which these regulations are adopted) that any subdivision plan filed with the Community Planning Commission shall receive the approval of such Commission if said plan conforms to the recommendation of the Board of Health and to the reasonable rules and regulations of the Community Planning Commission pertaining to subdivisions of land; provided, however, that such Commission may, when appropriate, waive, as provided for in Section 81-R, such portions of the rules and regulations as is deemed advisable (Section 81-M of Chapter 41, G.L.).

§ 350-2. Authority; effective date.

Under the authority vested in the Community Planning Commission of the Town of North Reading by Section 81-Q of Chapter 41 of the General Laws, said Commission hereby adopts these amended "Rules and Regulations Governing the Subdivision of Land in the Town of North Reading." These regulations shall be effective on and after March 20, 1973.

¹ Editor's Note: See Ch. 200, Zoning.

ARTICLE II
General Provisions

§ 350-3. Definitions.

APPLICANT -- A person (as hereinafter defined) who applies for the approval of a plan of a subdivision or a person who applies under § 350-4. "Applicant" shall include an owner or his agent or representative or his assigns.

BASE FLOOD (100-YEAR FLOOD) -- The flood having a one-percent chance of being equaled or exceeded in any given year. **[Added 2-28-1980]**

CERTIFIED BY -- "Certified by" (or endorsed by) the Community Planning Commission, as applied to a plan or other instrument required or authorized by the Subdivision Control Law to be recorded, shall mean bearing a certification or endorsement signed by a majority of the members of the Community Planning Commission, or by its Chairman or Clerk or any other person authorized by it to certify or endorse its approval or other action and named in a written statement to the Registrar of Deeds and recorder of the Land Court signed by a majority of the Commission (Section 81-L of Chapter 41 of the General Laws). **[Amended 9-5-2000]**

COMMISSION or COMMUNITY PLANNING COMMISSION -- "Community Planning Commission" shall mean a planning board established under Section 81-A.

COMMUNITY PLANNING COMMISSION AGENT -- Town employee or consultant authorized by the Community Planning Commission to review subdivisions and administer regulations.

DEVELOPER -- A person (as hereinafter defined) who develops a subdivision under a plan of a subdivision approved under Article III of these rules and regulations.

GENERAL LAWS (abbreviated G.L.) -- The General Laws of Massachusetts. In case of a rearrangement of the General Laws, any citation of particular sections of the General Laws shall be applicable to the corresponding sections in the new codifications.

LOT -- An area of land in one ownership, with definite boundaries and used, or available for use, as the site of one or more buildings.

LOT FRONTAGE -- The horizontal distance measured along the front lot line between the points of intersection of the side lot lines with the front lot line. Frontage for purposes of these rules and regulations shall be only continuous frontage.

LOT LINE, FRONT -- The property line dividing a lot from a street right-of-way.

LOT LINE, REAR -- The lot line opposite from a front lot line and which does not intersect a front lot line.

LOT LINE, SIDE -- Any lot line not a front or rear lot line.

MUNICIPAL SERVICES -- Sewers, water drains, water pipes, gas pipes, electrical lines, telephone lines, communication lines and their respective appurtenances.

OWNER -- As applied to real estate, the person holding the fee simple title to a parcel, tract, or lot of land.

PERSON -- An individual, or two or more individuals or a group or association of individuals, a trust, a partnership or corporation, having common or undivided interests in a tract of land.

PLAN or DEFINITIVE PLAN -- The plan of a subdivision as submitted (with appropriate application) to the Commission for approval, to be recorded in the Registry of Deeds or filed with the Land Court when approved by the Commission and such plan when approved and recorded; all as distinguished from a preliminary plan.

PRELIMINARY PLAN -- A plan of a proposed subdivision or resubdivision of land prepared in accord with Article III to facilitate proper preparation of a definitive plan.

RECORDED -- "Recorded" shall mean recorded in the Registry of Deeds of Middlesex County in which the land in question is situated, except that, as affecting Registered land, it shall mean filed with the recorder of the Land Court (Section 81-L of Chapter 41 of the General Laws).

REGISTRARED LAND SURVEYOR (RLS) -- A person who is certified by the Massachusetts Board of Registration as a Registered land surveyor. All plans bearing the stamp of a Registered land surveyor shall have been prepared by him or in his office under his immediate and responsible supervision. All plans, specifications, plats and reports stamped with the seal of either a Registered professional engineer or a Registered land surveyor shall be signed by the registrant named thereon. **[Added 7-16-1984]**

REGISTRARED PROFESSIONAL ENGINEER (RPE) -- A civil engineer whose discipline is normally and customarily associated with subdivision development and who is certified by the Massachusetts Board of Registration as a Registered professional engineer. All plans bearing the stamp of a Registered professional engineer shall have been prepared by him or in his office under his immediate and responsible supervision. **[Added 7-16-1984]**

REGISTRY OF DEEDS -- "Registry of Deeds" shall mean the Registry of Deeds of Middlesex County in which the land in question is situated, and, when appropriate, shall include the Land Court (Section 81-L of Chapter 41 of the General Laws).

ROADWAY -- That portion of a way which is designed and constructed for vehicular travel.

STREET, PRINCIPAL -- A street which, in the opinion of the Commission, is being used or will be used as thoroughfare within the Town of North Reading or which will otherwise carry a heavy volume of traffic.

STREET, SECONDARY -- A street which, in the opinion of the Commission, is being used or will be used primarily to provide access to abutting lots and which will not be used for through traffic.

SUBDIVISION:

- A. "Subdivision" shall mean the division of a tract of land into two or more lots and shall include a resubdivision and, when appropriate to the context, shall relate to the process of subdivision or the land or territory subdivided; provided, however, that the division of a tract of land into two or more lots shall not be deemed to constitute a subdivision within the meaning of the Subdivision Control Law, if, at the time when it is made, every lot within the tract so divided has a frontage on (a) a public way, (b) a way shown on a plan theretofore approved in accordance with the Subdivision Control Law, or (c) a way in existence when the Subdivision Control Law became effective in the town, having, in the opinion of the Community Planning Commission, sufficient width, suitable grades and adequate construction to provide for the needs of vehicular traffic in relation to the proposed use of the land abutting thereon or served thereby, and for the installation of municipal services to serve such land and the buildings erected or to be erected thereon. Such frontage shall be of at least such distance as is then required by Zoning² or other bylaw. **[Amended 3-31-1987]**
- B. Conveyances or other instruments adding to, taking away from, or changing the size and shape of, lots in such a manner as not to leave any lot so affected without the frontage above set forth, or the division of a tract of land on which two or more buildings were standing when the Subdivision Control Law went into effect in the town into separate lots on each of which one of such buildings remains standing, shall not constitute a subdivision (Section 81-L of Chapter 41 of the General Laws). **[Amended 9-5-2000]**

SUBDIVISION CONTROL -- The power of regulating the subdivision of land granted by the Subdivision Control Law, Chapter 41, Sections 81-K through 81-GG inclusive, as hereinafter amended.

SUBMITTED PLAN -- A plan shall be officially submitted to the Community Planning Commission as of the date said plan and forms necessary under these rules and regulations are duly filed with the Clerk or Secretary of the Commission at a regularly scheduled business meeting of the Commission and the fact of such submission is entered in the minutes of the meeting. Such plan shall nevertheless be considered duly submitted even though not entered in the minutes of the meeting if otherwise properly submitted and such failure of entry into the minutes is due to the inadvertence or unwarranted refusal of the Clerk or Secretary to make such entry. Such plan and forms may also be submitted by Registered mail to the Community Planning Commission, care of the Town Clerk. If so mailed, the date of mailing shall be the date of submission of the plan.

TOWN -- Town of North Reading, unless otherwise specified.

²Editor's Note: See Ch. 200, Zoning.

§ 350-4. Approved plan required.

No person shall make a subdivision within the meaning of the Subdivision Control Law of any land within the town or proceed with the improvement for sale of lots in a subdivision, or the construction of ways, or preparation therefore or the installation of utilities and municipal services thereof, unless and until a definitive plan of such subdivision has been submitted and approved by the Community Planning Commission as hereinafter provided.

§ 350-5. Source of information required.

In those cases in which the land shown on the plan is abutted by land of an owner not the owner of the land as shown, the Commission may require a statement from the person who prepared the plan as to the source or sources of the information about the location of boundaries. A separate form for such statement will be furnished by the Commission (Form D, Designer's Certificate).

§ 350-6. More than one building for dwelling purposes on a lot.

Not more than one building designed or available for use for dwelling purposes shall be erected or placed or converted to use as such on any lots in a subdivision, or elsewhere in the town, without the consent of the Community Planning Commission. Such consent may be conditional upon the providing of adequate ways furnishing access to each site for such building in the same manner as otherwise required for lots within a subdivision.

§ 350-7. Fees.

- A. Every application for approval of a definitive subdivision plan shall be accompanied by a nonrefundable fee payable to the Town of North Reading in the amount of \$500, regardless of size, plus \$5.50 per lineal foot of roadway, including all cul-de-sacs, measured along the center line of the road. **[Amended 2-28-1980; 11-19-1985; 8-8-1989]**
- B. Every application for a preliminary plan shall be accompanied by a nonrefundable fee payable to the Town of North Reading in the amount of \$250 plus \$75 for each lot. **[Amended 2-28-1980; 11-19-1985]**
- C. Every application for an "approval not required" plan shall be accompanied by an application fee of \$100. **[Amended 11-19-1985]**
- D. All expenses for advertising, recording and filing of documents shall be borne by the applicant.
- E. There shall be a fee of \$1,000 for any requests for bond extensions. **[Added 8-8-1989]**

- F. There shall be a fee of \$50 for each requested waiver of these rules and regulations. No fee shall be charged with respect to requested waivers consistent with an approved Open Space Residential Development special permit. [Added 9-5-2000; Amended 5-19-2009]

§ 350-8. Application by a corporation.

A vote from the clerk of the corporation shall accompany submission of definitive subdivision plans certifying authorization of individual(s) to act for the corporation.

§ 350-9. Ownership of property.

A copy of the deed(s) of property shall accompany submission of definitive subdivision plans.

§ 350-10. Project review fees; reimbursement to town. [Added 9-3-1991]

- A. When reviewing an application for, or when conducting inspections in relation to, a preliminary subdivision, a definitive subdivision, or a special permit under the provisions of the North Reading Zoning Bylaws,³ the Community Planning Commission may determine that the assistance of outside consultants is warranted due to the size, scale or complexity of a proposed project, because of a project's potential impacts, or because the town lacks the necessary expertise to perform the work related to a preliminary subdivision, a definitive subdivision, or a special permit under the provisions of the North Reading Zoning Bylaws. The Community Planning Commission may require that applicants pay a "project review fee" consisting of the reasonable costs incurred by the Community Planning Commission for the employment of outside consultants engaged by the Community Planning Commission to assist in the review of a proposed project.
- B. In hiring outside consultants, the Community Planning Commission may engage engineers, planners, lawyers, urban designers or other appropriate professionals who can assist the Community Planning Commission in analyzing a project to ensure compliance with all relevant laws, ordinances/bylaws, and regulations. Such assistance may include, but not be limited to, analyzing an application, monitoring or inspecting a project or site for compliance with the Community Planning Commission's decision or regulations, or inspecting a project during construction or implementation.
- C. Prior to any expense being incurred, which would be chargeable to the developer, the Community Planning Commission shall provide the developer with an estimate of the expected costs. The developer shall deposit, with the town, a cash amount equal to 1/3 the total estimated cost of review and inspection of the proposal.

³Editor's Note: See Ch. 200, Zoning.

- D. Funds received by the Community Planning Commission pursuant to this section shall be deposited with the Municipal Treasurer who shall establish a special account for this purpose. Expenditures from this special account may be made at the discretion of the Community Planning Commission without further appropriation. Expenditures from this special account shall be made only for services rendered in connection with a specific project or projects for which a project review fee has been or will be collected from the applicant. Accrued interest may also be spent for this purpose. These funds will be disbursed by the Community Planning Commission to the reviewing/inspecting party until expended. At that time the developer shall deposit a second amount equal to 1/3 the total estimated cost upon being so directed by the Community Planning Commission. These funds will be disbursed as before until expended. The developer shall then deposit a third amount equal to 1/3 the total estimated cost upon being directed by the Community Planning Commission to do so. These funds will be disbursed by the Community Planning Commission as before.
- E. Upon completion of all review and inspection services, the Community Planning Commission shall examine all records to ensure that all payments have been made. In the case of an estimate being too low, the developer shall make a final deposit to the town in the amount of the shortfall. In the case of an estimate being too high, the Community Planning Commission shall refund to the developer any unused funds. The failure of the developer to provide funds for all outstanding costs shall be cause for denial of the proposal. A final report of said account shall be made available to the applicant or the applicant's successor in interest. For the purpose of this regulation, any person or entity claiming to be an applicant's successor in interest shall provide the Community Planning Commission with documentation establishing such succession in interest.
- F. Any applicant may make an administrative appeal from the selection of the outside consultant to the Board of Selectmen. Such appeal must be made in writing and must be made within 20 days after the Community Planning Commission has mailed or hand-delivered notice to the applicant of the selection. The grounds for such an appeal shall be limited to claims that the consultant selected has a conflict of interest or does not possess the minimum, required qualifications. The minimum qualifications shall consist either of an educational degree in, or related to, the field at issue or three or more years of practice in the field at issue or a related field. The required time limit for action upon an application by the Community Planning Commission shall be extended by the duration of the administrative appeal. In the event that no decision is made by the Board of Selectmen within 30 days following the filing of the appeal, the selection made by the Community Planning Commission shall stand.

ARTICLE III

Procedure for Submission and Approval of Plans**§ 350-11. Plan believed not to require approval. [Amended 3-31-1987;]**

A. Submission of plan. Any person who wishes to cause to be recorded in the Registry of Deeds or to be filed with the Land Court a plan of land and who believes that his plan does not require approval under the Subdivision Control Law may submit his plan and eight contact prints and one copy of a properly executed Form A, to the Community Planning Commission accompanied by the necessary evidence to show that the plan does not require approval. In addition to the above eight contact prints, the applicant should provide a duplicate Mylar of the plan if the subject property is located on a way in a subdivision that has not been accepted by Town Meeting as a public way. Said person shall file by delivery or Registered or certified mail a notice with the Town Clerk stating the date of submission for such determination accompanied by a copy of said application and describing the land to which the plan relates sufficiently for identification. If the notice is given by delivery, the Town Clerk shall, if requested, give a written receipt therefore. Applications shall be accompanied by a base fee of \$100 for creation of up to one new lot, plus \$50 per each additional new lot created, payable to the Town of North Reading, and shall also include a copy of deed identifying record owner of property. **[Amended 5-19-2009]**

(1) The applicant must submit evidence sufficient to demonstrate that each lot on the plans, and/or any lot altered by the plan, has frontage in compliance with the Town of North Reading Zoning Bylaw **[Amended 5-19-2009]**

(2) All lots shown on a plan presented to the Community Planning Commission for endorsement under this section must have reasonably feasible driveway access across the legal frontage on the street to the building site. Determination as to feasibility of access via legal frontage shall be made based on steepness of topography, presence/absence of ledge, and presence/absence of wetland or FEMA Zone A floodplain along the proposed driveway route from legal frontage to building site. The applicant shall document compliance with this access via legal frontage requirement on the plan. If compliance cannot be demonstrated, submission as a definitive plan under these rules and regulations is an alternative for the applicant.

(3) Said plan shall be of minimum dimensions of 8 1/2 inches by 11 inches or a maximum size not to exceed 24 inches by 36 inches and shall contain the following information:

- (a) Identification of the plan by name and address of owner of record and location of the land in question, cross-referenced to page and parcel number of the Assessor's Maps.
- (b) The statement "Approval Under Subdivision Control Law Not Required" and sufficient space for the date and the signatures of all five members of the Commission.

- (c) Zoning classification and location of any zoning district boundaries that may lie within the locus of the plan, including identification of the Floodplain District and the Aquifer Protection Districts.
- (d) In the case of the creation of a new lot, the remaining land area and frontage of the land in the ownership of the applicant shall be shown.
- (e) Notice of any decision of the Zoning Board of Appeals, including but not limited to variances and exceptions regarding the land or any buildings thereon. Said notation shall identify the date of decision, the book and page of recording, along with a brief description of the decision.
- (f) Abutters from latest available Assessor's records unless the applicant has knowledge of any changes subsequent to the latest available Assessor's records (see Form E, Certified List of Abutters).
- (g) Distance to the nearest road or to other permanent monument.
- (h) Location of all existing buildings, including setback and side and rear yard designations.
- (i) A locus plan at 1,000 feet to the inch shall be included on the plan.
- (j) Identification of all wetlands, based on a field survey, as defined in M.G.L. Chapter 131, Section 40, including all of the four subsets comprising "inland wetlands."
- (k) In the case of a limited frontage lot, the plan shall contain the following information:
 - [1] Frontage distance of each abutting lot;
 - [2] Identification of the required minimum diameter circle pursuant to § 200-67F of the Zoning Bylaw.
- (l) All property lines not abutting the applicant's property and not directly related to the lot(s) being subdivided, which may be shown on the plan, shall not be drawn as a continuous solid line but rather with broken lines. Additionally, when an existing lot line is being changed, the existing line shall be drawn with a shaded, broken line and the new lot line shall be drawn with a solid line. All existing and proposed lot lines shall be so labeled.
- (m) Certification by a Registered land surveyor pursuant to the requirements of M.G.L., Chapter 112.

- B. Endorsement of plan not requiring approval. If the Community Planning Commission determines that the plan does not require approval, it shall, without a public hearing, and within 21 days of formal submission, endorse the plan.
- (1) The Community Planning Commission may add to such endorsement a statement of the reason approval is not required. The plan shall be returned to the applicant.
 - (2) Community Planning Commission endorsement of a plan under this section shall not be construed as a determination of compliance with the Zoning Bylaw⁴ or with state and local land use regulations.
- C. Determination that plan requires approval. If the Community Planning Commission determines that the plan does require approval under the Subdivision Control Law, it shall, within 21 days of the formal submission of the plan, so inform the applicant in writing and return the plan. The Community Planning Commission shall also notify the Town Clerk in writing of its action.
- D. Failure of Commission to act. If the Community Planning Commission fails to act upon a plan submitted under this section or fails to notify the Town Clerk and the person submitting the plan of its action within 21 days after its formal submission, it shall be deemed to have determined that approval under the Subdivision Control Law is not required, and it shall forthwith make such endorsement on said plan, and on its failure to do so forthwith, the Town Clerk shall issue a certificate to the same effect.

§ 350-12. Preliminary plan.

- A. General. A preliminary plan of a subdivision may be submitted by the applicant and eight prints of it shall be filed with the Community Planning Commission, with properly executed application and the necessary fee.
- (1) The applicant shall file by delivery or Registered or certified mail a notice with the Town Clerk stating the date of formal submission (submitted plan) for such approval of a preliminary plan, accompanied by a copy of a properly executed application Form B. The submission of such a preliminary plan will enable the applicant, Community Planning Commission, the Board of Health, the Public Works Department, the Police Department, the Fire Department, the agent to the Community Planning Commission and other town agencies and owners of property abutting the subdivision to discuss and clarify the details of such subdivision before a definitive plan is prepared. Therefore, it is strongly recommended that a preliminary plan be filed in each case. A properly executed application Form B shall be filed with the preliminary plans submitted to the Community Planning Commission.

⁴Editor's Note: See Ch. 200, Zoning.

(2) At least 14 days prior to the first meeting scheduled to discuss the preliminary plan, the applicant shall notify all owners of property abutting the proposed subdivision that a preliminary plan has been filed. The Community Planning Commission will supply the applicant with notification form. **[Added 11-19-1980]**

(3) The Community Planning Commission may extend the forty-five-day period permitted by statute between submission of a preliminary plan and action thereon upon written request of the applicant. **[Amended 9-5-2000]**

(4) Until all required information and materials are submitted, no legal subdivision submission will have taken place and the applicant and the Town Clerk will be so notified in writing within 14 days of the date of filing. **[Added 2-21-1980]**

B. Contents. The preliminary plan may be drawn on tracing paper with pencil at a suitable scale, preferably 40 feet to the inch. The plan shall be designated as a "preliminary plan" and shall provide sufficient information to form a clear basis for discussion of the details of the subdivision and for preparation of the definitive plan; the plan shall contain the following:

(1) The subdivision name, if any, boundaries, North point, date, scale, legend and title "Preliminary Plan."

(2) The names and addresses of the record owner of the land and the subdivider and the name and address of the designer, engineer, and surveyor who made the plan, which shall appear in the lower right-hand corner.

(3) The names of all abutters, as determined from the last assessment, unless the applicant shall have more recent knowledge of such abutters (Form E, Certified List of Abutters).

(4) The existing and proposed lines of streets, ways, easements and any public or common areas within the subdivision, in a general manner.

(5) Major features of the land such as existing walls, fences, monuments, buildings, wooded areas, outcroppings, ditches, swamps, water bodies and natural waterways. **[Amended 3-31-1987]**

(6) The proposed system of sewage disposal, water installation and of drainage, including adjacent existing natural waterways.

(7) The approximate boundary lines of proposed lots, with approximate areas and dimensions.

(8) The names, approximate location and widths of adjacent streets approaching or within reasonable proximity of the subdivision.

(9) The topography of the land with a five-foot contour interval; or, in flat areas, of a two-foot contour interval. Water bodies and their elevations shall be shown with the date of measurement.

(10) The proposed names of the proposed streets and a number on each lot on each proposed street.

(11) The profiles of existing grades and approximate proposed finished grades of the roadway and drain and other utilities.

(12) Area of adjoining land and water of the applicant not presently being subdivided.

(13) The zoning classification of land shown on the plan, including identification of the Floodplain District and Aquifer Protection District Zones as overlays on the plan. [**Amended 3-31-1987**]

(14) Necessary engineering calculations to provide information to the Community Planning Commission that fire protection, vehicular traffic flow, and all other safety precautions are being provided.

(15) Show by shading or other methods the areas on all lots that are to be excavated or filled.

C. Approval. During the discussion of the preliminary plan, the complete information required for the definitive plan, and the financial arrangements will be developed.

(1) The Community Planning Commission may give such preliminary plan approval, with or without modification or suggestions, after the Commission's review of data and comments from the Board of Health, Public Works Department, Police Department, Fire Department, and the Community Planning Commission agent. Such approval does not constitute approval of the subdivision but facilitates the preparation of the definitive plan and the securing of final approval thereof. One copy of the preliminary plan will be returned to the applicant. In the event of disapproval, the Community Planning Commission shall state the reasons for its disapproval in accord with Section 81-S of Chapter 41. It shall be the applicant's responsibility to submit or obtain enough data or material to obtain meaningful comments from all parties reviewing said plan.

§ 350-13. Definitive plan.**A. General. [Amended 2-28-1980]**

(1) Any person who submits a definitive plan of a subdivision (submitted plan) to the Community Planning Commission for approval shall file with the Commission the following: All items required in Subsection A(1)(a) and (b) and Subsection B of this section and the minimum filing fee (see § 350-7) shall be submitted for a definitive plan to be "duly submitted" in accord with the General Laws of Massachusetts. Until all required information and materials are submitted, no legal submission will have taken place, and the applicant and the Town Clerk will be so notified in writing within 14 days of the date of filing.

(a) One original drawing of the definitive plan and eight contact prints thereof. All plan sheets shall be prepared in accordance with the Rules and Regulations of the Registrar of Deeds or the Land Court Manual of Instructions.

(b) A properly executed application Form C, Application for Approval of a Definitive Plan, including the time within which the applicant agrees to complete the ways and install the public utilities in the subdivision; Form D, Designer's Certificate; and Form E, Certified List of Abutters. Approval of all plans shall be upon the condition that all ways shown thereon and public utilities required by the Commission shall be completed and installed within the time so specified. The Commission may decline to approve any plan unless the applicant agrees to complete the ways shown thereon and install the public utilities aforesaid within two years of the date of approval. If the ways in any subdivision are not completed and the utilities aforesaid are not installed within the time so agreed to by the applicant or so required by the Commission, no such way shall thereafter be laid out, constructed, completed or opened for public use unless and until a new application is filed with and approved by the Commission. Ways or portions thereof not completed within two years from the date of approval by the Commission shall thereafter be completed in accordance with the then-in-force construction standards of the Community Planning Commission contained herein.

(2) The applicant shall file by delivery or Registered or certified mail a notice with the Town Clerk stating the date of submission for such approval and accompanied by a copy of the completed Form C, Application for Approval of Definitive Plan.

B. Contents.

(1) The definitive plan shall be prepared by a professional engineer and land surveyor Registered in Massachusetts and shall be prepared in accordance with the Rules and Regulations of the Registrar of Deeds or the Land Court Manual of Instructions. The plan shall be at a scale of one inch equals 40 feet or such other scale as the Community Planning Commission may accept to show details clearly and adequately, and shall include plans and profiles of each individual street at a scale of one inch equals 40 feet horizontal and one inch equals four feet vertical. All elevations shall refer to the United States Coast and Geodetic Datum. Sheet sizes shall be 24 by 36 inches including a one-inch border. All plans shall be accompanied by an index sheet at a scale of one inch equals 100 feet or one inch equals 200 feet showing the entire subdivision and adjacent streets and dimensions of the lots and streets and lot numbers. This plan shall indicate the Assessor's Map and parcel number on the land in question. **[Amended 5-19-2009]**

(2) The definitive plan shall contain the following information [Subsections B(2)(1) through (s) may be submitted on the same sheet as the definitive plan or on separate sheets]:

- (a) A title, appearing in the lower right-hand corner of the plan, showing the name of the subdivision, if any, the date, scale, the names and addresses of the applicant, and the names of the designer, engineer and surveyor who made the plan, their seals and signatures.
- (b) North arrow, benchmark, and boundaries of the subdivision.
- (c) Location and ownership of abutting property as it appears on Form E, Certified List of Abutters, unless the applicant shall have more recent knowledge of such abutters, including all abutting land owned by the applicant not presently being subdivided. A copy of the deed of the land in question shall also be submitted.
- (d) Major features of the land, such as existing waterways, swamp and water bodies, natural drainage courses, walls, fences, buildings, wooded areas, outcroppings and ditches which exist on or near the site at the time of survey], including all existing structures in the subdivision or within 50' of the perimeter of the subdivision. **[Amended 5-19-2009]**
- (e) Lines of existing and proposed streets, ways, lots, lot numbers or other designation of each lot, easements, and public or common areas within the subdivision. (The proposed names of proposed streets shall be shown in pencil until they have been approved by the Community Planning Commission.) If the subdivision consists of more than one section, all lot numbers shall be consecutive.
- (f) Sufficient data to determine the location, direction and length of every street and way line, lot line and boundary line, and to establish these lines on the ground. This shall include the lengths and bearings of plan and boundary lines, of all subdivision lot lines including lot frontage on the streets, of the boundary lines of all streets and easements, and the length, radii, tangents and central angles of all curves in lot lines and street lines.

All angle points or intersections of tangents along the street lines shall be shown. Adjoining lands of the applicant not included in the subdivision will be shown.

- (g) Location of all permanent monuments properly identified as to whether existing or proposed.
- (h) Location, names and present widths of streets, or private ways bounding, approaching or within reasonable proximity of the subdivision, showing both roadway widths and right-of-way widths.
- (i) Indication of all easements, covenants or restrictions applying to the land and their purposes, whether or not within the subdivision, including any decision on appeal or variances or exceptions made by the Zoning Board of Appeals applicable to the subdivision of the land or any buildings thereon.
- (j) If the property that comprises the subdivision or any part or boundary thereof has been examined, approved, and confirmed by the Massachusetts Land Court, such information shall be noted on the plat with case numbers and other pertinent references to Land Court procedure, and the same requirement shall apply to any adjoining parcels of land of the applicant.
- (k) Suitable space to record the action of the Community Planning Commission and the signatures of the five members of the Community Planning Commission.
- (l) Existing profiles on the exterior lines drawn in fine black line, dotted for left and dashed for right side, and proposed profile on the finished center line drawn in fine black solid line of proposed streets at a horizontal scale of one inch equals 40 feet and vertical scale of one inch equals four feet or such other scales acceptable to the Community Planning Commission. At least two benchmarks are to be shown on plans and profiles, and grade elevations at every fifty-foot station except in vertical curves which shall be at every twenty-five-foot station. All existing and proposed intersections, and sidewalks, shall be shown with all proposed grade elevations calculated. Elevations are to be referred to U.S. Coast and Geodetic Survey. Gradient shall be shown by figures expressed in percent. The plans and profiles of all proposed roadways, at their interface with existing ways, shall be sufficiently detailed to ensure proper and consistent mate-up of proposed with existing facilities such as gutterline grades, berms, sidewalks, grass strips, and off-road grading. **[Amended 3-31-1987]**
- (m) Existing and proposed topography at two-foot contour intervals and, by symbols, the highest known high water mark. There shall also be indicated by differentiating symbols the contour line four feet above said high water mark.

[1] In a subdivision or similar proposal larger than 50 dwelling units or larger than five acres, whichever is less, the applicant shall supply base flood elevation data. [**Amended 2-28-1980**]

[2] The topographic plans shall clearly indicate the town's Floodplain District as defined in § 200-44 of the Zoning Bylaw. The town's Aquifer Protection District shall also be identified, if applicable, as defined in § 200-38 of the Zoning Bylaw. Additionally, clearly distinguishable boundaries shall outline the following: [**Amended 7-8-1986; 3-31-1987**]

[a] All unnumbered A and A1-A30 flood zones as shown on the latest flood insurance rate map for the Town of North Reading prepared by the Federal Emergency Management Agency.

[b] The wetland boundaries as shown on the most recent Town of North Reading Wetlands Map.

[c] Calculated areas of the one-hundred-year flood level for postdevelopment conditions if different from that for existing conditions as identified in Subsection B(2)(m)[2][a] above.

[d] Actual wetland boundary, as defined in Chapter 131 and as determined by an appropriate qualified botanist, if different from that identified in Subsection B(2)(m)[2][b] above, with appropriate supporting documentation.

(n) Size and location of existing and proposed water supply mains and their appurtenances, hydrant, sewer pipes and their appurtenances and/or sewage disposal systems, storm drains and their appurtenances, and easements pertinent thereto, and dimensions of gutters, including data on borings and percolation tests made, and method of carrying water to the nearest watercourse or easements for drainage as needed, whether or not within the subdivision. If surface water drains will discharge onto adjacent existing streets or onto adjacent properties not owned by the applicant, he shall clearly indicate what course the discharge will take, and shall present evidence to the Commission that the discharge is satisfactory and permitted by public or private ownership of adjacent street or property and does not cause any detrimental effects to public or private property. Where surface or subsurface drainage is proposed to discharge into an existing drainage system, the adequacy of existing drain system shall be evaluated for adverse impact down to the ultimate point of discharge to a significant natural watercourse such as Martin's Pond or the Ipswich River. [**Amended 7-8-1986**]

(o) Stormwater Management Report prepared by a Registered Professional engineer to substantiate proposed drainage system design and sizing and demonstrate compliance with the following standards: **[Amended 5-19-2009]**

1. The most recent version of the Massachusetts DEP Stormwater Policy and regulations and guidance thereunder. This includes the requirement that LID measures be considered, and permits use of LID Site Design Credits pursuant to the Volume 3 of the Massachusetts Stormwater Handbook and as amended;

2. Additional standards for drainage design established by the Department of Public Works as set forth in the most recent version of the Town of North Reading Stormwater Management Rules and Regulations Section 7.B. (Stormwater Management Plan standards);

3. Design storm frequencies of two, five, 10, 25, 50 and 100 years shall be evaluated for both existing and postdevelopment conditions. A zero increase in the peak rate of runoff for all storms analyzed shall be maintained by utilizing measures such as retention, detention or, preferably, by induced infiltration where soil conditions permit;

4. Every attempt should be made to sustain existing runoff volumes through minimization of impervious surface, environmentally sensitive design, LID measures, appropriate BMP selection and good operation and maintenance procedures. Runoff volumes for each analysis conducted shall be clearly reported in the drainage calculations.

5. A long-term operation and maintenance plan as defined in the most recent version of the Massachusetts Stormwater Management Handbook shall be included with the initial drainage report submission. The plan shall include a calculation of cost associated with inspection, operation and maintenance of each drainage system component on an annualized basis;

6. An erosion and sediment control plan as defined in the most recent version of the Massachusetts Stormwater Management Handbook shall be included with the initial drainage report submission; and

7. Projects undertaken under an Open Space Residential Development special permit are expected to meet the criteria for an “Environmentally Sensitive Development” LID site design credit under the most recent

version of the Massachusetts Stormwater Handbook, unless the applicant can present a compelling basis that those criteria cannot be met on the site.

(p) Proposed street trees shall be indicated on the profile sheets and shall be planted in at least 1/2 cubic yard of loam in the front grass strip at a spacing to be determined by the Community Planning Commission depending upon the tree species. A list of acceptable trees is available in the Community Planning Commission office. The developer will be responsible for ensuring survival of said trees for a period of 18 months after street acceptance. **[Amended 7-8-1986]**

- (q) Cross-sections typical of each street, roadway and sidewalk to be constructed.
- (r) Location of proposed streetlights and sidewalks (s) Necessary engineering calculations to provide information to the Community Planning Commission that fire protection, vehicular traffic flow, and all other safety precautions are being provided.
- (t) In tabular form as follows for each sheet of the subdivision plan as submitted:
 - [1] The total area which is being subdivided on each sheet.
 - [2] The total number and area of lots included on each sheet.
 - [3] The total of areas dedicated for street purposes, drainage, sewer or utility easements on each sheet.
 - [4] The total of areas reserved for parks, schools, and other public use on each sheet.

SUBDIVISION NAME:

SECTION NO. _____ SHEET NO. _____

- 1. Total area of original tract shown on this plan equals _____.
 - a. Area in lots (Nos. 1 through 6, etc.) equals _____.
 - b. Area in streets (A-B-C, etc.) equals _____
 - c. Area reserved for parks, schools, ___ etc., equals _____.

Total area of subdivision (should equal No. 1 above) _____.

 - d. Street-Station _____ to Station _____ equals _____.
 - e. Street-Station _____ to Station _____ equals _____.
 - f. Street-Station _____ to Station _____ equals _____.

Total area of streets (should equal "b" above) ____.

g. Sewer Easement:

Station ____ to Station ____ equals ____.

h. Drainage Easement:

Station ____ to Station ____ equals ____.

i. Utility Easement:

Station ____ to Station ____ equals ____.

j. (other):

Station ____ to Station ____ equals ____.

- (u) As a part of the definitive plans, there will be submitted an overall drainage plan with topographic details for the subdivision and all areas within the total drainage area plus the area of ultimate disposal. A separate plan, or as part of the above plan, shall be included for the water system as it pertains to the Master Water Plan. The above requirements may be on one plan or on two separate plans, with complete details of the drainage and the water system. Approval by the Department of Public Works must be obtained for their concurrence on the overall water system plan. **[Amended 5-19-2009]**
- (v) If the definitive plan is submitted in connection with an approved Open Space Residential Development Special Permit, the application shall include a report prepared by a Registered professional engineer listing all waivers from the standard Subdivision Rules and Regulations required for compliance with the OSRD Special Permit and listing all aspects of the definitive plan that are not consistent with the OSRD Special Permit and an explanation of said inconsistencies. Applicants with an approved OSRD Special Permit shall receive a presumption in favor of waivers consistent with the approved OSRD plan as set forth in Section 350-34. **[Amended 5-19-2009]**
- (w) Locations and calculations of stockpiling, fill and removal of earth materials, including: **[Added 5-19-2009]**
- [1] The location of proposed stocking area(s) for "earth" materials;
- [2] Existing and legally allowed stump dump(s);
- [3] The location of proposed area(s) for disposal of surplus "earth" materials. The finished grades of these areas shall be indicated by contours and/or spot elevations with the volume of "fill" indicated;

[4] The location of area(s) to be utilized for borrow materials. The finished grades of these areas shall be indicated by contours and/or spot elevations with the volume of material indicated;

[5] That if excess "earth" materials are proposed to be disposed of off-site, then a notation stating the volume of "earth" to be removed shall be provided on the plan(s). This volume shall include all amounts of "earth" proposed to be removed for the construction of streets, sidewalks, driveways, structures, and all other improvements related to the subdivision. If no "earth" is to be removed, a statement to such effect shall be included on the plan(s);

[6] A notation stating the volume of "fill" material proposed to be obtained off site including borrow, gravel, and other materials necessary for the construction of the streets, sidewalks, driveways, structures, and all other improvements related to the subdivision;

(x) ENVIRONMENTAL AND COMMUNITY IMPACT STATEMENT [**Added 5-19-2009**]

[1] Applicability:

- a. Any subdivision of any residential subdivision which creates frontage for four (4) or more dwelling units, and all non-residential subdivisions, shall be accompanied by eight (8) copies of an Environmental and Community Impact Analysis. The Commission may require portions of this Analysis be carried out for shorter roads if, in their opinion, the sensitivity of the land, neighborhood or infrastructure warrants the investigation. The Environmental and Community Impact Analysis shall clearly and methodically assess the relationship of the proposed development to the natural and man-made environment of North Reading. This report shall be prepared by professionals qualified, experienced, and, as applicable, licensed, in their fields. Such professionals may include Registered Professional (Civil) Engineers, Traffic Engineers, Architects, Landscape Architects, Land-Use Planners, Hydrologists, Biologists and other environmental professionals. The applicant shall bear the cost of this analysis.
- b. Any further subdivision of land, over a period three years (the term beginning at the recording date of the prior plan), which in total creates four lots, shall be required to meet the requirements of item 5.4.1.a. above. The Community Planning Commission may waive such requirement as it applies to this item.

[2] Concerns to be addressed:

For each of the components of the Environmental and Community Impact Analysis listed under paragraph 3 below, each of the following concerns must be separately addressed:

- a. The Environmental and Community Impacts of the Proposed Development - The primary and secondary environmental and community impacts, both beneficial and adverse, anticipated as a result of the proposed development; this section shall include all impacts resulting from the construction phase as well as those resulting from the projects completion;
- b. Adverse Impacts which cannot be avoided should the proposed development be implemented - The report shall describe the kinds and magnitudes of adverse impacts which cannot be reduced in severity or which can be reduced in severity but not eliminated;
- c. Alternatives to the proposed development - The report shall develop, describe, and objectively weigh alternatives to the proposed development which are allowed by the Zoning By-law; and
- d. Measures to be used to minimize adverse environmental and community impacts - Corrective and protective measures which will be taken, as part of the project, to minimize adverse impacts shall be described in detail.

[3] Topics to be Evaluated and Level of Detail Required:

The Applicant, as part of a Preliminary Subdivision Plan submitted in accordance with the requirements of Section IV, shall provide a draft Environmental and Community Impact Analysis. The draft shall address all pertinent aspects of Section 5.4. The Planning Commission, upon review of the draft Environmental and Community Impact Analysis, shall specify which of the following topics shall be evaluated in detail, within the Definitive Plan submittal. If no preliminary subdivision plan is submitted, the Environmental and Community Impact Analysis shall evaluate all of the following topics:

(a) Natural Environment

1. Air and Noise Pollution - The impact of local air quality and noise from the proposed development (including traffic generated from the development), both during and after construction, shall be evaluated; for larger developments (over 30 dwelling units) the Planning Commission may require detailed technical reports of such impacts;
2. Water Pollution - The impact of storm water run-off on adjacent and downstream surface water bodies and sub-surface ground water shall be evaluated; dangers of flooding as a result of increased downstream runoff, especially peak runoff; and the impact of the proposed project on water table levels shall also be analyzed;

3. Land - Compatibility of the proposed development with existing soils; the impact of any soils or other such materials to be removed from or added to the site; and the potential dangers and impacts of erosion and sedimentation caused by the proposed development;
4. Plants & Wildlife - The impact that the proposed project may have on wildlife habitat and on any rare or endangered plant or animal species known to exist in the area;
5. Water Supply - The average and peak daily demand and the impact of such demands on the ground water; and
6. Sewage Disposal - The average and peak daily disposal and the impact of each disposal on the ground water.

(b) Man-Made Environment

1. Existing Neighborhood Land Use – Compatibility with adjacent or nearby existing land uses, or approved private development plans, if known, for adjacent or nearby land use changes to occur during the life of the proposed development; if not compatible, reasons therefore shall be detailed; and
2. Zoning - Compatibility of proposed development with the purposes of the Zoning By-Law and the Zoning district(s) within which the site is located.

(c) Public Services

1. Schools - The expected impact on the school system, both elementary and secondary levels, and the number of students;
2. Police - The expected impact on police services, time and manpower needed to protect the proposed development and service improvements necessitated by the proposed development;
3. Fire - Expected fire protection needs; on-site fire fighting capabilities; on-site alarm or other warning devices; fire-flow water needs, source and delivery system and other needs shall be presented; fire department service improvements necessitated as a result of the proposed project shall also be discussed;
4. Recreation - On-site recreation provisions shall be detailed and off-site recreation demands shall be estimated; provision for public open space, either dedicated to the Town or available to its residents or employees shall also be described;
5. Solid Waste Disposal - Analysis of the projected volume and type of solid waste to be generated by the proposed development and methods of removal;

6. Traffic - The expected impact of traffic generated by the proposed development on area roadways; discussion shall include existing average and peak traffic volumes and composition, projected average and peak traffic generation and composition, intersection impacts and analysis of area roadway and intersection capacities; methodologies used to make projection shall be included; and

7. Highway - Projected needs, responsibility and costs to the Town of roadway maintenance shall be analyzed; impacts of construction equipment on area roadways shall also be discussed and the impacts of road work to be defined during construction.

(d) Aesthetics

1. Lighting - The type, design, location, function and intensity of all exterior lighting facilities shall be described; attention given to safety, privacy, security, and daytime and nighttime appearance shall be detailed;

2. Landscaping - Provisions for landscaping shall be described including type, location and function of all plantings and materials; and

3. Visual - Attention given to views into the site and from the site shall be described; included shall be long -distance views as well as views to and from adjacent properties.

(e) Planning

Analyze the compatibility of the proposed development and its alternatives with the goals and objectives of the most recent Master Plan and the most recent Open Space and Recreation Plan.

(f) Traffic Impacts

The applicant shall provide an analysis of development impact which, at a minimum, includes the following:

1. The existing Level of Service (LOS - see definition below) of relevant road systems including quantitative and qualitative measurements of operational factors including speed, travel delay, freedom to maneuver and safety;

2. The expected change in the condition of relevant road systems as a result of the proposed development;

3. The comparison on a per-acre basis of the total vehicular traffic generation from the proposed development with:

i) The existing and potential vehicular traffic generation from all other developments accessing relevant road systems; and

ii) The vehicular traffic generation which would be expected to produce a LOS below LOS "C"; and

4. In determining the impact of vehicular traffic generation from a development, the following standards and definitions shall be used (unless the applicant demonstrates to the Planning Commission that given the nature of the proposed project or applicable road systems, other standards are appropriate:

i) Trip generation rates for land uses as listed in the most recent update of Trip Generation, Institute of Transportation Engineers, Washington, D.C.; and

ii) Levels of Service: "Level of Service (LOS) is a term which traffic engineers use to define the various operating conditions that occur on a roadway or intersection when accommodating various traffic volumes; although LOS is a qualitative measure of traffic flow, it is an acceptable measurement for determining overall impact of development on roadway networks; LOS "A" is associated with relatively free-flow and average overall traffic speed in excess of 30 miles per hour; LOS "B" represents stable flow with minor delays and speeds of 25 miles per hour or greater; LOS "C" corresponds to the design capacity of a road system and indicates stable flow with delays, and speeds of 20 miles per hour or more; LOS "D", "E", and "F" correspond to decreasing abilities to travel greater than 15 miles per hour and correspond to the over-capacity of the road system.

(g) Cost/Benefit Analysis

The Applicant shall provide a cost/benefit analysis of the development at full build-out; this municipal cost/benefit analysis should follow standard and usual procedures for measuring both the benefits to be derived and costs to be incurred by the Town of North Reading as a result of the proposed development; this also should estimate net benefits or costs of non-quantifiable environmental impacts.

C. Review by Board of Health as to suitability of the land. At the time of filing of the definitive plan with the Community Planning Commission, the applicant shall also file with the Board of Health one contact print of the definitive plan, together with such information in the nature of percolation tests and deep test holes as the Board of Health may require, plus the information required on Schedule B, Board of Health Review.⁵ Proof of submittal of definitive plan to the Board of Health shall accompany the definitive plan filing with the Community Planning Commission. The Board of Health shall within 45 days after the filing of the plan report to the Community Planning Commission, in writing, approval or disapproval of said plan. If the Board of Health disapproves said plan, it shall make specified findings as to which, if any, of the lots shown on such plan cannot be used for building sites without detriment to the public health, and include such specific findings and the reasons therefore in such report, and, where possible, shall make recommendations for the adjustment thereof. Every lot shall be provided with a sewerage system or sewer connection satisfactory to the Board of Health.

⁵Editor's Note: Schedule B is included at the end of this chapter.

- D. Review by other town officials. The Community Planning Commission may transmit copies of the definitive plan to town officials other than the Board of Health as follows: one copy each to the Town Counsel for review of easements and agreements; the Department of Public Works; the Building Inspector; the Fire Department; the Police Department and the Community Planning Commission agent.
- (1) Before the definitive plan is approved, the Community Planning Commission may request written statements from the above officials with regard to the proposed improvements in the following respect:
- (a) Town Counsel as to the form of easements, covenants and performance guarantees.
 - (b) Department of Public Works and/or the Community Planning Commission agent as to the design of the street system, location of easements, monuments, drainage system, water system, and, if applicable, the sewage system.
 - (c) The Fire Department as to location of hydrants, and with regard to safety requirements.
 - (d) The Police Department as to street safety.
- E. Soil survey and percolation tests. Where appropriate, the Community Planning Commission may require, at the expense of the applicant, soil surveys and/or test borings to establish the suitability of the land for the proposed storm drainage system and proposed street construction. Such soil surveys and tests must be filed with all plans for nonresidential subdivisions or multifamily residences.
- F. Public hearing. Before taking action to approve, approve with modifications, or disapprove a definitive plan, the Community Planning Commission shall hold a hearing at which parties in interest shall have an opportunity to be heard, in person or by agent or attorney. Notice of the time and place of such hearing and of the subject matter, sufficient for identification, shall be published in a newspaper of general circulation in the town once in each of two successive weeks, the first publication to be not less than 14 days before the date of the hearing and by mailing a copy of such advertisement to the applicant and to all owners of land abutting the land shown on the plan and shown on the most recent tax list.
- (1) The procedure that the Community Planning Commission will follow with regard to approval, disapproval or modification of the final plan submitted by the applicant will be that as set forth in Chapter 41, Section 81-U, of the General Laws, as amended. In summary, the Commission, after receiving the final plan and profiles, will review the same to determine whether they are in compliance with its adopted rules and regulations and the Zoning Bylaw.⁶

⁶Editor's Note: See Ch. 200, Zoning.

(2) Before final approval of the plan, the applicant shall comply with all applicable regulations and rules of the Department of Public Works and the Board of Health not otherwise covered by these rules and regulations. Specific reference is made to the specifications for sewerage systems, which shall conform with the rules and regulations of the Board of Health.

(3) Before final approval of the plan, the applicant shall establish that the lots in the definitive plan are in conformity with the North Reading Zoning Bylaws, and failure of the lots to comply will be adequate grounds for disapproval of the definitive plan (Chapter 41, Section 81-Q, of the General Laws, and amendments thereto). The Commission may, as a condition of granting a permit under Section 81-Y, impose reasonable requirements designed to promote the health, convenience, safety and general welfare of the community and to benefit the town. In such event, the Commission shall endorse such conditions on the plan to which they relate; or set forth a separate instrument, attached thereto, to which reference is made on such plan and which shall, for the purpose of the Subdivision Control Law, be deemed to be a part of the plan.

(4) Before final approval of the plan, all necessary permits under Chapter 131 of the General Laws as written or revised, and from the Massachusetts Department of Public Works, and any other state agency shall be obtained and copies forwarded to the Community Planning Commission.

(5) Notations shall be made on the plans of any revisions and the date revisions were made. A letter shall also accompany the plans fully describing all revisions in detail.

(6) The applicant shall provide two original Mylars and two prints of the definitive plan for endorsement by the Community Planning Commission. All legal documents shall be marked for return to the Community Planning Commission by the Registry of Deeds. Additionally, the applicant shall provide a digital copy of the approved definitive plan meeting the requirements of the current version of the MassGIS Standard for Digital Plan Submission to Municipalities, Level 1. In the event an applicant cannot provide said digital copy, funds sufficient to cover the costs of digitization of said definitive plan shall be provided in lieu thereof. **[Added 3-31-1987; Amended 5-24-1994; Amended 5-19-2009]**

G. Certificate of approval. The action of the Community Planning Commission in respect to such plan shall be by vote, copies of which shall be certified and filed with the Town Clerk and sent by special delivery, Registered or certified mail, return receipt requested, to the applicant.

(1) If the Community Planning Commission modifies or disapproves such plan it shall state in its vote the reasons for its action and shall rescind such disapproval when the plan has been amended to conform to the rules and regulations and recommendations of the Community Planning Commission.

(2) Final approval, if granted, shall be subject to the construction specifications contained herein and shall be endorsed on the original drawings of the definitive plan by the signatures of a majority of the Community Planning Commission after the Town Clerk has notified the Community Planning Commission that no notice of appeal has been filed with that office.

(3) After the definitive plan has been approved and endorsed, the Commission shall return one original to the applicant. **[Amended 5-19-2009]**

(4) The Community Planning Commission may extend the time period permitted by statute between submission of a definitive plan and action thereon upon written request of the applicant (Form S, Extension of Time).

(5) Approval of the definitive plan does not constitute the laying out or acceptance by the town of streets within a subdivision and does not signify that the subdivision may be constructed before all safety and health standards have been met.

(6) The original copy of the recorded covenant shall be returned, following recording, by the Registry of Deeds to the Community Planning Commission. Upon receipt thereof, the Commission will mail a copy of said covenant to the applicant.

H. Performance guarantee. Before endorsement of the Commission's approval of a definitive plan of subdivision, the applicant shall agree to complete the required improvements specified in Article V for any lots in a subdivision, such construction and installation to be secured by one, or in a part by one and part by the other, of the following methods which may, from time to time, be varied by the applicant with the written consent of the Community Planning Commission:

(1) Approval with satisfactory security.

(a) The applicant shall either file a tripartite agreement, a deposit of money, negotiable securities or a bank passbook, in an amount determined by the Community Planning Commission to be sufficient to cover the cost of all or any part of the improvements specified in Article V not covered by a covenant under Subsection H(2) hereof. Such bond, security or passbook, if filed or deposited, shall be accompanied by an appropriate and properly executed agreement prepared in the manner of Form F, G, and H or such other form as the Commission may require, and approved as to form and manner of execution by the Town Counsel and shall be contingent on the completion of such improvements within two years of the date of the approval of the definitive plan.

(b) The tripartite agreement may be forfeited or the term may be extended at the discretion of the Community Planning Commission. If extended, the Community Planning Commission may, at its discretion, request an increase or decrease of the amount deposited to ensure sufficient bonding to cover the costs to complete the improvements, including all costs associated with providing a clerk-of-the-works to oversee said completion. **[Amended 3-31-1987; 6-18-2002]**

(2) Approval with covenant. The applicant shall file a Form I, Approval with Covenant Contract, or such other form of covenant as the Community Planning Commission requires, approved as to form and manner of execution by the Town Counsel, properly executed and duly recorded in the Registry of Deeds by the owner of record, running with the land, whereby such ways and services as specified in Article V, not covered by bond or deposit under Subsection H(1) hereof, shall be provided to any lot before such lot may be built upon or conveyed, other than by mortgage deed.

(3) Additional conditions. Notwithstanding any of the aforementioned provisions to guarantee performance, the Community Planning Commission may require prior to endorsement of a definitive plan and incorporate into its conditional approval of such plan additional specific conditions, including, but not necessarily limited to, the following: **[Added 3-31-1987]**

(a) Applicant shall submit proper and acceptable deed for utility and drain easements. The grants of easements shall contain a provision that the Town of North Reading shall not be responsible for extensive landscaping such as replacement of trees and shrubs in connection with maintenance of water mains, drainage facilities, and/or utilities.

(b) No lot shall be released from the statutory covenant without first obtaining Board of Health approval for a sewage system on the lot. Copies of all approved septic designs shall be submitted by the applicant to the Planning Administrator for grading approval. If, in order to obtain a permit for an approved disposal system from the Board of Health, fill or grading is required to the extent that, in the opinion of the Planning Administrator, the drainage pattern would be adversely affected, then the Planning Administrator may require an amended plan and revised drainage calculations. This condition shall be included in the statutory covenant and a note shall be placed on a recordable plan sheet. **[Amended 5-24-1994]**

(c) All drainage facilities and associated structures (including iron pipe monumenting, loaming, and seeding) shall be completed to the satisfaction of both the Conservation Commission and the Planning Administrator prior to any lot releases. This condition shall be included in the statutory covenant and a note shall be placed on a recordable plan sheet. **[Amended 5-24-1994]**

(d) Any and all plans which may be approved by the Conservation Commission pursuant to an Order of Conditions shall be made a part of the definitive subdivision plan. The applicant may substitute the Conservation Commission drainage/topo plans for the definitive subdivision drainage/topo plans providing that the substituted plans contain all information, drawings, and notes as are contained on both the definitive subdivision submittal and the Conservation Commission submittal. If there is any inconsistency between the submitted subdivision plan and the plans as may be approved by the Conservation Commission, the applicant shall submit an amended plan to the Community Planning Commission for approval. Said amended plan shall be accompanied by a cover letter setting forth any and all changes from the submitted subdivision plan and shall include four sets of revised drainage calculations, if applicable. A plan sheet to be recorded shall contain a note that the applicant/developer shall comply with this item prior to commencement of work within the jurisdiction of the Conservation Commission.

- (e) In the event that any portion of the covenant described in Subsection H(3)(c) above is waived by the Community Planning Commission, a certificate of compliance pursuant to M.G.L., Chapter 131, Section 40, from the Conservation Commission shall be required of the applicant prior to release of drainage bond money. Said certificate requires compliance with all items contained in any Order of Conditions that pertain to work involved in construction of roads and entire drainage system and any lot grading necessary to conform to the approved plans.
- (f) The as-built and acceptance plans shall be accompanied by a certificate of compliance from a Registered professional engineer certifying that the grades on all the lots have been established in general compliance with the drainage/topo plan as they may have been revised by the approved septic system design plan, and that said grades have been established so as not to create adverse drainage patterns onto adjoining lots or streets and a note placed on the plan.
- (g) Deeds of conveyance shall contain and be subject to a condition that the lot owner shall not cut any hardwood trees within 15 feet of the street layout line without the owner/developer's approval or until such street is accepted by the Town of North Reading as a public way. This condition shall be contained in the supplementary restrictive covenant and a note shall be placed on a recordable plan sheet.
- (h) Every lot in the subdivision shall be served by its own driveway. No common driveways will be allowed. Access to the lot must be provided from the frontage on the proposed way shown on the endorsed plan unless subsequently waived by the Community Planning Commission. This condition shall be contained in the supplementary restrictive covenant and a note shall be placed on a recordable plan sheet.
- (i) Deeds of conveyance for all lots subject to drain easements shall contain and be subject to a condition prohibiting any structure, including a driveway, from being built on the easements unless a waiver is granted by the Community Planning Commission. This condition shall be included in the supplementary restrictive covenant and included as a note on the plan.
- (j) The applicant shall submit a lighting proposal and electrical distribution plan for the Community Planning Commission's approval. Said plan shall be accompanied by a letter from the Reading Municipal Light Department indicating the proposed lighting scheme and level of illumination.

[1] Additionally, the electrical distribution and lighting scheme should be shown on the plan consistent with the lighting proposal. The electrical distribution plan, streetlight locations, and appropriate easements shall be applied to the plan and shall indicate at what point the wiring will be brought underground.

[2] All electrical, telephone and cable lines shall be brought into the subdivision underground from the nearest supply feed, as identified by the Reading Municipal Light Department.

[3] Streetlight stanchions shall be placed within the subdivision so as to accommodate street signs to be affixed thereon. The Community Planning Commission may require additional street signs and sign poles if it deems necessary.

- (k) Any deed conveying out a lot shall contain a description reserving the fee in the roadways to the owner/developer. This condition shall be contained in the supplementary restrictive covenant and included as a note on a recordable plan.
- (l) Any deed conveying out a lot shall contain and be subject to a condition that there shall be no driveways where stone bounds are proposed. This condition shall be contained in the supplementary restrictive covenant and a note shall be placed on a recordable plan sheet.
- (m) Approval by the Community Planning Commission of a plan shall not be treated as, nor deemed to be, approval by the Board of Health for a permit for the construction and use on any lot of an individual sewage system. No building or structure shall be built or placed on any lot without the consent of the Board of Health.
- (n) Deeds of conveyance for all lots shall reserve for the developer/owner or his successors in title, and/or the Town of North Reading, a construction easement superimposed on all lots intended to accommodate completion of all grading and of the entire drainage system including but not limited to drainage structures, lot grading, roadway sideslope stabilization, iron pipe monumenting, loaming and seeding. Upon acceptance of the roadways and utilities by the Town of North Reading, the easements will be terminated. This condition shall be contained in the supplementary restrictive covenant and a note shall be placed on a plan sheet.
- (o) Deeds of conveyance for any lots containing any detention areas shall contain and be subject to a restriction prohibiting altering or filling within the drainage easement areas beyond the approved contours of the detention areas. This condition shall be contained within the supplementary restrictive covenant and included as a note on the plan sheet.
- (p) Applicant shall document compliance with Subsection H(3)(a), (b) and (c) contained in the July 26, 1984, generic letter from the Police Department (on file at the CPC office). Applicant shall forward copy of letter sent to Police Department with respect to fulfilling these items.
- (q) No lot will be released from the statutory covenant unless the Planning Administrator is satisfied that the entire septic system accessory to the principal dwelling is located entirely on the principal use lot, including any slope grading as may be required by Title 5 of the State Environmental Code (310 CMR 15.00). A plan sheet to be recorded shall contain a note that the entire septic system, including any required grading, shall be located entirely on the same lot as the principal dwelling. **[Amended 5-24-1994]**

- (4) Lot releases. **[Added 5-24-1994]**
- (a) The Planning Administrator shall act as the Community Planning Commission's agent in determining the eligibility of and execution of any lot release request. The Planning Administrator shall apply only those conditions imposed by the Community Planning Commission in a conditional approval, covenant or supplementary restrictive covenant.
- (b) No lot shall be released from the statutory covenant or supplementary restrictive covenant unless the Planning Administrator is satisfied that all conditions of said release have been met.
- (c) Any decision by the Planning Administrator denying a request for lot release may be appealed to the Community Planning Commission. Any such appeal must be submitted on forms provided by the Planning Office and must be accompanied by an application fee of \$100 to be considered complete. Appeals hearings will be scheduled within 30 days of receipt of a complete application.
- I. Reduction of performance guarantee. The penal sum of any such bond, performance guarantee, surety or security or the amount of any deposit held under Subsection H(1) above may, from time to time, be reduced by the Community Planning Commission and the obligations of the parties thereto released by said Commission in whole or in part. If release is by reason of covenant, a new plan of the portion to be subject to the covenant may be required by the Commission.
However, under no circumstances may or will the Community Planning Commission release any bond, performance guarantee, surety or other security to less than 25% of its original value until such time as the applicant has obtained and received street acceptance at town meeting.
- J. Final Release of performance guarantee. Upon completion of improvements required and the submission of approved reproducible as-built drawings under Article V, security for the performance of any covenant with respect to any lot, the applicant may send by Registered or certified mail to the Town Clerk and the Community Planning Commission a written statement that the said construction or installation in connection with which such bond, deposit or covenant was posted has been completed in accordance with the requirements contained under Article V, such statement to contain the address of the applicant. If the Community Planning Commission determines that said construction or installation has been completed, it shall notify the Town Treasurer and the Town Accountant on a properly executed release form that it releases the interest of the town in such bond or deposit and that it shall be returned to the person or persons who furnished same; or, in the case of covenant, it shall issue a written release of the covenant on a properly executed release form. Again, the bond will not be released less than 25% of its original value until such time as the applicant has obtained and received street acceptance at town meeting.

- (1) However, 10% of the value of the bond shall be held by the town to ensure maintenance of streets and municipal services for 18 months after completion of construction and installation or until the streets are accepted by the town, whichever comes first; after which date the town shall return the remainder of the bond, if any, to the applicant.
- (2) Approximately 60 days before the expiration of the 18 months, the Community Planning Commission shall request an inspection of said street or way or portion thereof to determine whether or not defects have developed therein, and determine whether or not it should recommend same to the Board of Selectmen for the laying out of said street or way or portion thereof as a public way. If the recommendation is in the affirmative, the Commission shall so advise the Board of Selectmen forthwith, including in such recommendation, notification that the 18 months for which the developer is responsible for maintenance of said way or portion thereof will expire on a certain date and said way may be laid out as a public way.
- (3) Upon the expiration of the period for which the applicant is responsible for maintenance of said way, and if said developer has complied with all the requirements of the Subdivision Control Law and the Community Planning Commission rules and regulations as set forth in an inspection report of said way and the Commission has recommended to the Board of Selectmen that said way should be laid out as a public way, any moneys held by said Commission for the maintenance of said way shall be returned forthwith to the applicant.
- (4) Prior to releasing the town's interest in a performance bond or deposit or releasing the covenant, the Community Planning Commission shall receive from the applicant an acceptance plan (see Subsection K).
- (5) If the Community Planning Commission determines that said construction or installation has not been completed, it shall specify to the applicant, in writing by Registered or certified mail, return receipt requested, the details wherein said construction and installation shall have failed to comply with requirements contained under Article V. Upon failure of the Community Planning Commission to act on such application within 45 days after the receipt of the application by the Town Clerk and the Community Planning Commission, all obligations under the bond shall cease and terminate by operation of law; any deposit shall be returned and any such covenant shall become void.
- (6) In the event that said forty-five-day period expires without such specification or without the release and return of the deposit or release of the covenant as aforesaid, the Town Clerk shall issue a certificate to such effect, duly acknowledged, which may be recorded.
- (7) Prior to release of security for performance which was given by bond, tripartite agreement, deposit or covenant, the applicant shall submit, at the following construction stages, a statement stamped and certified by either a Registered professional engineer or a Registered land surveyor (as delineated under § 350-3, Definitions) that the required improvements are built in conformity with the rules and regulations and the approved subdivision plan. **[Added 7-16-1984]**

(8) If the as-built certification of Subsection J(8)(a) or (b) below is performed by a Registered land surveyor and if any of the requirement improvements are not in conformity with the approved subdivision plan or the rules and regulations, then said RLS certification and other appurtenant information shall be accompanied by a statement stamped and certified by a Registered professional engineer describing the nonconforming construction and a statement, if appropriate or applicable, that in his opinion the described nonconforming construction and/or installation is equal to or better than what is required by the rules and regulations and the approved subdivision plan. **[Added 7-16-1984]**

(a) Underground utilities and drainage.

[1] Prior to any backfilling, the applicant's Registered professional engineer or Registered land surveyor shall observe and certify that the as-built location and elevation of all underground utilities including, but not limited to, drainage, water and electrical, conform to the rules and regulations and the approved subdivision plan. In addition, the Registered professional engineer or Registered land surveyor shall observe and certify that the location, elevation and grading of the entire drainage system, including drainage easements, swales, retention/detention areas and all visual drainage appurtenances are in conformity with the rules and regulations and approved subdivision plan (see § § 350-23H for as-built plan contents). In any instance where the as-built construction is not in conformity, the Registrared professional engineer or Registrared land surveyor shall list the exceptions and attach a "red-lined, marked-up print" which shall consist of a print of the approved subdivision plan identifying those areas marked in red pencil, wherein the construction and/or installation is inconsistent with either the rules and regulations or the approved plan.

[2] This "red-lined, marked-up print" shall also include location ties for all individual lot water service curb boxes within the subdivision. **[Added 3-31-1987]**

(b) Binder application. Following the binder application and prior to any further roadway construction, the applicant shall submit an as-built certification signed and stamped by either a Registered land surveyor or a Registered professional engineer. Said certification shall certify the roadway location, width, elevation and that the center line of all roadways coincide with the center line of the street right-of-way and that the preceding items conform to the rules and regulations and the approved subdivision plan.

(c) Upon completion of required improvements, applicant shall submit as-built and acceptance plans as delineated under § 350-23G and H.

K. Acceptance by the town. The applicant shall file with the Community Planning Commission a final plan (acceptance plan) drawn with India ink on Mylar and suitable for reproduction, of completed street or streets and any easements together with proper legal descriptions for initiating an article in the Town Meeting warrant pursuant to the acceptance of the ways by the Town Meeting (see § 350-23G), and upon acceptance by the Town shall grant a deed or easement to the Town of the streets as contained in the definitive plan; said deed or easement to be recorded by the Town Clerk upon acceptance of the streets by the Town Meeting. Additionally, the applicant shall provide a copy of the as-built plan on computer disk pursuant to Subsection F(6). **[Amended 5-24-1994]**

ARTICLE IV
Design Standards

§ 350-14. Streets.

A. Location.

(1) All streets in the subdivision shall be designed so that, in the opinion of the Community Planning Commission, they will provide safe vehicular travel; natural drainage with no drainage pockets; and an attractive street layout in order to obtain the maximum safety and amenity for future residents of the subdivision; and they shall be in accord with the rules and regulations of the Community Planning Commission.

(2) The proposed streets shall conform in location, so far as practicable, to any existing plans of the Community Planning Commission; to the Master Plan or parts thereof adopted by the Community Planning Commission; and, where required by the Community Planning Commission, to the existing street system. Where proposed streets are to intersect with existing streets, due consideration shall be paid to the location of existing hydrants and to provide additional hydrants to avoid potential fire protection apparatus hose hookup lengths in excess of 250 feet in emergency situations. [**Amended 3-31-1987**]

(3) Provision satisfactory to the Community Planning Commission shall be made for the proper projection of streets or for access to adjoining property, whether or not subdivided.

(4) Reserve strips prohibiting access to streets or adjoining property shall not be permitted except where, in the opinion of the Community Planning Commission, such strips shall be in the public interest.

B. Alignment.

(1) Street jogs with center-line offsets of less than 125 feet shall be avoided.

(2) The minimum center-line radii of curved streets shall be 150 feet for secondary streets and 500 feet for principal streets.

(3) A tangent at least 150 feet in length shall separate all reverse curves on principal and secondary streets.

(4) Streets shall be laid out so as to intersect as nearly as possible at right angles. No street shall intersect any other street at less than 60°.

(5) Property lines at street intersection shall be rounded or cut back to provide for a radius of not less than 15 [FIFTEEN] feet which shall be tangent to both the existing and proposed street layout lines.

However, when the intersection of two streets varies more than 10° from a right angle, the radius of the curve at the obtuse angle may be less and the acute angle may be greater than 15 feet to the extent approved or required by the Community Planning Commission. **However, if the CPC allows a radius of greater than 15 feet, the following standards must be adhered to:**

Curb or edge of pavement lines at street intersections shall be rounded or cut back to accommodate the largest Fire Department vehicle as identified by the North Reading Fire Department, based on the width of the intersecting streets and angle of street intersection. Property lines at street intersections shall be parallel to curb lines. To increase pedestrian safety through reduction of crossing distances and speeds of turning vehicles, curb roundings shall not be greater than reasonably necessary to accommodate the largest Fire Department vehicle. [Amended 5-19-2009]

(6) Streets shall be laid out so as to intersect at intervals in a range of 600 feet to 1,200 feet in length, unless otherwise specified by the Community Planning Commission. In special instances, the Community Planning Commission may approve an easement for a future street, in lieu of actual construction of a cross street.

C. Width.

(1) The minimum width of right-of-way shall be 50 feet.

(2) Alleys will not be approved in subdivision of land in districts designated as residential under the Zoning Bylaws.⁷ Alleys with a minimum width of 40 feet may be required by the Commission at the rear of any lots designated or zoned for nonresidential use.

D. Grade.

(1) The center-line grade for any street shall not be less than 1%.

(2) The maximum center-line grade for streets shall be as follows:

(a) Secondary streets: 9%.

(b) Principal streets: 6%.

⁷Editor's Note: See Ch. 200, Zoning.

(3) Where changes in grade exceed 1%, vertical curves as required by the Commission will be provided; and where a grade is 5% or greater within 150 feet of the intersection of street right-of-way lines, there shall be provided in a residential subdivision a leveling area of at least 75 feet, with a maximum grade of 3%, and in all other subdivisions, a leveling area of at least 200 feet, with a maximum grade of 2%, and at all other intersections there shall be a leveling area of at least 50 feet.

E. Dead-end streets. [**Amended 10-5-1982; 12-5-2000**]

(1) For the purposes of this section, a dead-end street shall be any street with a single common ingress and egress.

(2) Any new proposed street which intersects solely with a dead-end street shall be deemed to be an extension of the dead-end street.

(3) Dead-end streets and their extensions, if any, shall not be longer than 500 feet unless the water is looped, in which case the maximum shall be 1,000 feet unless, in the opinion of the Commission, a greater length is necessitated by topography or other local conditions. An extension of a water line to the boundary of the land within a subdivision for the purpose of providing a physical loop at a later date shall not be considered "water looping" for the purpose of this section.

(4) Dead-end streets shall be classified as one of two types. They shall be either a cul-de-sac or a looped road.

(a) Culs-de-sac shall be provided at the closed end with a vehicular turnaround having an outside roadway diameter of at least 100 feet and a property line diameter of at least 120 feet unless otherwise specified by the Community Planning Commission. The Community Planning Commission may, when potential volume warrants, require a minimum outside roadway diameter of 140 feet, a property line diameter of 160 feet and the placement of a circular landscaped island with minimum radius of 20 feet at the center of the turnaround, if the dead-end street is not intended to connect with another street at some future point in time. The Commission may require a roadway easement from the end of the turnaround to adjacent property. Under no circumstances shall a cul-de-sac have a property line diameter greater than 200 feet.

(b) Looped roads shall be any dead-end street which is not a cul-de-sac.

(5) The length of dead-end streets shall be measured along the roadway center line as follows:

(a) Cul-de-sac length shall be measured from the side line of the intersecting street to the center of the turnaround. (See Figure 1.)⁸

⁸Editor's Note: Figures 1 and 2 are included at the end of this chapter.

Formula: $(\text{length} = A \rightarrow B)$

(b) Looped road length shall be measured from the side line of the intersecting street to the point at which a choice in direction is provided (A B), plus half the distance around the looped roadway from the point of choice in direction to the point of reintersection. (C → D) (See Figure 2.)

Formula: $(A \rightarrow B) + \frac{(C \rightarrow D)}{2} = \text{length}$

§ 350-15. Curb cuts.

- A. Driveways shall be at least 10 feet wide and have a curb return at the roadway of two feet in radius and shall have an opening of at least 16 feet and no greater than 24 feet at the gutter line.
- B. Any two driveways leading to or from a street to or from a single lot shall not be within 30 feet of each other at their intersections with the front lot line for an interior and 40 feet for a corner lot.
- C. If driveways slope from the edge of the street right-of-way to the edge of the pavement, there shall be a grade of not less than 1% but not more than 8%, but the grade between the sidewalk and the right-of-way shall be only as shown on the typical cross-section (see Schedule A9).

⁹Editor's Note: Schedule A is included at the end of this chapter.

SUBDIVISION OF LAND

Figure 2

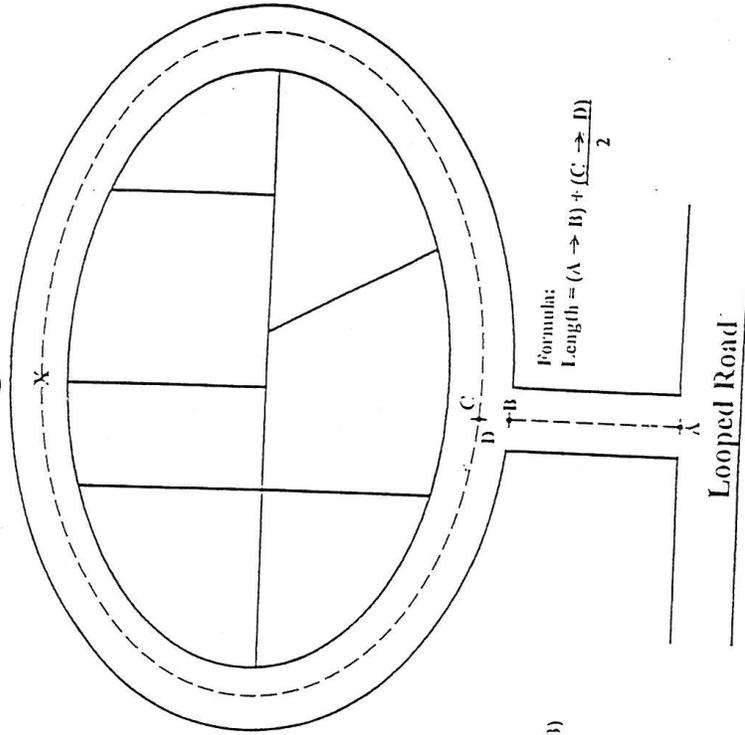
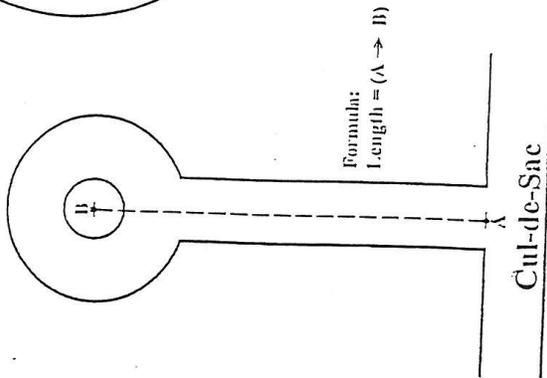


Figure 1



§ 350-16. Easements.

- A. Where utilities cross lots or are centered on rear or side lot lines, easements shall be provided with a width of at least 20 feet.
- B. Where a subdivision is traversed by a watercourse, drainage way, channel or stream, the Community Planning Commission shall require a storm water easement or drainage right-of-way of adequate width (a minimum of 30 feet) and proper side slope to conform substantially to the lines of such watercourse, drainage way, channel or stream and to provide for construction or other necessary purposes.
- C. Access easements to park and conservation land shall be provided, if required by the Community Planning Commission, and shall be at least 20 feet wide.

§ 350-17. Open space.

- A. Before approval of a plan, the Community Planning Commission may also, in proper cases, require the plan to show a park or parks, suitably located for playground or recreation purposes or for providing light and air. The park or parks shall not be unreasonable in area in relation to the land being subdivided and to the prospective uses of such land. The Community Planning Commission may, by appropriate endorsement on the plan, require that no building be erected upon such park or parks without its approval for a period of three years. Pedestrian ways, bikeways, or bridle paths of not less than 20 feet in width may be requested where deemed desirable to provide circulation or access to schools, playgrounds, parks, shops, transportation, open spaces and/or community facilities. Each area reserved for such purpose shall be of suitable area, dimensions, topography and natural character for the purposes of a park and/or playground. The area or areas shall be so located as to serve adequately all parts of the subdivision as approved by the Community Planning Commission.
- B. The Community Planning Commission may require that the area or areas reserved shall be located and laid out so as to be used in conjunction with similar areas of adjoining subdivisions or of probable subdivisions. Any land so reserved shall be graded to dispose properly of surface water and shall be left in condition for the purpose intended, as required by the Community Planning Commission. Land acquired in this manner shall be compensated as provided in Section 81-Q of Chapter 41 of the General Laws.

§ 350-18. Protection of natural features.

Due regard shall be shown for all natural features, such as trees, wooded areas, watercourses, scenic points, historic spots, and similar community assets, which, if preserved, will add attractiveness and value to the subdivision.

§ 350-19. Lot drainage.

- A. Lots shall be prepared and graded in such a manner that development of one shall not cause detrimental drainage on another; if provision is necessary to carry drainage to or across a lot, an easement or drainage right-of-way of minimum width of 30 feet and proper slope shall be provided. Storm drainage shall be designed in accord with the requirements outlined in § 350-13B of these rules and regulations and with the town's Comprehensive Drainage Plan as last revised. **[Amended 7-8-1986]**
- B. Where required by the Community Planning Commission or the Board of Health, the applicant shall furnish evidence as to any lot or lots that adequate provision has been made for the proper drainage of surface and underground waters from such lot or lots.

§ 350-20. Fire hydrants.

Hydrants shall be provided at least every 500 running feet on one side of each street. A hydrant may be required at the end of a dead-end street. They shall be of a style approved by the Department of Public Works.

§ 350-21. Sidewalks, grass plots and trees.

See typical cross-sections, Schedule A.10

§ 350-22. Utilities.

All utilities shall be placed underground at the time of initial construction, including electric and telephone.

¹⁰ Editor's Note: Schedule A is included at the end of this chapter.

ARTICLE V

Required Improvements for Approved Subdivision**§ 350-23. General provisions. [Amended 7-16-1984; 7-8-1986; 3-31-1987]**

- A. It is the intent that no street or way through private property shall be accepted by the town unless the same be previously constructed and completed in accordance with the approved plans, these rules and regulations, and the following specifications.
- B. Unless otherwise specified, all the work and the materials used in the work to be done shall conform to the requirements of the Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges 1973 Edition, as amended or revised, hereinafter referred to as the Standard Specifications, as amended, and the special provisions included hereinafter. Under no circumstance shall the physical construction of any improvements pursuant to the approved subdivision plans be conducted between the dates of December 1 and March 15 of the year.
- C. Supplementing the aforesaid Standard Specifications, certain specifications or special provisions shall apply particularly to the work to be done hereunder. References in the following specifications, unless otherwise stated, are to the aforesaid Standard Specifications, amendments or addenda. These specifications and special provisions shall take precedence and shall govern when they are stricter.
- D. To facilitate reference, each paragraph in these specifications where appropriate is noted with the paragraph number of the particular section as contained in the Standard Specifications.
- E. Wherever in the Standard Specifications or other contractual documents the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted by substitution as follows:

COMMONWEALTH -- Town of North Reading.

DEPARTMENT -- Department of Public Works, Town of North Reading.

ENGINEER -- The Community Planning Commission of the Town of North Reading acting directly or through an authorized representative; such representative acting within the scope of the particular duties entrusted to him.

- F. As each construction operation, as outlined in § 350-37C of these rules and regulations, is completed, it shall be inspected by the Community Planning Commission agent for subsequent approval by the Community Planning Commission. Under no circumstance shall subsequent logically consecutive construction stages be initiated until the required inspection of the one previously completed is made. Failure to comply with this

inspectional procedure shall be remedied by an uncovering and proper reconstruction of all uninspected stages of the work at the expense of the applicant.

- G. To facilitate acceptance by the Town of North Reading, the applicant shall have prepared and certified by a Registered land surveyor an acceptance and street layout plan drawn with India ink on linen or Mylar material, size 24 inches by 36 inches, showing widths, lengths, bearings of all boundary lines of streets and easements, and radii, tangents and central angles of all curves in street lines. It shall show that all stone bounds are set. A blank space four inches by eight inches shall be provided on the lower right-hand corner on the plan for a title block to be filled in by the applicant. The surveyor shall place a certification on the plan stating, "The street (or way or portion thereof) is laid out and the bounds are set as shown on this plan"; which shall be dated, signed and the surveyor's stamp affixed thereon. (See sample of typical title block which is incorporated into these rules as Schedule C.11) One original Mylar and four prints shall be submitted to the Community Planning Commission. Following endorsement of original Mylar by the Community Planning Commission and the Board of Selectmen, the applicant shall supply one duplicate Mylar and four prints to the Community Planning Commission. Deed to town for streets shall accompany submission of original Mylar plan.
- H. The applicant shall submit as-built plans drawn with India ink on linen or Mylar material certified by his Registered professional engineer (as defined under definitions) to show actual locations and grades of all utilities and improvements, roadway profile, and any changes authorized by the Community Planning Commission. As-built "on-the-ground" conditions at time of acceptance shall include as a minimum the following items to be shown on the as-built plan:
- (1) Rims and inverts of all drainage structures as they would appear on the profile section of the plan.
 - (2) Location, size and type of material for the water main. Indicate spot elevations every 200 feet on the water main to verify vertical installation.
 - (3) Location of gas mains (and house services if installed).
 - (4) All underground electrical installations.
 - (5) Underground cable installation.
 - (6) Fire alarm wiring, if applicable.
 - (7) Underground telephone wiring.

¹¹Editor's Note: Schedule C is included at the end of this chapter.

- (8) Show water services to each individual lot with linear ties to a permanent structure or monument.
- (9) Line water gates and ties.
- (10) Electrical services to lots.
- (11) Telephone services to lots.
- (12) Cable services to lots.
- (13) Curbing-berms and indicate type (vertical or Cape Cod).
- (14) Granite curbs.
- (15) Sidewalks and indicate width.
- (16) Granite headers.
- (17) Grass plots and indicate width.
- (18) Indicate any encroachments on private property.
- (19) Driveway curb cuts.
- (20) Hydrants and water gates.
- (21) Utility (telephone/electric) poles and any guys.
- (22) Streetlights.
- (23) Electric transformers.
- (24) All drainage, drainage structures, drainage easements; off-site drainage, appurtenances, pipe sizes and materials. All of this information shall be shown both within the right-of-way and any easement. If a drainage channel, swale or brook is part of the drainage, then top and bottom of bank elevations shall be given every 50 feet. If a retention basin is constructed, then enough elevations shall be given to indicate that the retention basin will have the proper staging called for in the approved plan (includes "detention" areas).
- (25) Any and all other utility appurtenances.
- (26) Handicap ramps, width and locations.

- (27) Location of survey monuments.
- (28) Trees.
- (29) Landscaping and plantings if required by approved plan.
- (30) Center-line profile (fifty-foot stations with high and low points).
- (31) Side slopes and lot grading certification.
- (32) Center-line stationing. Indicate on plan portion of the as-built plan.
- (33) Indicate benchmark.
- (34) Indicate width of roadway layout.
- (35) Indicate width of roadway pavement.
- (36) Location of street signs.
- (37) Typical title block (see sample of same which is incorporated into these rules as Schedule D12).
- (38) Location ties shall be indicated for all water service curb boxes to each individual lot and shall be sufficient to allow expeditious location of the service gate.

§ 350-24. Street and roadway.

A. Preparation for pavement.

- (1) The roadway shall be graded and prepared for pavement as follows:
 - (a) 101. Clearing and grubbing of the entire area of such street or way shall be performed to remove all stumps, brush, roots, boulders over six inches in diameter, and like material which may exist upon the surface. **[Amended 7-8-1986]**
 - (b) 120. Roadway earth excavation shall remove all materials encountered down to the true surface of the subgrade, or to suitable material in areas where unsuitable material exists, in preparation for foundation of roadway, sidewalks, driveways and berms. Approved materials obtained from the excavation may be used in fills as required if, in the opinion of the Community Planning Commission, they are suitable.

¹²Editor's Note: Schedule D is included at the end of this chapter.

- c) 150. When in the opinion of the Community Planning Commission suitable material is not available within the limits of the highway location to form the subgrade or subbase, the contractor shall obtain such additional material as may be approved by the Community Planning Commission from other sources in accordance with this section.
- (d) 170. The subgrade surface, 16 inches below the finished surface grade, shall be prepared true to the lines, grades and cross sections given and properly rolled. All soft and spongy material below the subgrade surface shall be removed to a depth determined by the Community Planning Commission and the space thus made shall be filled with special gravel borrow, containing no stones over six inches in their largest diameter. **[Amended 7-8-1986]**
- (e) 401. Gravel subbase or foundation containing no stones having any dimensions greater than two inches shall be spread on the surface of the subgrade to a minimum depth of eight inches in conformity with the requirements of Section M1.03.0, Type c of the Standard Specifications for furnishing gravel borrow. A final four-inch layer of subbase material shall be placed on top of the eight inches compacted M1.03.0, Type c subbase material in accordance with the procedure outlined in Section 402.61 of the Standard Specifications which shall conform to the material requirements of M2.01.7 of the Standard Specifications for Dense Graded Crushed Stone for Subbase. **[Amended 7-8-1986]**
- (f) 401.60. Final grading, rolling and finishing, including the shaping, trimming, rolling and finishing of the surface of the subbase prior to application of gravel for surfacing of the roadway and base courses for walks or loam for berms, shall be in accordance with this section, except as specifically modified in Subsection A(1)(e) above, and as directed by the Community Planning Commission.
- (2) At the conclusion of this step, the roadway shall be staked in all locations where permanent monuments are to be installed as provided in § 350-30, Monuments, of these rules and regulations.
- B. Dimensions. Roadways shall be constructed for the full length of all streets within the subdivision and shall have the same curb radius required in § 350-14B above. The center line of all roadways shall coincide with the center line of the street right-of-way unless a deviation is approved by the Community Planning Commission. The minimum and maximum widths of roadway pavements shall be 30 feet for a principal street and 28 feet for a secondary street on a fifty-foot right-of-way. Should the CPC deem the street to have the potential of being a major connecting artery, it may require a width of 32 feet on a principal street. **[Amended 10-5-1982]**

- C. 460. The wearing surfaces of roadways shall be of Class I Bituminous Concrete Pavement, Type I-1, paved in two courses as follows: The binder course shall be 2 1/2 inches thick and the finish course shall be 1 1/2 inches thick making a total of four inches of pavement after having been completely rolled and compacted. This type of pavement shall be composed of mineral aggregate, mineral filler and bituminous material, plant mixed and laid hot. The pavement shall be constructed upon the prepared surface and in conformity with lines, grades and typical cross-section shown on plans. Material and construction methods shall conform to all other requirements of Section 460 of the Standard Specifications except that no such construction shall be undertaken unless the temperature is at least 32° Fahrenheit in the shade, and rising. **[Amended 7-8-1986]**
- D. 685. Embankments outside the right-of-way shall be evenly graded and pitched at a slope of not greater than four horizontal to one vertical in cuts and fills. Where cuts are made in ledge, other slopes may be determined with the approval of the Community Planning Commission. Where terrain necessitates greater slopes, retaining walls, terracing, fencing, or riprap may be used either alone or in combination to provide safety and freedom from maintenance, but must be done in accordance with plans filed with and approved by the Community Planning Commission. Whenever embankments are built in such a way as to require approval by the Community Planning Commission, the applicant must furnish to the town duly recorded access easements free of encumbrances for maintenance of the slopes, terraces or retaining walls. All such slopes shall be grassed in accordance with the specifications for the area between the roadway and sidewalk or roadway and boundary of the right-of-way. **[Amended 10-5-1982]**

§ 350-25. Utilities.

- A. 140. Excavation for structures, including foundations for drains, sewers and water pipes, walls and other structures shall be made to the depth as indicated on the definitive plan or established by the Community Planning Commission agent as appropriate. Rock excavation designated as Class B encountered in trench excavation shall be removed as directed. **[Amended 7-8-1986]**
- B. 200. All drain, sewer, gas and water pipes, underground utilities and other structures shall be installed upon the completion of the rough grading of the roadway subgrade and before the placing of the subbase, gravel base course, sidewalks or pavement. **[Amended 7-8-1986]**
- (1) Water.
- (a) Public water mains shall be Class 150 cement-lined ductile iron pipe of such size as approved by the Public Works Department and shall not be less than eight inches in diameter. A hydrant shall be located at each street intersection and not more than 500 feet apart. A hydrant may be required at the end of a dead-end street.

- (b) Each hydrant shall be served directly from the water main through a six-inch lateral connection. It shall be gated with a valve box with a six-inch valve and shall have two two-and-one-half-inch hose outlets and one five-inch pump outlet. Water main valves shall be located in such number and locations that lines by individual blocks may be isolated for maintenance purposes.
- (c) The applicant shall provide adequately sized water pipes to connect to the public water system in accordance with the Master Water Plan as last revised. All water lines shall be designed and installed with a minimum of five feet of cover to proposed finished grade. Prior to laying the water mains in trenches, a layer of clean, washed sand shall be laid in the trench and thoroughly compacted to a depth of not less than six inches. After placement of the main(s), an additional twelve-inch layer of thoroughly compacted, clean, washed sand shall be placed over the main(s). Subsequent backfill operations shall be effected as outlined in the Standard Specifications. This entire operation shall be inspected by the Community Planning Commission inspection agent. **[Amended 3-31-1987]**
- (d) All sections of the proposed water main shall be hydrostatically tested, disinfected, and analyzed pursuant to Section 301.60 of the Standard Specifications under the supervision of the Community Planning Commission inspection agent. Satisfactory results of both testing and analysis shall be indicated in a written report to the Community Planning Commission prior to release of security. **[Added 3-31-1987]**
- (e) Wherever proposed mains are to tie-in to existing water mains, the physical connection shall be made using three approximately sized gate valves (two on the existing main and one on the proposed) to ensure proper isolability and maintainability. **[Added 3-31-1987]**
- (2) Gas mains may be installed if gas connection is available.
- (3) Telephone lines shall be installed in underground conduits. **[Amended 7-8-1986]**
- (4) Electric lines shall be installed underground in accord with the regulations of the Reading Light Department. The Community Planning Commission may permit transformers, switches and other such equipment to be placed on the ground in approved locations.
- (5) Sewerage.
- (a) If a public sewerage system is located within 1,000 feet of the subdivision, the applicant shall connect all lots to the public sewerage system in accordance with the town's Comprehensive Sewer Plan as last revised.

- (b) If a public sewerage system is planned by the town but not yet constructed, the applicant shall be required to design and install at his cost in the street and to every lot, sewerage laterals which can be connected later to the public sewerage system. In order for the applicant to design and install properly such laterals, the town shall be responsible for establishing and providing the applicant, at the applicant's expense, with the necessary plan, specifications and design standards of the proposed public sewerage system.
 - (c) If Subsection B(5)(a) and (b) above do not apply, the applicant shall design an acceptable sewerage system but may install private on-lot systems in conformance with Board of Health regulations.
 - (d) Where public sewers are required, the following design standards shall apply:
 - [1] Public sewers shall be designed according to professional engineering practices.
 - [2] Public sewers shall be not less than eight inches in diameter, with six-inch house laterals.
 - [3] Manholes shall be located at every change in grade or horizontal alignment but not more than 300 feet apart. Sewer ejector pumps may be permitted at the discretion of the Board of Health.
- C. Drainage. Adequate disposal of surface and subsurface water shall be provided and pipes, manholes and catch basins, swales and other stormwater management structures shall be provided according to the sizes and depths as indicated on the APPROVED plans and in conformity with the requirements of: **[Amended 5-19-2009]**
1. The most recent version of the Massachusetts DEP Stormwater Policy and regulations and guidance thereunder. This includes the requirement that LID measures be considered, and permits use of LID Site Design Credits pursuant to the Volume 3 of the Massachusetts Stormwater Handbook and as amended;
 2. Additional standards for drainage design established by the Department of Public Works as set forth in the most recent version of the Town of North Reading Stormwater Management Rules and Regulations Section 7.B. (Stormwater Management Plan standards);
 3. Mass Highway Department "Project Development and Design Guide" (2006), Chapter 8, Drainage and Erosion Control and as amended;
 - (4) The standard depth of catch basins shall be two feet six inches below the invert of lowest drain. Manholes shall be constructed to the required depth at each junction point and as shown on the plan. Pipe culvert and pipe drains shall be in conformity with the requirements of Section 230 for installation of pipes.

(5) Reinforced concrete pipe shall be used for all drainage pipes in the subdivision (with the exception of subdrains), unless otherwise approved by the Community Planning Commission, and shall be installed in accordance with the approved plans. All RCP drain lines shall be of rubber gasket or O-ring construction. No backfilling of pipes shall be done until the installation has been inspected by the Community Planning Commission agent. All drainage trenches shall be filled with clean gravel borrow in accordance with specification 760. **[Amended 7-8-1986]**

(6) Trench backfill material in areas under roadways shall be thoroughly compacted as outlined in the Standard Specifications. Catch basins shall not be tied to one another under any circumstances but should rather be manifolded into a drain manhole. **[Added 7-8-1986; amended 3-31-1987]**

(7) Standard of design for drainage. **[Added 1-21-1992]**

(a) General. Drainage design shall be based on the Massachusetts Department "Project Development and Design Guide" (2006), Chapter 8, Drainage and Erosion Control.

(b) Closed system - conduit drainage.

[1] Peak rates of runoff shall be calculated for each catch basin or receiving structure. Design capacities for conduit flow shall meet or exceed the twenty-five-year storm event based on the SCS TR-55 or TR-20 methods.

[2] Design velocities for conduit flow shall be at least 2.0 FPS based on a five-year storm event and shall not exceed 15.0 FPS based on a twenty-five-year storm event.

[3] Roughness coefficients used for RCP pipe shall be at least $n=0.012$. Storm damage prevention shall be provided for storms above the twenty-five-year event.

[4] Adequate removal of surface water from all paved areas shall be provided. Catch basins shall be installed on both sides of the roadway on continuous grades at intervals of not more than 300 feet, at low points and sags in the roadway and near the corners of the roadway at intersecting streets, and at such other places as deemed necessary by the Community Planning Commission to assure the unimpeded flow of all natural watercourses, to assure adequate drainage of all low points and to provide proper runoff of stormwater. In no instances shall catch basins be located along a driveway cut.

[5] Catch basins and grates shall be designed and located so that surface water does not cross the roadway. Stormwater flow into catch basins via subsurface drainage pipes is not permitted.

[6] Open drainage systems [e.g. country drainage] shall be allowed if required for consistency with an approved Open Space Residential Development Special Permit, in connection with a comprehensive Low Impact Development drainage approach. In other subdivisions, waivers from the requirements of this section to permit open drainage systems may

be granted at the discretion of the Community Planning Commission as part of a comprehensive LID drainage approach, where the following conditions are met: (a) said drainage systems are consistent with conditions in surrounding areas;

(b) open drainage is used in connection with a comprehensive Low Impact Development drainage approach as set forth under the Environmentally Sensitive Design LID Credit as defined in the current version of the Massachusetts Stormwater Manual; and

(c) all LID measures meet the design standards set forth in the Massachusetts Stormwater Manual.

(c) Cross culverts.

[1] Where natural or man-made drainage courses are obstructed, cross drains, culverts or other structures shall be installed to restore drainage. Cross drains and culverts shall be reinforced concrete pipe, Class III, Wall "B" or other material as approved by the Community Planning Commission, and shall have a minimum of 2.5 feet of cover over the pipe.

[2] The minimum culvert pipe diameter shall be 18 inches. Where cross drains or culverts are proposed under roadways or other areas subject to motorized traffic, calculations shall be submitted showing that the cross drains or culverts can withstand H-20 loading conditions under ordinary bedding conditions.

[3] Two feet minimum of freeboard shall be provided above the maximum headwater depth as calculated during the one-hundred-year storm event.

[4] Where side slopes at either end of culverts or cross drains are steeper than two feet horizontal to one foot vertical and overall vertical distance from the road shoulder to the existing ground surface exceeds three feet or at all headwalls within the road right-of-way, guard rails or railings of a type approved by the Community Planning Commission shall be installed.

(d) Erosion control. Where water velocities discharged from drain pipes or culvert outlets may cause scour or erosion, flared end sections and rip-rap or other appropriate protection shall be designed and installed on the maximum expected design velocity to resist movement.

(e) Manholes. Manholes shall be provided at intervals of no greater than 300 feet, at changes in vertical and horizontal alignment and at all junctions. There shall be a 0.10 foot minimum hydraulic drop through the manhole or the crowns of the inlet and outlet pipes shall be matched, whichever provides for a greater hydraulic difference. Any transition between pipe materials, reinforced concrete and plastic (pvc) shall be accomplished via a standard manhole.

- (f) Detention basins. Detention and retention basins, when proposed, shall be designed in conformance with the specifications set forth in the Massachusetts Stormwater Manual, the requirements of the Town of North Reading Stormwater Bylaw and Regulations, and good engineering practice. Detention and retention basins shall be capable of controlling the one-hundred-year storm event capacity of the basin. The pipe inlet inverts discharging into the basin shall be at or above the twenty-five-year storm event capacity of the basin.
- D. 260. Where subdrains are required by the Community Planning Commission, they shall conform to Section 260 of the Standard Specifications.
- E. On-site systems. On-site sewage disposal facilities shall be installed and constructed in conformity with the rules, regulations and requirements of the Board of Health. On-site septic tanks and leaching fields shall be located in so far as possible in the front or side yard of the building(s) served, unless surface and subsurface soil conditions, drainage and topography in the location of such on-site facilities require their placement in the rear yard.
- F. Extensions of utility systems. Where adjacent property is not subdivided or where all the property of the applicant is not being subdivided at the same time, provisions shall be made for the extension of the utility system by continuing the mains the full length of streets to the exterior limits of the subdivision, at such grade and size which will, in the opinion of the Community Planning Commission, permit their proper extension at a later date.

§ 350-26. Sidewalks.

- A. Sidewalks shall be constructed within the subdivision, separated from the pavement area by a seeded strip, as provided in § 350-28.
- B. The sidewalk shall extend the full length of each side of the street and shall be a minimum width of five feet. Streets which are considered and will remain dead-end streets shall require only one sidewalk. **[Amended 10-5-1982]**
- C. 700. Bituminous concrete sidewalks, having a minimum thickness of 2 1/2 inches after compression, shall be constructed on an eight-inch gravel foundation (M1.03.0, type c) to the required lines and grades in accordance with these specifications. **[Amended 7-8-1986]**
- D. 700. If concrete sidewalks are desired, they shall be constructed as directed by the Community Planning Commission in conformity with this section of the Standard Specifications. **[Amended 7-8-1986]**

§ 350-27. Curbs and berms. [Amended 7-8-1986]

Vertical granite curbs shall be provided (six inches in height) throughout each subdivision, except where this requirement is inconsistent with an approved Open Space Residential Development plan or where a waiver for open drainage is approved pursuant to Section 350-25-C.6. A six-foot granite catch basin curb inlet shall be installed at each catch basin.

§ 350-28. Grass plots.

- A. A grass plot shall be provided on each side of each roadway between the pavement and sidewalk areas, and shall occupy all the remaining area.
- B. The slope of the grass plot shall be as shown on the profiles and Typical Cross-Section, Schedule A.13
- C. Streetlight stanchions and streetlights shall be located in the grass plot but shall not be nearer than 25 feet from the intersection of two streets, measured from the intersection of the tangents of the intersecting street curb lines. **[Amended 7-8-1986]**

§ 350-29. Trees. [Amended 10-5-1982; 7-8-1986; 3-31-1987; 8-20-1996]

- A. Street trees species approved by the Community Planning Commission shall be planted on each side of each street in a subdivision at least five feet behind the right-of-way. Such trees shall be located approximately at seventy-five-foot intervals and shall be at least 12 feet in height, two inches in caliper measured from four feet above the approved grade, and each tree shall be planted each in at least 1/2 cubic yard of topsoil, unless otherwise required by the Community Planning Commission. All trees are to be protected by a maintenance easement for a period of three years. A list of approved species is to be obtained from the Tree Warden. At least three different species of trees are to be planted unless otherwise approved by the Community Planning Commission.
- B. All deciduous street trees shall be clear of any branches from the approved grade level to a point seven feet above ground level.
- C. The developer will be liable for all trees so planted as to their erectness and good health for 18 months after acceptance.
- D. All street trees are to be planted so as not to conflict with streetlights, hydrants, or underground electrical systems. A minimum horizontal clearance of 20 feet is required.

¹³ Editor's Note: Schedule A is included at the end of this chapter.

- E. Root barriers of a style and design acceptable to the Department of Public Works shall be installed in all locations where street trees are closer than 10 feet to a roadway or sidewalk.
- F. All cut and fill bankings must be planted with low growing shrubs and wood chipped to a minimum depth of six inches where side slopes are between one on four and two on four or seeded with a deep-rooted perennial grass to prevent erosion where a side slope is one on four or milder.

§~ 350-30. Monuments.

- A. Granite monuments shall be installed on street lines at all points of curvature and at all points of change in direction.
- B. Monuments shall be installed at all other points where, in the opinion of the Community Planning Commission, permanent monuments are necessary.
- C. Monuments shall be a standard permanent granite of not less than four feet in length and not less than six inches in width and breadth and shall have a one-half-by-two-inch drill hole in the center of the top surface. Said monuments shall be installed at the time of the final grading with the top flush with the top final graded surface.
- D. The placement and accurate location of these markers shall be certified by a Registered land surveyor and properly located on the street acceptance plans.

§ 350-31. Street signs and names.

- A. Upon commencement of any construction, reflective street signs shall be installed at each intersection to conform to the standard established by the Department of Public Works.
[Amended 6-18-2002]
- B. Street names shall be approved by the Community Planning Commission to prevent duplication and to provide names in keeping with the character of the town.
- C. From the time of final grading until such time as each street is accepted by the town as a public way, the sign posts at the intersection of such street with any other street shall have affixed thereto a sign designating such street as a private way.

§ 350-32. Streetlights.

- A. Streetlights shall be installed to conform to the type and style as required by the Department of Public Works.
- B. Streetlight stanchions shall be located at such intervals as required by the Community Planning Commission in the grass plot, as provided in § 350-28 and shall be installed in accord with the procedure required by the Reading Light Department. [**Amended 7-8-1986**]

§ 350-33. Maintenance of improvements.

For the purpose of protecting the safety, convenience and welfare of the town's inhabitants, for the provision of adequate access to all of the lots in a subdivision by ways that will be safe and convenient for travel; for reducing the danger to life and limb in the operation of motor vehicles; for securing safety in the case of fire, flood, panic, and other emergencies; and for securing adequate provision for water, sewerage, drainage, underground utility services, fire, police and other similar municipal equipment; under the authority of Chapter 41, Section 81M, as amended, the applicant or his successor shall provide for the proper maintenance and repair of improvements under this section of the rules and regulations during the construction of said improvements or until the town votes to accept such improvements, whichever comes first.

All stormwater management systems shall be maintained in accordance with the operation and maintenance plan submitted as part of the definitive plan under Section 350-13-B.2 (o). The developer and lot owners will be responsible for maintaining the drainage facilities within the subdivision until and unless the Town accepts these drainage facilities in conjunction with the subdivision roadways' acceptance.

ARTICLE VI
Administration

§ 350-34. Variation.

Strict compliance with the requirements of these rules and regulations may be waived when, in the judgment of the Community Planning Commission, such action is in the public interest and not inconsistent with the Subdivision Control Law. Approval of an Open Space Residential Development Special Permit shall be considered a finding that waivers consistent with such Special Permit are in the public interest and not inconsistent with the Subdivision Control Law. Applicants with an approved OSRD Special Permit shall receive a presumption in favor of waivers consistent with the approved OSRD plan.

§ 350-35. Statutory reference.

For matters not covered by these rules and regulations, reference is made to Sections 81-K to 81-GG, inclusive, of Chapter 41 of the General Laws.

§ 350-36. Building permits.

- A. No building shall be erected within a subdivision without written permission from the Planning Administrator (Lot Release Form) pursuant to § 350-13H(4). [**Amended 5-24-1994**]
- B. The Building Inspector shall not issue any permit for the erection of a building until he is first satisfied that the lot on which the building is to be erected is not within a subdivision or that a way furnishing the access to such lot as required by the Subdivision Control Law is shown on a plan recorded or entitled to be recorded under Chapter 41 of Section 81-X, as amended, and that any condition endorsed thereon limiting the right to erect or maintain buildings on such lot had been satisfied or waived by the Commission, and in the event that more than one building for dwelling purposes be erected or placed or converted to use as such on any lot, that the Building Inspector is satisfied that consent has been obtained from the Community Planning Commission in accord with § 350-6 of these rules and regulations, Chapter 41, Section 81-Q, and amendments thereto.

§ 350-37. Inspections. [Amended 3-31-1987]

- A. Inspections shall be arranged by the applicant with the Community Planning Commission agent for that purpose prior to the construction of streets and the installation of utilities and during construction as specified herein at each significant construction stage.
- B. Inspection shall be requested in writing at least 48 hours in advance of each inspection to the Community Planning Commission.
- C. Inspections shall be made by the Community Planning Commission agent, unless otherwise indicated, for each of the following:
 - (1) Satisfactory excavation.
 - (2) Satisfactory laying and testing of water and sewer mains, hydrants, and related equipment.
 - (3) Satisfactory locations of gas mains and related equipment (by the gas company).
 - (4) Satisfactory installation of surface and subsurface drainage system and related equipment.
 - (5) Satisfactory filling.
 - (6) Satisfactory compaction.
 - (7) Satisfactory installation of electric lines and related equipment (by the Reading Municipal Light Company).
 - (8) Satisfactory location of telephone lines and related equipment (by the telephone company).
 - (9) Satisfactory completion of the pavement.
 - (10) Satisfactory placing of curbs and gutters.
 - (11) Satisfactory construction of sidewalks.
 - (12) Satisfactory finish grading of grass plots.
 - (13) Satisfactory installation of monuments.
 - (14) Satisfactory grading of lots.

(15) Satisfactory planting of street trees.

(16) Satisfactory final cleanup.

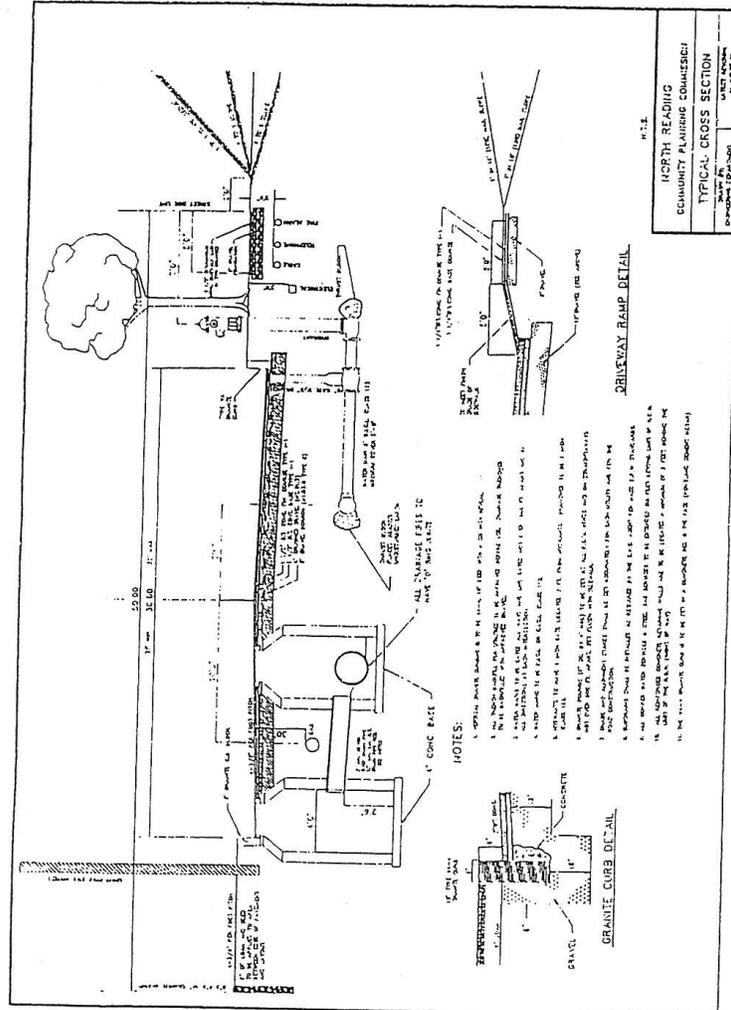
D. The Community Planning Commission may establish the order of the required inspection and may require satisfactory completion of one step before the applicant proceeds to the next. It may require tests to be done by the applicant as a condition for approval when, in the opinion of the Community Planning Commission, it is advisable.

E. Failure to comply with the inspection procedure may necessitate removal of improvements at the expense of the applicant or rescission of the approval of the plan in accord with Chapter 41, Section 81-W, of the General Laws of Massachusetts.

§ 350-38. Severability.

If, in any respect, any provision of these rules and regulations in whole or in part, shall prove to be invalid for any reason, such invalidity shall only affect the part of such provision which shall be invalid and in all other respects these rules and regulations shall stand as if such invalid provisions had not been made, and they shall fail to the extent, and only to the extent, of such invalid provision, and no other provision of these rules and regulations shall be invalidated, impaired or affected thereby.

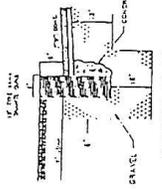
SUBDIVISION OF LAND
 Schedule A
 [Amended 10-5-1982; 6-26-1990]



N.E.
 NORTH READING
 COMMUNITY PLANNING COMMISSION
 TYPICAL CROSS SECTION
 DATE: 10/15/82
 DRAWN BY: [Signature]

DRIVEWAY RAMP DETAIL

- NOTES:**
1. DRIVEWAY RAMP SHALL BE 12" MIN. WIDE AT ALL TIMES.
 2. DRIVEWAY RAMP SHALL BE 12" MIN. WIDE AT ALL TIMES.
 3. DRIVEWAY RAMP SHALL BE 12" MIN. WIDE AT ALL TIMES.
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 11. DRIVEWAY RAMP SHALL BE 12" MIN. WIDE AT ALL TIMES.



GRANITE CURB DETAIL

SUBDIVISION OF LAND

Schedule B **Board of Health Review** (For Reference Only)

Review by the Board of Health as to suitability of the land

At the time of filing of the definitive plan, the applicant shall also file with the Board of Health one contact print of the definitive plan, dark line on white background, together with the following information:

- A. A statement in writing concerning the status of the proposed project in relationship to the removal of fill or dredge of any bank, flat, marsh, meadow or swamp bordering on any inland water.
- B. If the disposal system is to be connected to the North Reading sewer system, in writing indicate the anticipated volume and composition of the waste to be discharged.
- C. If the disposal system is to be on-site, the applicant must comply with all the provisions of the State Sanitary Code, Article 11, including Regulation 14 covering percolation tests; and arrange, at the applicant's cost, to conduct said tests in accordance with said regulation in the presence of the Board of Health agent. The applicant must file a written report signed by a Registered professional engineer or Registered sanitarian with the Board of Health within 30 days of filing of the definitive plan, which indicates exactly the procedure used and test results and a conclusion based upon the test results concerning whether the soil conditions on each lot are suitable for the sewerage disposal purposes intended. Sewerage to be disposed in excess of 2,000 gallons per day must be approved by the Massachusetts Department of Public Health (General Laws, Chapter 111, Section 17).
- D. The Board of Health reserves the right to make further and additional requirements as in its judgment it may determine to be necessary in a particular case.
- E. Failure to comply with this procedure may result in the Board of Health's disapproval of said plan (General Laws, Chapter 41, Section 81U).
- F. The Board of Health shall within 45 days after filing of the plan report to the Community Planning Commission in writing approval or disapproval of said plan. If the Board of Health disapproves said plan, it shall make specific findings as to which, if any, of the lots shown on such plan cannot be used for building sites without injury to the public health, and include such specific findings and the reasons therefor in such report, and, where possible, shall make recommendations for the adjustment thereof. Every lot shall be provided with a sewerage system or sewer connection satisfactory to the Board of Health.

SUBDIVISION OF LAND

Schedule C

— TYPICAL TITLE BLOCK —

ACCEPTANCE PLAN AND STREET LAYOUT PLAN

SUBDIVISION NAME STREET NAME, NORTH READING	
SCALES - HOR. 1" = 40' VER. 1" = 4' DATE :	ENGINEER - _____ SEAL
NORTH READING COMMUNITY PLANNING COMMISSION. _____ _____ _____ DATE - _____	STREET LAYOUT APPROVED BY THE NORTH READING BOARD OF SELECTMEN _____ _____ _____ _____ DATE - _____

SUBDIVISION OF LAND

Schedule D

— TYPICAL TITLE BLOCK —
 AS BUILT PLAN

SUBDIVISION NAME STREET NAME, NORTH READING	
SCALES - HOR. 1" = 40' VER. 1" = 4' 	ENGINEER - _____ SEAL
DATE - _____ NORTH READING COMMUNITY PLANNING COMMISSION _____ _____ _____ _____ DATE - _____	SIGNATURE _____ GRADE _____ CERTIFICATION _____

SUBDIVISION OF LAND

Schedule E

TYPICAL TITLE BLOCK
DEFINITIVE SUBDIVISION PLAN

NAME OF SUBDIVISION

DEFINITIVE SUBDIVISION PLAN TITLE OF PAGE NORTH READING, MASSACHUSETTS	
APPLICANT: DATE: SCALE: NORTH READING COMMUNITY PLANNING COMMISSION DATE:	OWNER: REVISED: ENGINEER: SEAL SIGNATURE PETITION & PLAN FILED: HEARING DATE: CONDITIONALLY APPROVED: FINAL PLAN REVISION: PLAN ENDORSED:

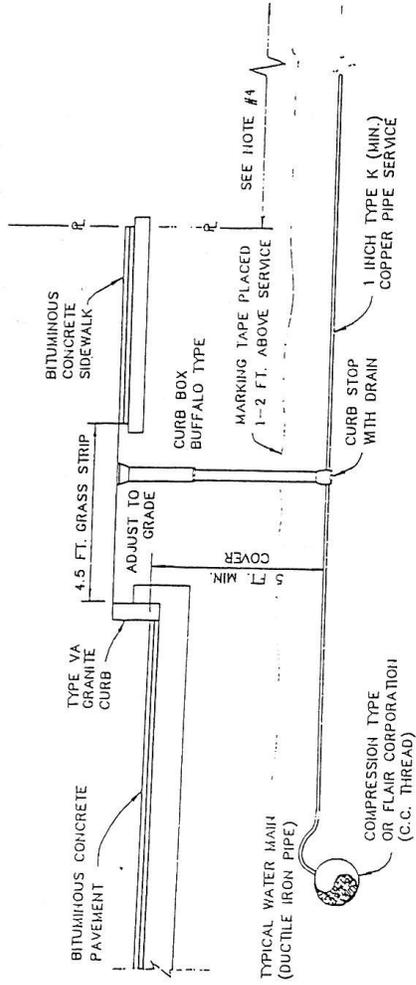
SUBDIVISION OF LAND

Schedule F
Town of North Reading Subdivision Rules and Regulations
Drainage System and Hydraulic Design parameters
[Added 2-26-1991]

Minimum pipe specification	(SDR 35 Solid Wall PVC Pipe) (RCP, Class III, Wall B)
Minimum roughness coefficient	n = 0.012
Minimum pipe size	12 inch
Minimum depth over pipe	2½ feet
Minimum pipe capacity	25-year storm event
Minimum design velocity	2.0 fps @ 5-year event
Maximum design velocity	15.0 fps @ 25-year event
Maximum catch basin spacing	300 feet
Maximum manhole spacing	300 feet
Minimum drop though manholes	0.10 feet
Culvert design capacity	100-year storm event
Minimum culvert size	18 inches

SUBDIVISION OF LAND

Schedule G



NOTES:

1. TYPE "K" WATER SERVICE TO BE A MINIMUM OF 5 FEET DEEP.
2. PRIOR TO BACKFILL, THE WATER SERVICE IS TO BE INSPECTED BY A REPRESENTATIVE OF THE TOWN OF NORTH READING.
3. APPLICATION FOR A WATER SERVICE AND AN APPROVED "STREET OPENING PERMIT" MUST BE OBTAINED FROM THE DEPARTMENT OF PUBLIC WORKS.
4. "PICTAIL" EXTENSION OF 1 INCH COPPER SERVICE TO EXTEND 10 FT. MINIMUM BEYOND SIDEWALK.

WATER SERVICE DETAIL

SCALE: NONE DATE: FEB. 11, 1991

TYPICAL WATER SERVICE CONNECTION

Prepared for:
NORTH READING DEPARTMENT
OF PUBLIC WORKS

NR
NORTH READING
ENGINEERING DEPT.

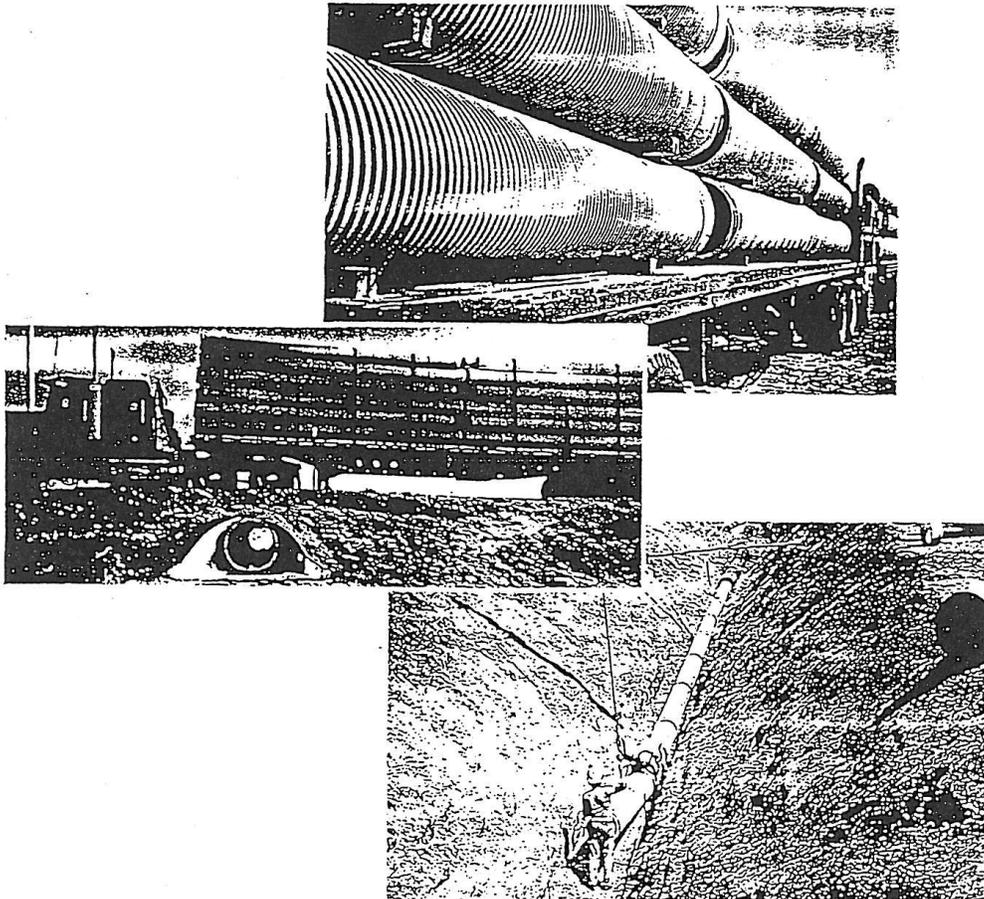


DATE REVISION BY

 J-M PIPE

PERMA-LOC[®]

PVC Storm Drain Pipe
Sizes 18" - 48"



Perma-Loc

PVC Stormdrain & Underdrain Pipe

J-M large diameter Perma-Loc PVC drain pipe is suitable for storm water runoff. Its unique design and many product features are the result of research and technology gained from over 50 years of pipe manufacturing. J-M continues to lead the way in pipe innovations.

Advantages

Corrosion Resistance

J-M Perma-Loc Pipe is resistant to ordinary storm drain waters and corrosive soils both alkaline and acidic.

Abrasion Resistance

Perma-Loc offers excellent resistance to abrasion, gouging and scoring and has proven to be superior to most common piping materials.

High Flow Characteristics

Long lengths, smooth interiors and factory-made close tolerance joints provide a Manning "n" coefficient of .009. This high carrying capacity makes possible the use of flatter grades or smaller diameter pipe in many applications.

Silt Tight Joints

Joints may be either an internal plastic sleeve or an integral bell gasketed joint. When the joint is assembled according to manufacturers recommendation it will prevent misalignment of adjacent pipes and form a silt tight joint.

Long Lengths

All Perma-Loc pipe comes in 10' laying lengths. Compared to some other types of storm drain pipe, longer lengths mean fewer joints and a savings in installation time.

Light Weight

Perma-Loc is a lightweight pipe and can reduce manpower requirements for installation.

Fittings and Accessories

J-M fittings and accessories, as well as saddles manufactured by other vendors, are available for use with Perma-Loc.

J-M Perma-Loc pipe meets the need for strength and load-bearing capacity in today's storm water collection and disposal systems. Unique design and high-performance materials from J-M make it the natural choice in storm drain systems from coast to coast.

External Loads

Background

Loads imposed on buried conduits have, in past practice, been calculated by using the Marston load formula. For trench loads, Marston has a formula for rigid pipe and another formula for flexible pipe. It is important to recognize that under identical conditions of bury, the soil load generated on a flexible conduit is less than the load generated on a rigid conduit. The comparative load on a rigid conduit versus the load on a flexible conduit is expressed as the ratio of trench width to the flexible pipe O.D.

By definition, a flexible conduit is one which will deflect before reaching failure.

Marston's formulas for soil loads:

Rigid pipe $W = Cd w Bd^2$

Flexible pipe $W = Cd w Bc Bd$

Where:

W = Load on pipe (lb/lin ft)

Cd = Load coefficient

w = Soil unit weight (lb/ft³)

Bd = Ditch width (ft)

Bc = O.D. of pipe (ft)

Prism Load

Loads imposed on buried conduits have been calculated by using the Marston load formulas for rigid and flexible pipe. However, it has been determined that the Marston formula for flexible pipe may not determine the maximum long-term load — the "Prism load" formula is more accurate. The "Prism load" is the weight of the column of soil directly above the pipe. Thus, precautions in keeping the trench narrow are unnecessary for the flexible pipe installation. The important thing is to compact the haunching material from the pipe out to the undisturbed trench walls.

Therefore, J-M suggests that the maximum long term load be determined by the prism load for design.

Prism load: $P_v = wH$ (lb/ft²)

Where:

P_v = Pressure at the top of the pipe due to the weight of the soil (lb/ft²)

w = Soil unit weight (lb/ft³)

H = Depth from top of pipe to top of ground (ft)

Note: To convert prism load (lb/ft²) to lb/linear ft, multiply by the O.D. of the pipe in feet, or:

$$W = wH Bc$$

Live Loads

Live loads imposed on buried conduits from traffic must also be considered in a design and become more important at shallow depths. The combination of soil load and live load must be added together to design for the maximum load as shown in curves above.

The soil load and live load must be added to determine the total external load on a buried conduit. This combined load should be used for design. Figure 1 illustrates the magnitude of soil load and live loads separately and also charts the magnitude of the combined or total loads. The curves in Figure 1 apply only for H20 highway loading and a soil weight of 120 lb/cu ft.

H20 Highway Load

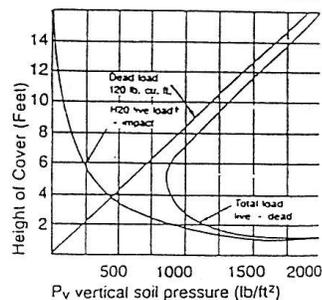


Figure 1.

Note: To convert vertical soil pressure to load on pipe — pounds per linear foot — multiply by O.D. of pipe in ft.

†Live load applied on assumed area of 36" x 40".

Use of maximum long-term deflection chart

At shallow depths of cover — 3 feet and less, flexible conduits can deflect and rebound under dynamic loading conditions if the trench width is not highly compacted. Thus, unless this compaction is achieved, flexible road surfaces may be damaged as a result. Therefore, for shallow installations under flexible road surfaces (less than 3 feet), the industry recommends a minimum of 95% density in embedment materials from the bottom of the trench up to the road surface using Class I or Class II materials. At this density, minimum cover for Perma-Loc — as is typical with most other flexible pipes — is recommended to be one foot from the top of the pipe to the road elevation for rigid road surfaces or to the bottom of flexible road surfaces. This recommendation is not meant to conflict with the design engineer's specifications and his specifications will govern.

*See page 6 for definitions of classes.

Pipe deflection

Deflection is defined as the change in vertical inside diameter of a flexible conduit when subjected to a vertical load. The amount of deflection that will occur in any flexible conduit is a function of three factors:

1. Pipe stiffness (F/Δy).
2. Soil stiffness.
3. Load on the pipe.

It is important to recognize that flexible conduits perform differently in the ground than they do under laboratory flat plate loading. The interaction of pipe stiffness and soil stiffness combine to give flexible conduits a high effective strength when buried.

Methods for predicting pipe deflection

The most commonly used approach in predicting deflection has been the modified "Iowa Deflection Formula."

Modified Iowa Formula:

$$\Delta y = \frac{D_L K W_c r^3}{EI + .061 E' r^3}$$

Where:

- Δy = Vertical deflection (inches)
- D_L = Lag factor (1.5 maximum)
- K = Bedding factor
- W_c = Earth load (lb/in)
- r = Mean radius* (in)
- E = Modulus of elasticity (lb/in²)
- I = Moment of inertia** (in⁴)
- E' = Soil stiffness (lb/in²)

*Distance from center of pipe to neutral axis.

**Calculate using standard strength of material formulae.

Although considered a conservative approach, considerable variation in predicted deflection will result depending upon the choice of empirical constants E', K and D_L.

Empirical methods of predicting deflection have evolved in recent years which eliminate the guesswork inherent in the Iowa method. When design is based on actual laboratory test and previous field measurements, it is unnecessary to know the actual load acting on the pipe or the soil stiffness. Thus an installation can be designed with a known factor of safety provided enough empirical data is available.

To accommodate the problem of having to establish data for the number of trench widths that are found in the field, the prism load was chosen because it represents the maximum loading condition on a flexible pipe. Time lag to account for future settlement of the backfill can be included by choosing long-term values of deflection.

J-M has developed through laboratory tests and actual field data the maximum long-term deflection charts. Figure 2 shown below. This chart eliminates the guesswork in predicting deflection and gives the design engineer a quick ready reference. Figure 2 is for Perma-Loc with a stiffness of 10 psi minimum.

The values given for deflection limits are the ultimate long-term deflection that will occur in a particular soil class having a given density (compaction) in the haunching area of the pipe zone for various heights of cover (feet).

1. Where live loads are not a factor or not involved in the total external load on the pipe, the chart can be used directly to determine the limit of the maximum long-term deflection of the PVC pipe.

Example: If a 24" Perma-Loc storm drain pipe is installed in Class IV material, having 85% compaction in the pipe zone and with 12 feet of cover, will this recommended maximum long-term deflection of 7½% be met?

Answer: Enter Figure 2 at 12 feet of cover, Class IV material at 85% compaction, pipe will never deflect more than 7½% (color code — brown).

(Continued on page 6)

Figure 2.

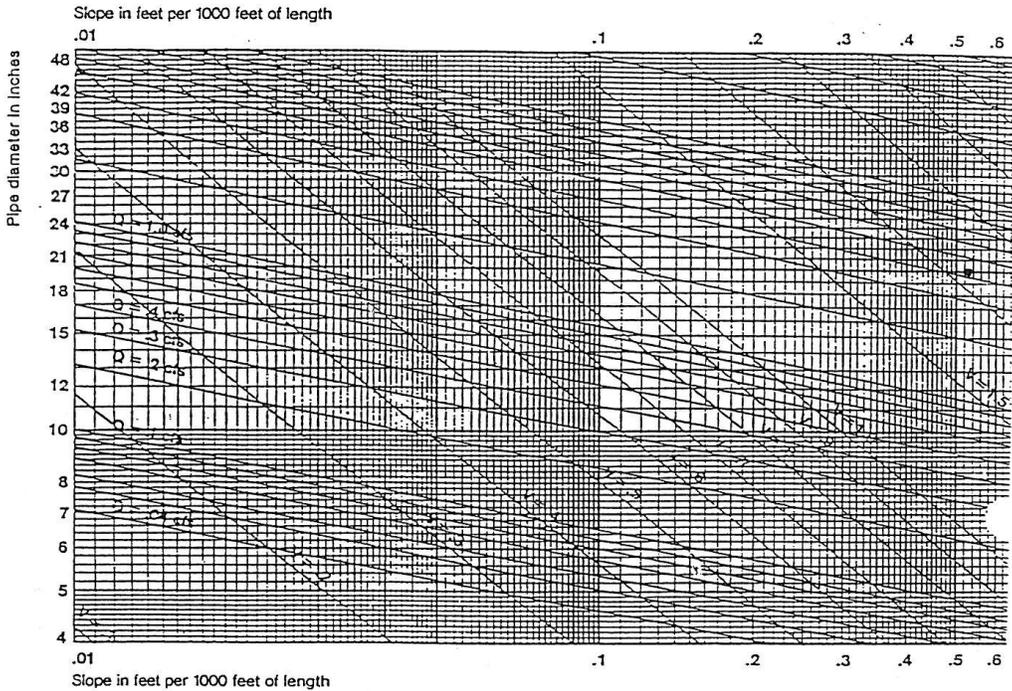
ASTM Bedding Classification	Density (Proctor) AASHTO T-99	Height of cover (feet)																<input type="checkbox"/> Maximum 75% deflection <input type="checkbox"/> This zone not recommended			
		1	3	5	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36		
Gravel	Class I 95%																			<input type="checkbox"/>	<input type="checkbox"/>
	Class II 90%																			<input type="checkbox"/>	<input type="checkbox"/>
Sand	80%																			<input type="checkbox"/>	<input type="checkbox"/>
	Class III 90%																			<input type="checkbox"/>	<input type="checkbox"/>
	85%																			<input type="checkbox"/>	<input type="checkbox"/>
Clay	65%																			<input type="checkbox"/>	<input type="checkbox"/>
	Class IV 85%																			<input type="checkbox"/>	<input type="checkbox"/>
	75%																			<input type="checkbox"/>	<input type="checkbox"/>
	65%																			<input type="checkbox"/>	<input type="checkbox"/>
Peat	Class V	This soil class not recommended.																			

Note: This is a conservative design based on 10 psi minimum stiffness for all sizes.

Flow chart for
pipe flowing full

Coefficient of flow
 $n = 0.009$

Derived from the Manning Formula
 $v = \frac{1.486}{n} R^{2/3} S^{1/2}$



Conversion chart

Table 1

Slope values

Slope values derived from this chart are for coefficient of flow $n = 0.009$. They may be converted to slopes for other coefficients of flow by means of the following multiplying factors:

0.79 for $n = 0.008$	1.77 for $n = 0.012$
1.00 for $n = 0.009$	2.086 for $n = 0.013$
1.23 for $n = 0.010$	2.42 for $n = 0.014$
1.494 for $n = 0.011$	2.778 for $n = 0.015$

Conversion chart

Table 2

Diameters

Diameters derived from this chart are for coefficient of flow $n = 0.009$. These may be converted to diameters for other coefficients of flow by means of the following multiplying factors:

0.956 for $n = 0.008$	1.114 for $n = 0.012$
1.000 for $n = 0.009$	1.147 for $n = 0.013$
1.040 for $n = 0.010$	1.180 for $n = 0.014$
1.078 for $n = 0.011$	1.211 for $n = 0.015$

Conversion factors

CFS, MGD, GPM

To convert cubic feet per second (cfs) to million gallons per day (mgd), multiply cfs by 0.646. To convert cubic feet per second (cfs) to gallons per minute, multiply cfs by 448.83.

One cubic foot of water = 7.48 gallons

Example

Assume:

Flow coefficient $n = 0.009$
Length = 2800 ft.
Pipe size = 8 inch
Elevations—Upstream = 215' - 0"
Downstream = 213' - 0"

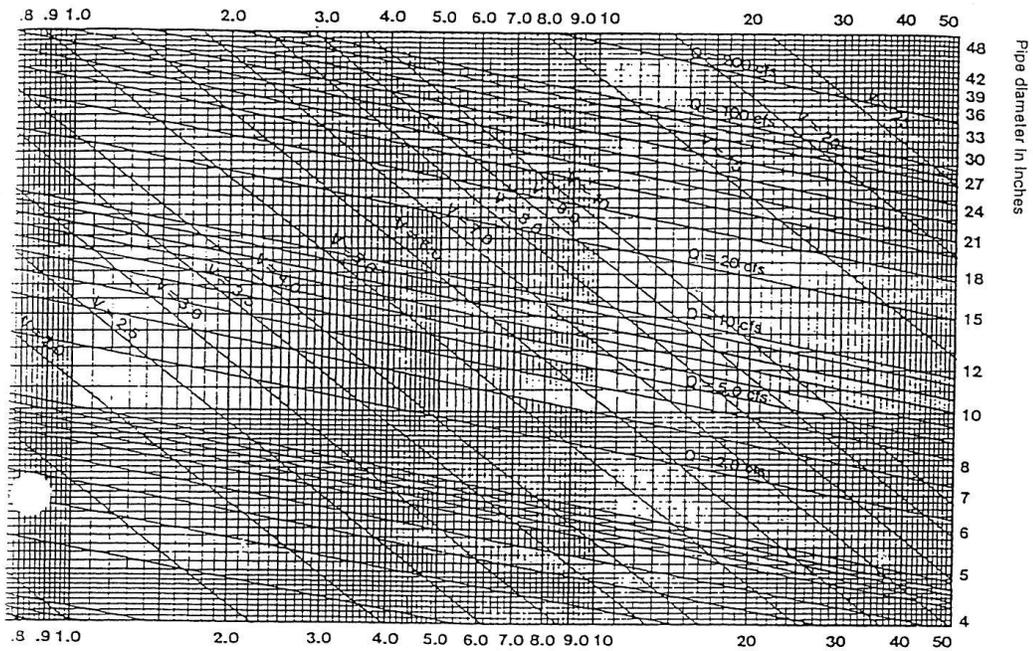
Required:

- 1) Flow rate when flowing full
- 2) Velocity

Difference in elevation divided by length of pipe line equals slope in ft./ft.

Multiplying by 1000 = slope 0.7 ft./1000 ft. Enter graph at 0.7 slope and also at 8 inch diameter pipe. At intersection, lines for velocity and flow rate also intersect. These give flow rate of 0.5 cu. ft. per second and velocity of 1.3 feet per second.

PVC storm drain pipes have a coefficient of $n = 0.009$. Their high carrying capacities may often result in the use of flatter grades or in the use of smaller diameter pipe.



(Above Graph Based On Pipe Flowing Full.)

To get flow equal to Perma-Loc, what size competitive pipe is required?
Approximate sizes are listed below.

Perma-Loc ($n = .009$)	Reinforced Concrete ($n = .013$)	Corrugated Metal ($n = .021$)
48	60	66
42	48	54
36	42	48
30	36	42
27	33	36
24	30	33
18	21	24

Installation

2. Where live loads must be considered, determine first the combined total external load on the pipe from Figure 1. Divide that load (lb/ft²) by the soil weight (lb/ft³) to obtain the equivalent height of cover (ft). Using this height of cover with the bedding class the Proctor density, enter the maximum long-term deflection chart, Figure 2, to determine the maximum long-term deflection limit.

In working with these charts, it becomes apparent that:

1. Soil density in the pipe zone plays a greater role than soil type in the control of deflection in buried flexible conduits.

2. The amount of deflection is independent of pipe size, providing all pipe sizes are stiffness of $F/\Delta y$ 10 psi.

Note: Pipe size does not appear in the chart for maximum long-term deflections.

Note: Deflection values shown do not include effect of live load or longitudinal bending.

1. No length of pipe installed under conditions specified will deflect more than is indicated; the pipe will deflect less than the amount indicated if specified density is obtained.
2. External loading based upon soil weight of 120 per cubic foot.
3. Deflections predicted are based upon pipe which was initially circular prior to installation. Actual deflections may differ because of initial out-of-roundness caused by storage and/or handling. These variations should be taken into account when measured deflections are compared with those in the table.
4. Bedding classifications correspond to ASTM D 2321.
5. Deflection listed in table are maximum long-term values. The recommended maximum long-term value is 7.5 percent.

Pipe Zone Terminology

Foundation

Preparation is only required when the trench bottom is unstable. Any foundation that will support a rigid pipe without causing loss of grade or flexural breaking of pipe will be more than adequate for PVC pipes.

Bedding

The bedding directly underneath the pipe is required only to bring the trench bottom up to grade. It should not be so thick or soft that the pipe will settle and lose grade. The purpose of the bedding is to provide uniform longitudinal support of the pipe.

Haunching

The haunching area is the most important in terms of limiting the deflection of a flexible pipe. This is the area that should be compacted to the Proctor densities shown in charts on page 3.

Initial Backfill

Initial backfill begins above the springline of the pipe to a plane 6 inches to 12 inches above the pipe. Compacting soils to levels above the springline gives little additional side support.

Most of the support is accomplished by compacting the soil surrounding the lower half of the pipe.

Caution: If hydro-hammers are used to prepare the bedding and backfill for the road surface, they should not be used within 3 feet of the top of the pipe and then only if the pipe zone soil density has been previously compacted to a minimum 85% standard Proctor density.

Pipe Zone Materials

Pipe zone materials include the materials in the haunching area and the initial backfill. They include a number of processed materials plus the soil types listed under USCS Soil Classification System (FHA Bulletin No. 373). These materials are grouped into five broad categories according to their suitability for this application, as follows.

Class I. Angular, ¼" to 1½" graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone and crushed shells.

Class II. Coarse sands and gravels with maximum particle size of 1½", including variously graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry; Soil type GW, GP, SW and SP are included in this class.

Class III. Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil types GM, GC and SM and SC are included in this class.

Class IV. Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil types MH, ML, CH and CL are included in this class. Installing pipe in Class IV soils below the water table is not recommended.

Class V. These materials are not recommended for bedding, haunching or initial backfill.

Key To Pipe Performance

The performance of a flexible conduit does not depend only on the class of embedment materials used, but more importantly, on the density of the material in the haunching zone. By using a combination of soil class, soil density, and series classification of Perma-Loc, the design engineer can achieve the most economical installation within the recommended deflection limits.

Excavation And Pipe Laying

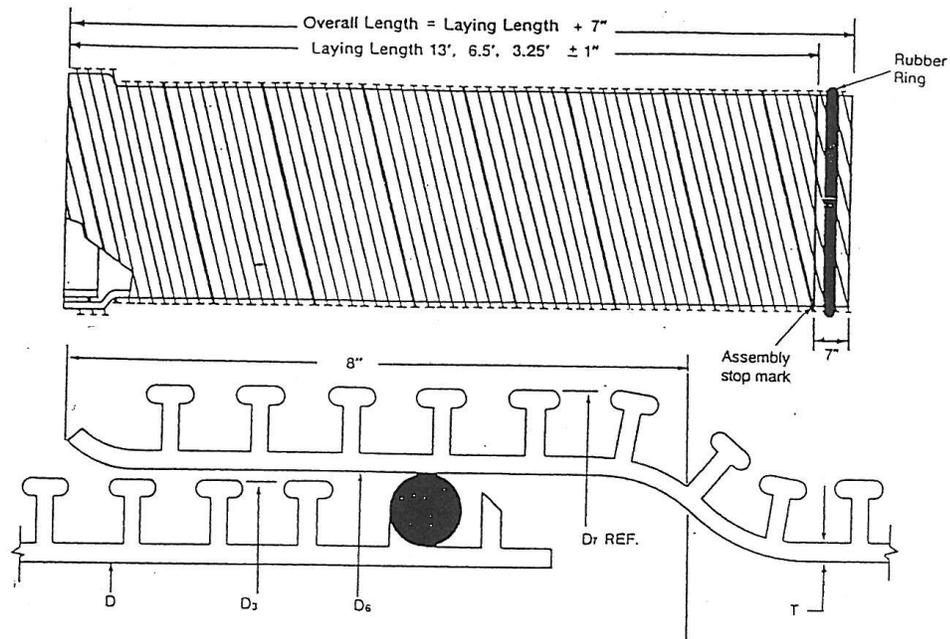
As with other pipes, the trench for PVC is excavated with bell holes to give uniform bearing along the full length of each pipe section. The ditch should be wide enough to allow for proper placement and compaction of the selected materials in the haunching area.

Sheeting

If unstable soil conditions or regulations require the use of sheeting or boxes, they should be used in a manner not to disturb the embedment material within three pipe diameters on each side of the installed pipe.

Compaction Techniques

Flooding or jetting are commonly used methods for obtaining desired densities of granular embedment materials. If flooding is used, the embedment materials should be allowed to dry below optimum moisture before final backfill operations are begun. If jetting is used, desired density of the embedment materials should be previously obtained by other methods. Neither flooding or jetting should be used if the possibility of washing away side support exists.



Dimensions (Inches)

Pipe Size	D	D ₃	D ₆	D _r REF.	T Min.	Min. Pipe Stiffness	Approx. w./ft.
18"	17.65	19.03	19.50	20.88	.105	32	8.29
21"	20.75	22.27	22.64	24.16	.125	28	11.22
24"	23.50	25.18	25.70	27.38	.140	24	13.46
27"	26.50	28.40	28.90	30.80	.150	22	17.36
30"	29.50	31.42	32.16	34.08	.160	20	20.12
36"	35.50	37.64	38.525	40.665	.170	16	27.81
42"	41.50	43.74	44.00	46.24	.185	14	38.20
48"	47.50	49.94	50.17	52.61	.200	12	52.60

Pipe Manufactured to Conform to
AASHTO M 304M - 89 Specifications

Short form specification

Scope

This specification designates general requirements for unplasticized polyvinyl chloride (PVC) plastic (spiral wound) pipe with integral wall bell and spigot joints for the conveyance of domestic sewage and storm water.

Materials

All pipe and fittings shall be manufactured and tested in accordance with AASHTO Specification M 304M-89, "Poly (Vinyl Chloride) (PVC) Ribbed Drain Pipe & Fittings Based On Controlled Inside Diameter".

The pipe and fittings shall be made of PVC plastic. The pipe shall be colored brown for in-ground identifications as drain pipe.

Pipe

The bell shall consist of an integral wall section or an internal plastic sleeve. The solid cross section rubber ring shall be factory assembled on the spigot. Sizes and dimensions shall be as shown in this specification. Standard laying lengths shall be 13 ft. \pm 1 inch. At manufacturer's option, random lengths of not more than 15% of total footage may be shipped in lieu of standard lengths.

The physical (or chemical) properties of J-M products described herein represent typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice.

Joining system

Joints may be either an internal plastic sleeve or an integral bell gasketed joint. When the joint is assembled according to manufacturers' recommendation it will prevent misalignment of adjacent pipes and form a silt tight joint.

Impact resistance

Impact resistance will be determined in accordance with ASTM D 2444, using Tup B and flat plate holder B. The specimens should be oriented so that one of the ribs receives the strike essentially centered on the top face. Failure in the test specimens shall be any shattering or any crack or split extending through the main wall of the pipe that was created by the impact and that can be seen by the naked eye. The impact strength shall not be less than 100 ft. lbs. for sizes 18" through 27", and not less than 120 ft. lbs. for sizes 30" through 48".

Fittings

All fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal and have bell and/or spigot configurations compatible with that of the pipe.

Physical and chemical requirements

Pipe shall be designed to pass all tests described here at 73°F (\pm 3°F).

Pipe stiffness

The pipe stiffness, at 5% deflection, shall equal or exceed the values given in Table 1 of AASHTO specification M 304M-89, and published herein on page #7. Specimens are a minimum of one pipe diameter in length and are tested in accordance with ASTM D 2412.

Note: Pipe may be restrained in flat plate test to prevent twisting in the test apparatus.

Flattening

Specimens will be flattened between parallel plates in a suitable press until the pipe inside diameter is reduced by 60% of its original dimension. The rate of loading shall be uniform and such that the compression is completed within 2 to 5 minutes. The specimen shall pass if no splitting, cracking, or breaking is observed under normal light with the unaided eye. Small tears initiated at the cut end of the rib shall not constitute failure.

WARRANTY

J-M warrants that its standard products are manufactured in accordance with its applicable material specifications and are free from defects in workmanship and materials, using J-M's specifications as a standard. Every claim under this warranty shall be deemed waived unless in writing and received by J-M within thirty (30) days of the date the defect was discovered, and within one (1) year of the date of the shipment. Claims for product appearance defects, such as sunbleached pipe etc., however, must be made within thirty (30) days of the date of the shipment. J-M must first be given an opportunity to inspect the product alleged to be defective in order to determine if it meets J-M specifications and if the handling, installation, and operating conditions have been satisfactory and in accordance with J-M recommended practices.

Products sold by J-M which are manufactured by others are warranted only to the extent and limits of the warranty of the manufacturer. The limited and exclusive remedy for breach of the above warranty by J-M shall be the resupply of a like quantity of non-defective product. J-M shall not be liable for any INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES OF ANY KIND, INCLUDING, WITHOUT LIMITATION, ANY EXPENSES FOR REMOVAL OR REINSTALLATION RESULTING FROM ANY DEFECT. J-M MAKES NO OTHER REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, IN FACT OR IN LAW, INCLUDING WITHOUT LIMITATION, THE WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, OTHER THAN THE LIMITED WARRANTY SET FORTH HEREIN.

J-M SALES & MARKETING / J-M PIPE CUSTOMER SERVICE CENTER

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OR

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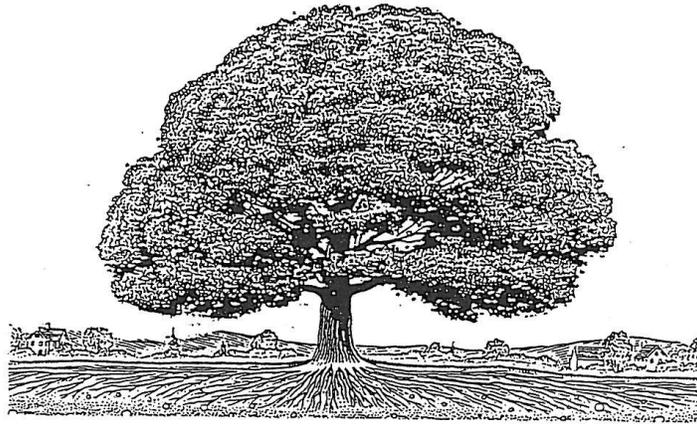
J-M PIPE

J-M Manufacturing Company, Inc.

9 Peach Tree Hill Road
Livingston, NJ 07039

Solutions to Tree - Sidewalk Conflicts

By: Bruce R. Fraedrich, Ph.D, Bartlett Tree Research Laboratories, Charlotte, NC



INTRODUCTION

Sidewalk heaval from tree roots is a common problem in cities. Sidewalk lifting creates a tripping hazard that often leads to litigation. However, if tree roots are arbitrarily removed to prevent or correct sidewalk heaval, the tree is more prone to windthrow. As one city arborist is fond of saying, "A Tree falling in a city has a distinctive sound; it sounds like a law suit".

Sidewalk/tree conflicts can be avoided by matching the species to the site and by carefully designing sidewalk configurations and planting specifications. Where sidewalk heaval has occurred, the tree and site must be carefully evaluated before root pruning and sidewalk replacement is attempted.

TREE ROOT SYSTEMS

Root systems of trees generally occupy the upper foot of soil (Figure 1). Support roots and fine roots often proliferate in the upper few inches, especially in clay or poorly drained soils. When trees are planted between the curb and sidewalk, roots seldom grow under the curb and into the roadbed. Roots grow beneath the sidewalk and in the tree lawn.

Sidewalk heaval results when surface support roots grow in diameter, thereby physically lifting the pavement. The

interface between the sidewalk and soil actually is highly desirable for tree root growth due to the presence of oxygen and moisture within this zone.

PREVENTING ROOT INTERFERENCE WITH SIDEWALKS

Tree selection considerations: Most tree/sidewalk interference can be avoided by selecting species that are compatible with the site. Where tree lawns are less than three feet wide, avoid planting trees. Tree lawns three-to-four feet wide must utilize species that mature to a small height (<30 feet). Tree lawns from five-to-six feet wide should utilize species that reach to less than 50 feet in height. Trees that mature at heights greater than 50 feet should be planted in tree lawns at least eight-to-ten feet wide. Ideally, large maturing trees should be planted on setbacks on private property (at least six feet from the sidewalks). Shade tolerant, small ornamentals can then be planted in tree lawns near the roadside.

Plants to avoid near sidewalks include the following (these species tend to be shallow rooted and are apt to cause sidewalk heaval):

Norway Maple *Acer platanoides*
Red Maple *Acer rubrum*

Sugar Maple	<i>Acer saccharinum</i>
Ash	<i>Fraxinus spp.</i>
Sweetgum	<i>Liquidambar styraciflua</i>
Tuliptree	<i>Liriodendron tulipifera</i>
Pin Oak	<i>Quercus palustris</i>
Poplar/Cottonwood	<i>Populus spp.</i>
Willow	<i>Salix spp.</i>
American Elm	<i>Ulmus americana</i>
Siberian Elm	<i>Ulmus pumila</i>

SIDEWALK DESIGN CONSIDERATIONS:

Alternative sidewalk designs can be used to reduce tree root interference, or at least to extend the time intervals before roots heave the sidewalk.

Expansion Joints: Use expansion joints between sidewalk segments near trees. If roots begin to lift the sidewalk, the joints will limit the number of segments affected. The presence of expansion joints also facilitates removal of sidewalk segments.

Sidewalk Configuration: Sidewalks and curbs can be curved (bowed) around trees to provide more space for development of buttress roots. Reduce the width of the walkway to three feet near trees to provide even greater space. Recent research from Europe indicates that a base of coarse gravel beneath a sidewalk is effective in preventing or at least delaying sidewalk heave. The open pore space in the gravel is not conducive to root growth. Roots develop deeper in the soil, thus preventing or delaying sidewalk heave.

Pavers: The use of bricks or interlocking pavers adjacent to trees can also minimize tree/pavement interference. Individual pavers that have lifted can be removed without replacing the entire sidewalk section. Individual pavers can be lifted and a portion can be removed with a chisel to level them.

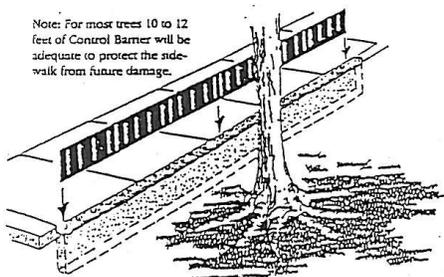


Figure 2. Root barrier used to reduce sidewalk heave.

Planting Techniques: Using root barriers between new plantings and sidewalks (and curbs) can reduce sidewalk heave (Figure 2). Root barriers include commercial polypropylene plastic (Deep Root Products) and geotextile fiber impregnated with herbicides (Biobarrier). Six millimeter plastic also has been suggested as a root barrier.

Barriers should be installed in slit trenches to a depth of 12 inches to encourage deeper rooting or channel roots away from walks and curbs. Barriers should extend five to six feet in each direction from the trunk of the tree.

Polypropylene planter boxes that encircle the root ball of new plantings are intended to direct roots downward to prevent sidewalk interference. There is concern that planter boxes may ultimately girdle trees or disfigure roots. Barriers along sidewalks are preferred.

CORRECTING SIDEWALK INTERFERENCE

Minor Lifts: For minor lifts in sidewalks, consider leaving the heaved section in place. Replace adjacent sections and angle them upward and slightly above the lifted segment. Use expansion joints between the sections. Asphalt "ramps" between lifted sections can be used to reduce the tripping hazard, avoiding a costly complete replacement.

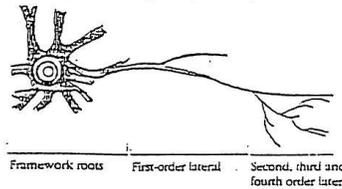


Figure 3. Framework roots are particularly critical for support of the tree.

Major Heave: Where major sidewalk heave has occurred, consider alternatives to root pruning, including curving (bowing) the sidewalk away from the tree, using pavers over a crushed stone base or bridging.

Root Pruning: Roots provide the following functions: support, water and nutrient absorption, energy (starch) storage and synthesis of organic compounds. When trees are root pruned, there is increased risk of windthrow or decline and death. Removing framework (buttress) roots (Figure 3) greatly increases the risk of failure.

If tree failure cannot be risked, then root pruning should not be considered. Tree removal or altering sidewalk designs should be considered as outlined previously.

The following considerations will help minimize the risk of tree failure following root pruning:

STREET TREES

The listed trees are largely able to withstand today's urban conditions: smoke, dust, exhaust gases, soil compaction, extensive heat reflection and limited nutrient & water supply. Due to this unfavorable environment urban street trees do not usually reach normal heights.

Trees to 25 Feet High

(fit under telephone wires)
Suggested spacing: 20'

Acer buergerianum	-	Trident Maple	-	Laburnum spp.	-	Golden-chain
Acer campestre	-	Hedge Maple	-	Malus spp.	-	Most Crab Apples
A. griseum	-	Paperbark Maple	-	M. x atrosanguinea	-	Carmino Crab
A. palmatum	-	Japanese Maple	-	M. baccata & vars.	-	Siberian Crab Apple
A. pensylvanicum	-	Striped Maple	-	M. floribunda	-	Showy Crab
A. plantanoides	-	Norway Maple	-	M. f. Hillierii	-	Crab Apple
A. 'Faassen's Black'	-		-	M. f. Hillierii	-	Hillier Crab
A. pseudoplatanus	-		-	M. Hopa	-	Hopa Crab
'Erectus'	-		-	Malus purpurea	-	
A. tataricum	-	Sycamore	-	x Eleyi	-	Eley Crab
Amelanchier laevis	-	Tatarian Maple	-	Magnolia stellata	-	Star Magnolia
Carpinus caroliniana	-	Serviceberry	-	M. Kobus	-	Magnolia
Cercis canadensis	-	American Hornbeam	-	M. Soulangiana	-	Saucer Magnolia
Cornus florida	-	Redbud	-	Prunus spp. & vars.	-	Flowering Plum, Cherry, Almond
C. kousa	-	Flowering Dogwood	-	P. avium 'plena'	-	Sweet Cherry
Crataegus laevigata	-	Kousa Dogwood	-	P. cerasifera vars.	-	Cherry Plum
(oxyacantha)	-		-	P. serrulata	-	Oriental Cherry
C. x 'Lavallei'	-	English Hawthorn	-	P. s. Amanogawa	-	Oriental Cherry
(carrieri)	-		-	P. s. Kwanzan	-	Oriental Cherry
C. Phaenopyrum	-	Hawthorn	-	P. yedoensis	-	Yoshino Cherry
C. prunifolia	-	Washington Hawthorn	-	Styrax japonica	-	Japanese Snowball
Elaeagnus angustifolia	-	Hawthorn	-		-	
Fraxinus excelsior	-	Washington Hawthorn	-		-	
'Globosa'	-	Hawthorn	-		-	
'Halesia carolina	-	Russian Olive	-		-	
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