

SECTION 6: DESIGN STANDARDS

6.0 GENERAL

1. The subdivision shall be designed in a manner consistent with the guidelines set forth in Appendix C, relating to development by landscape types, which may be amended in the same manner that the Board may amend its Rules and Regulations.
2. All standards under this section shall be considered minimum standards and may be varied from or waived where the Board considers that alternative conditions will serve substantially the same objective. All waivers requested and granted by the Board shall be made in writing, with an explanation for the reasons therefore.
3. Design and construction shall minimize, to the extent possible, the following:
 - a. Volume of cut and fill;
 - b. Materials leaving the site;
 - c. Areas where existing vegetation will be disturbed, especially if such vegetation is located within two-hundred feet (200') of a river, wetland, or water body, or in areas having a slope of more than fifteen percent (15%);
 - d. Number of significant trees removed having a diameter of twelve inches (12") or more, when measured at four feet (4') above finished ground level;
 - e. Extent of waterways altered or relocated;
 - f. Dimensions of paved surfaces and areas (including streets), especially in aquifer recharge areas, except as necessary for safety and convenience, or to comply with the requirements of the Massachusetts Architectural Access Board;
 - g. Direct access from any lot to a collector or arterial street.
4. Design shall emphasize the following:
 - a. Use of collector streets to avoid traffic on streets providing house frontages;
 - b. Visual prominence of natural features of the landscape;
 - c. Maintenance within the subdivision of stormwater runoff and vegetative cover equivalent to conditions before development;
 - d. East-west orientation of streets, so as to allow maximum solar access.
5. Lots, buildings and structures involved in subdivisions shall comply with the Millbury Zoning Bylaw in effect at the time of submission of a preliminary plan, if the definitive plan is approved within seven (7) months of submission of the preliminary plan, except

as varied thereunder.

6. All streets, sidewalks, bikeways, walkways, water mains, pipes, hydrants, fire protection facilities, street lights, drains, basins, culverts, and other related facilities and services shall be installed and completed without expense to the Town in accordance with these Rules and Regulations, and the specifications and requirements of any appropriate board.

6.1 EASEMENTS

To the greatest extent possible, easements shall be located on property lines. Where utilities cross lots or are centered on rear or side lot lines, easements shall be provided of a width of not less than twenty feet (20').

Where a subdivision is traversed by a water course, drainage way, channel or stream, the Board shall require a storm water easement or drainage right-of-way of adequate width and proper side slope to conform substantially to the lines of such water course, drainage way, channel, or stream, and to provide for construction, maintenance or other necessary purposes. In no case shall the width of the easement be less than twenty feet (20'), the boundaries of the storm water easement be closer than five feet (5') horizontally from the annual high water line, or the side slope be steeper than two feet (2) horizontal to one foot (1) vertical. No building shall be constructed and no paving shall be permitted within such easement except as permitted under the Zoning Bylaw. Watercourses shall remain open except at street crossings.

The Board shall require access easements to adjacent properties when such property is undeveloped or underdeveloped, in order to facilitate future development. Such access easement shall be of sufficient width to construct a public way.

6.2 OPEN SPACE

The Board may 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 and shall be at least equal to one (1) acre of land for each twenty (20) dwelling units or fraction thereof shown on the plan. For all non-residential subdivisions, the park shall be equal to three (3) times the floor area of all structures, and ten percent (10%) of the land area. The Board 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 (3) years. Each area reserved for such purpose shall, in the opinion of the Board, be of suitable area, dimensions, topography and natural character for the purpose 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 Board.

Any open space or playground land shall be provided with appropriate frontage on a street, and pedestrian ways will normally be required to provide access from each of the surrounding streets, if any, on which the open space, park or playground has no frontage. Further, such parks and/or playgrounds may be required to have maintenance provided for

by agreements acceptable to the Board, unless the Town purchases the park and/or playground.

The Board 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.

6.3 PROTECTION OF NATURAL FEATURES

All natural features, such as stone walls, trees, wooded areas, water courses, scenic points, and historic spots, shall be preserved as much as possible. Any clearance, backfilling, cutting, thinning or other disturbance to trees twelve inches (12") or greater in diameter measured four feet (4') above finished ground level, located within the minimum front setback distance, shall be prohibited unless deemed both proper by the Board and not in conflict or contradiction with the intent of this Section. Any such proposed clearance shall be shown on the plan and written reasons therefore may be requested by the Board.

6.4 SITE CLEARING PRIOR TO SUBMISSION OF PLAN

In order to preserve natural vegetation which provides high runoff absorption on the site, site preparation, tree cutting, filling, grading, and other work done in anticipation of subdivision approval shall not be performed within three (3) calendar years prior to submission and approval of a preliminary or definitive plan. The Board reserves the right to disapprove any such work, and to order restoration of the site, upon filing of a definitive plan application. If, in the opinion of the Board, excessive vegetation is removed prior to the filing of a definitive plan, a Restoration Plan showing proposed replacement vegetation shall be submitted as part of the definitive plan application and shall require approval by the Board.

6.5 TREES AND LANDSCAPING

1. Existing Trees

To the greatest extent possible, trees within twenty feet (20') of the proposed roadway and building footprints, especially those over twelve inches (12") in diameter four feet (4') above finished ground level, shall be preserved. The following is a list of recommended measures for the protection of trees:

- a. Wherever possible, there shall be no operation of heavy equipment or storage of any materials under said tree within its natural drip line.
- b. Wherever possible, no grading or filling should be done within the drip line.
- c. No bituminous concrete paving or vehicle parking should be located under conifers. No more than twenty percent (20%) of the area under any deciduous tree's natural drip line may be so paved.

d. All drainage from paved areas should be directed away from root zones.

2. Street Trees

Existing trees, which in the opinion of the Board are suitable for street trees, shall be preserved, and where such are inadequate, new trees shall be provided on both sides of all streets.

- a. The Applicant is required to plant suitable broadleaved deciduous trees along roadways within the right-of-way, unless specifically exempted by the Board. All trees shall be the equivalent of well-rooted nursery-grown stock free of injury, harmful insects, and diseases. They shall be well-branched, and of sound structure.
- b. Large-growing trees shall be spaced at intervals of forty-five to fifty-five feet (45' – 55'), medium-growing trees at intervals of thirty to forty feet (30' – 40'), and small-growing trees at intervals of twenty to thirty feet (20' – 30'). Trees on one side of the STREET may be set either opposite or diagonally to trees on the opposite side.
- c. Minimum acceptable sizes of trees to be planted shall be as follows:

Large-growing:	2 ½" trunk diameter, caliper 1' above ground.
Medium-growing:	2 ½" trunk diameter, caliper 1' above ground.
Small-growing:	9' crown height, 5' spread.
- d. Planting operations shall be carried out as required by the Tree Warden.
- e. Requirements for support stakes, guy wire and cable, ground anchors, hose, and wrapping material shall be those contained in Section 6 of the Recommended Standard Specifications for Planting Trees, Shrubs and Vines, compiled and issued by the Associated Landscape Contractors of Massachusetts, Inc.
- f. To limit the spread of pests and disease, no more than twenty (20) trees of the same species may be planted contiguously and may not be planted again unless separated by a minimum distance of five hundred feet (500').
- g. The Applicant shall be responsible for maintenance of planted trees and replacement of those that have died or become diseased from the time of planting through one full year or until street acceptance, whichever is longer. Supplemental irrigation shall be provided to new trees as needed during the summer months to aid growth.

3. Bank Plantings

- a. All cut or fill bankings with slopes greater than 3:1 must be planted with suitable, well-rooted, low growing plantings. All plants shall be the equivalent of nursery-grown stock in good health, free from injury, harmful insects, and diseases.
- b. Deep-rooted perennial grass turf installed as sod is an acceptable alternative for the

planting of banks.

- c. If bank plantings are of a type that are properly spaced at close intervals, eight inches (8") to twelve inches (12") of loam shall be spread over the entire bank. If the plantings are to be widely spaced they may be planted in loam pits.
- d. Mulch (wood chips or equivalent) shall be spread to a minimum depth of six inches (6") among plants for weed and erosion control.
- e. The Applicant shall be responsible for maintenance of bank plantings and replacement of those that have died or become diseased from the time of planting through one full year.

4. Corner Plantings

Requirements for plantings adjacent to street intersections shall be the same as those for Bank Plantings with the following exceptions:

- a. Turf may be provided by seeding as well as by planting sod.
- b. Bushy shrubs and herbaceous plantings that would tend to obscure visibility are not permitted within twenty feet (20') of the street.

5. Cul-De-Sac Plantings

The central radius of a permanent loop turnaround dead-end street should be landscaped. The following options are permitted:

- a. Planting with ground cover using six to eight inches (6" to 8") base of loam and spreading mulch between plants for weed control.
- b. Planting perennial grass by either sod or seed.
- c. Planting ornamental shrubs of a type acceptable to the Board.
- d. Retaining existing vegetation, with approval of the Board.
- e. The standards of the American Nurserymen Association and the specifications of the Associated Landscape Contractors of Massachusetts shall apply to landscaping subject to these regulations.

6.6 GRASS STRIPS

All cleared areas of a right-of-way, not to be planted with groundcover plantings, including all disturbed areas over all culverts in drainage easements, shall be loamed with not less than six (6) inches compacted depth of good quality loam, seeded with lawn grass seed. Seeding shall be done at appropriate times of the year and in a manner to insure growth of grass. Utility poles, signs or similar items shall be placed within the center of the grass strip.

6.7 STREETS AND WAYS

1. General

All streets in the subdivision shall be designed so that, in the opinion of the Board, they will provide safe vehicular travel and natural drainage with no drainage pockets, and so that they are adjusted to the topography and provide the minimum number of intersections with existing and collector streets. Due consideration shall also be given by the Applicant to the attractiveness of the street layout in order to obtain the maximum livability and amenity of the subdivision.

The Board may disapprove a plan where it determines that dangerous traffic conditions may result from inadequacy of the proposed access or of the proposed ways within the subdivision, or of any of the ways adjacent to or providing access to the subdivision.

2. Residential Street Classification

The following classification of residential streets is intended to assist in the evaluation of the design of each street in a subdivision's system, and not intended to be used to set arbitrary standards without assessing the complete plan for a subdivision and the intended use of each street.

Residential streets in each category shall be classified, according to their design, use (actual or intended), their relationship to other streets in the hierarchy and their residential character, in the following categories, defined in Section 2 (Definitions): access street, subcollector, collector, arterial.

3. Dwelling Unit Access

Dwelling units shall not be given direct driveway access to arterial streets, except:

- a. Where existing lots of record abut arterial streets;
- b. In subdivisions that front on an existing arterial street where site conditions prevent other access; or
- c. In special instances where the configuration of the tract prevents the construction of an access road or an interior roadway, after review and approval by the Planning Board and the Director of Public Works.

Where practical and compatible with the zoning and internal layout of the subdivision, dwelling unit driveway access to collector streets shall be avoided.

4. Location and Alignment

- a. Design of all roadways shall be in accordance with the applicable requirements of the current edition of the American Association of State Highway and Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Streets" and the "Massachusetts Highway Department's Highway Design Manual". Provision shall be required for the proper projection of streets, or for

access to adjoining land not yet subdivided.

- b. Reserve strips prohibiting access to streets or adjoining property shall not be permitted except where, in the opinion of the Board, such strips shall be in the public interest.
- c. Horizontal and vertical alignment of all roadways shall provide a desirable stopping sight distance of two hundred feet (200'). The Board may permit a minimum sight distance of one-hundred fifty feet (150'), if it finds that safe driving conditions may be maintained. Stopping sight distance requirements may be increased if the Planning Board finds that the intersecting roadway has a design speed of greater than thirty (30) miles per hour, or if existing conditions indicate that prevailing speeds are greater than thirty (30) miles per hour.
- d. Street jogs with centerline offsets of less than one hundred twenty-five feet (125') shall be avoided.
- e. Property lines at street intersections shall be rounded or cut back to provide for a radius of not less than thirty feet (30').
- f. The minimum centerline radii of curved streets shall be one hundred feet (100') for an access street, one hundred fifty feet (150') for a subcollector, and three hundred feet (300') for a collector street.
- g. No streets shall intersect at less than a ninety (90) degree angle, except that the Board may permit an intersection of not less than sixty (60) degrees if it finds that no safety concerns exist. Property lines at intersections shall be cut back to provide a curb radius of not less than twenty feet (20'). Intersections shall be spaced a minimum of one-hundred twenty-five feet (125') apart.
- h. The centerline of roadways shall coincide with the centerline of the street right-of-way, unless the Board specifically approves a minor variance.
- i. Subdivisions containing more than twenty (20) dwelling units shall require not less than two separate means of access with an existing street or streets deemed sufficient per Section 4.2 or shown on an approved subdivision plan for which a performance guarantee has been filed. The Board may require more than two means of access based on the proposed number of dwelling units, proposed commercial/industrial building square footage or anticipated development impacts.
- j. Streets shall not be built within twenty-five feet (25') of any watercourse, except where a stream crossing has been approved by the Conservation Commission. A street may cross land which is flood prone provided that lots served may be reached by another means of access which is not subject to periodic flooding.
- k. In order to enhance safety and improve the appearance of the street, the Board may require devices and design features such as additional curves or other features that reduce vehicular speed or increase pedestrian or vehicular safety.
- l. Grades of streets shall not exceed six percent (6%) for collector streets and eight percent (8%) for subcollector and access streets. Grades shall not be less than one-

half percent (0.5%) for any street. No street shall contain an eight percent (8%) grade for more than two hundred feet (200'). On any street where the grade exceeds six percent (6%) on the approach to an intersection or cul-de-sac, a leveling area with a slope of not more than four percent (4%) shall be provided for a distance of not less than one hundred feet (100') measured from the nearest exterior line of intersecting street or cul-de-sac.

- m. The centerline slope of a cul-de-sac turnaround shall not exceed four percent (4%).
- n. Street grades shall be designed in relation to existing grades such that the volume of cuts and fills made within the right-of-way approximately balance, except to offset peat, boulders, or other unusable material to be removed.

5. Dead-End Streets

The length of a dead-end street shall never exceed one thousand five hundred feet (1,500'). For the purposes of this Section, any proposed street that intersects solely with a dead-end street shall be deemed to be an extension of the dead-end street.

Dead-end streets shall be provided at the closed end with a t-shaped turn-around or a loop turn-around having an outside roadway diameter of one hundred feet (100') and a property line diameter of one hundred and twenty feet (120') unless otherwise specified by the Planning Board. The Planning Board may, at its option, allow an outside roadway diameter of one hundred sixty feet (160') and the placement of a circular landscaped island with a radius of twenty feet (20') at the center of the turn-around, if the dead-end street is not intended to connect with another street at some future point in time. Responsibility for maintenance of such a landscaped island shall lie with the owners of all lots within the subdivision.

A T-shaped turn-around may be used for cul-de-sacs of up to five hundred feet (500') and serving up to six (6) dwelling units and shall be constructed as follows:

- a. One leg of the turn-around shall be located to the left of the street and positioned perpendicular to the other leg and to the street approaching the turn-around.
- b. Pavement of the turn-around legs shall be of the same width as in the remainder of the cul-de-sac.
- c. The turn-around legs shall be straight, and shall be seventy feet (70') long measured along the intersection of the right-of-way of the legs to the end of legs right-of-way.
- d. The street approaching the turn-around shall be straight for a minimum distance of sixty feet (60').
- e. There shall be no driveways off the ends of the turn-around legs, within twenty feet (20') from the end of pavement, or in the intersection roundings. These driveway-restricted areas shall extend for a depth of ten feet (10') off the pavement edge.
- f. A "No Parking" restriction shall be posted in the turn-around.

Temporary dead-end streets shall similarly provide for a turn-around, which may be located in part on easements over lots so long as contractual assurance is provided that upon extension of the street the terminated turn-around will be removed and replaced with loam and appropriate planting, curb, sidewalks, and trees shall be installed in accordance with the requirements stated herein.

6. Width

The width of street right-of-ways and traveled ways shall not be less than the following:

<i>Right-Of-Way Type</i>	<i>No. of Dwelling Units Potentially Served</i>	<i>Right-Of-Way Width</i>	<i>Traveled Way Width</i>
Access	0 to 20	40 Feet	22 Feet
Sub-Collector	21 to 149	50 Feet	26 Feet
Collector	Over 150	60 Feet	32 Feet

Greater width shall be required by the Board when deemed necessary for present and future vehicular travel.

Reductions of width which are a part of an overall drainage plan to reduce the impervious surfaces in the subdivision and runoff from the parcel may be permitted if the Planning Board deems plans for safety, parking, pedestrian circulation and other factors adequate to accommodate the requested reductions.

Rights-of-Way for pedestrian access adjacent to paved streets shall be obtained where sidewalks, bikeways, or other structures are necessary.

Slopes adjacent to roadways, natural or man-made, may be placed within easements on individual properties rather than acquired as rights-of-way.

6.8 STREET NAMES AND STREET SIGNS

Street names should be in keeping with the character of the Town and should reflect existing natural features and historical events related to the specific location of the subdivision in the Town of Millbury or veterans who gave their lives fighting on behalf of the United States. Street names shall be acceptable to the Planning Board after consultation with the Police Department and the Fire Chief. Street names that may result in confusion with existing names within the Town shall not be permitted.

Street name signs shall be furnished and installed at each street intersection at diagonally opposite corners and shall bear the names of both intersecting streets. Street signs shall be of a design conforming to street signs used by the Town. Street signs shall not be placed on telephone poles, or on any pole containing any other sign. Street signs shall be installed as specified in the latest edition of the Manual on Uniform Traffic Control Devices by the U.S. Department of Transportation.

From the time of rough grading until such time as a street is accepted by the Town as a public street, the signposts at the intersection of such street with any other street shall have affixed thereto a sign designating such street as a private street.

Safety and traffic control signage, including “STOP” signs and any other signs deemed to be required by the Board, in consultation with Town public safety personnel, shall be provided and installed by the Applicant.

6.9 MONUMENTS AND BOUNDARY MARKERS

Granite monuments not less than six inches square (6”) and four feet (4’) long with a three-eighth inch (3/8”) drill hole in the center are to be furnished and set on both sidelines of all points of curvature of streets where the sideline changes direction and points of tangency. Concrete bounds not less than five inches square (5”) and three feet (3’) long with a steel reinforced rebar shall be set at the intersections of lot lines and street rights-of-way, intersections of lot lines and permanent easements and at all points of change of direction of boundary lines of each lot in the subdivision. In instances where a retaining wall, stone wall or ledge interferes with an Applicant’s ability to install a granite monument or reinforced concrete bound, a drill hole may be substituted. In no case shall monuments be spaced more than five hundred feet (500’) apart. (rev. 1/22/07)

No permanent monument shall be installed until all construction which could destroy or disturb the monument is completed. Monument locations shall be staked prior to roadway construction and maintained. Concrete bounds shall be installed prior to the issuance of an occupancy permit. Granite monuments and concrete bounds shall be accurately set in the ground with the top flush with the finish grade of the surface of the ground adjacent to the location in which they are to be placed, unless otherwise specified by the Board. The developer shall excavate a hole sufficiently large to properly place the monuments or bounds and thoroughly tamp around them sufficient material to hold them securely in position. If the material is not satisfactory for backfill, in the opinion of the Town Planner or the Planning Board’s agent, then said holes shall be filled with gravel.

The Applicant’s surveyor shall furnish the Board with a letter certifying that monuments and bounds have been placed precisely as indicated on the definitive plan.

6.10 CURBING

Curbing shall be installed on all streets in all districts as follows:

1. Along the entire perimeter of all cul-de-sacs.
2. Along all curves of street intersections.
3. All sections of a street having a grade of three (3) percent or more shall have curbing. This curbing shall be continued from the end of the three (3) percent grade to the location of the next set of catch basins on the downhill side of such grade.
4. Along any other street where, in the opinion of the Board, curbs are necessary to handle run-off for that section of roadway or curbs are necessary for the maintenance of the pavement and the prevention of pavement edge raveling.

Curbing shall be constructed of granite, unless, in the opinion of the Board, other material will be satisfactory. In most locations, the Planning Board requires the use of Type VA4, or equivalent, vertical granite curbing as defined in Section M9.04.1 of the Massachusetts Standard Specifications for Highways and Bridges:

Minimum length:	6 feet
Width at top:	6 inches
Width at bottom:	4 inches (for 2/3 length)
Depth:	17-19 inch minimum

At curb cuts, vertical granite curbing shall have a bull-nose piece (two-foot (2') radius one-quarter (1/4) curve) and the sloped granite curbing shall consist of a straight piece with the top tapered to be flush with the ground.

Sloped granite curbs shall be Type SA as defined in Section M9.04.2 of the Massachusetts Standard Specifications for Highways and Bridges, or equivalent and shall be required as follows: at intersections with existing streets and at intersections within the subdivision for the distance of the arcs of the intersection radii; surrounding any islands or chokers within the street including landscaped islands in loop turnarounds of cul-de-sac streets; throughout the T-shape turnaround of a cul-de-sac street except for the straight curb line on the right side.

Curbing that connects to an existing street that has no curb or berm, has a different type or shape of curb or berm, or has curb with a lesser reveal, shall have a tapered end piece providing a smooth transition.

Curbing shall be sealed to the road pavement.

The need for curbing may be eliminated along certain roadways, when drainage is provided in swales, which are designed to reduce the rate of runoff, and restore or supply needed water to vegetation in the street right-of-way.

6.11 CURB CUT RAMPS AND CROSSWALKS

Whenever a sidewalk or bicycle path intersects a roadway, handicapped-accessible curb cut ramps shall be provided. Ramps shall be located close to the intersection to keep the width of the crosswalk to a minimum and shall conform with the design standards of the Massachusetts Architectural Access Board, as may be amended. The Board shall require that curb cut ramps contain detectable warnings, such as raised truncated domes with a diameter of nominal 0.9 in, a height of nominal 0.2 in and a center-to-center spacing of nominal 2.35 in and contrast visually with adjoining surfaces, either light-on-dark, or dark-on-light. The Board may require that crosswalks are constructed of textured or stamped concrete/pavement or brick pavers with granite edging. (rev. 2/22/10)

6.12 STREET ENTRANCES

All street entrances (driveways) shall be in accordance with the Rules and Regulations of the Director of Public Works. In no case shall the entrance be constructed until a driveway permit has been issued.

6.13 SIDEWALKS AND BICYCLE PATHS

Sidewalks shall be placed generally parallel to roadways as follows:

1. On both sides of streets providing direct access to commercial and retail facilities.
2. On both sides of streets providing direct access to schools.
3. On both sides of streets providing direct access to public recreational facilities.
4. On both sides of streets in a Business District.
5. On both sides of streets on a collector or sub-collector.
6. On one side of the street on an access street.

Where sidewalks are required on both sides of a street, one of the sidewalks may be eliminated where, in the opinion of the Planning Board, one sidewalk will provide adequate pedestrian circulation.

Sidewalks shall be installed in accordance with the requirements of the Massachusetts Architectural Access Board (521 CMR) in effect at the time of application.

Sidewalk design, including but not limited to, cross-slope, thickness, joints and material composition shall be approved by the Planning Board.

Sidewalk design shall be varied in horizontal layout and location to minimize disturbance of vegetation and to achieve maximum aesthetic value.

When located within the street right-of-way, sidewalks shall be located no closer than six inches (6") from the outside of the layout, with a maximum of pedestrian-vehicular separation. Where sidewalks are located outside of the right-of-way, the Applicant shall reserve suitable easements therefore.

Walkways connecting existing trails should be created whenever reasonable, and developed in new locations when possible.

Sidewalks shall be at least five feet (5') wide.

Public bicycle paths may be required by the Board to provide circulation or access to schools, recreational areas, retail facilities, transportation and community facilities, or where, in the opinion of the Planning Board, bicycle travel in the streets would be dangerous. These paths may, or may not, be part of the normal sidewalk provisions.

Bicycle paths shall be designed in accordance with the current edition of AASHTO's **Guide for the Development of Bicycle Facilities**. The minimum right-of-way of a bicycle path shall accommodate an eight to ten (8-10) foot paved width with two (2) foot graded shoulders on each side. Bicycle paths are to be designed with a minimum centerline radius of fifty (50) feet. Grades shall not exceed five percent (5%) except in those instances where, because of the characteristics of existing terrain, the Planning Board authorizes grades of up to eight percent (8%) for distances of less than one hundred (100) feet.

Provisions to ensure the safe and convenient use of bicycles may include, but may not be limited to, the following: warning or information signs along the bike route, bikeway pavement stencils, a special line on a roadway marked off by a painted line.

6.14 UTILITIES

All required utilities exclusive of transformers shall be placed underground at the time of initial construction. Required utilities may include water, sanitary sewer, storm drainage, telephone, cable television, electricity, gas, and wiring for street lights, unless otherwise specified by the Board. There shall be a minimum of three feet (3') of cover over all utility lines. Except for lot connections, cross-country connections, lift or pump stations, all main water, sewer and drainage utilities shall be located within the paved roadway area.

Where adjacent property is not subdivided or where all the property of the Applicant is not being subdivided at the same time, provision shall be made for the extension of the utility system(s) by continuing the mains the full length of streets, and to the exterior limits of the subdivision at such grade and size that will, in the opinion of the Board, permit their proper extension at a later date. Reasonable provision shall be made for extension of utilities to adjoining properties, including installation of water gates and manholes if necessary. The Applicant shall not deny others connection to the utilities, except that the Applicant shall not be required to pay the cost of such connection.

Connections for water, sanitary sewer, storm drain, gas, electric and telephone service from the main structure in the way to the exterior line of the way shall be constructed for each lot whether or not there is a building thereon, except that the Board may waive such requirement, in whole or in part, in the case of a lot to be used for a park, playground or for any other purpose for which, in the opinion of the Board, such connections shall not be required.

All utilities shall be installed and completed without expense to the Town in accordance with these Rules and Regulations and the specifications of the appropriate boards and departments.

6.15 WATER SYSTEM

When any portion of a subdivision lying outside of the Aquifer and Watershed Protection Overlay District is within one thousand feet (1,000') of a public water supply that is accessible by the borders of the property, or if the Fire Chief and/or Board of Health determines that available water is inadequate to provide safe potable water or fire protection, then the subdivision shall be required to extend public water to the development. Any such extension shall be accomplished in accordance with the requirements of the purveyor of public water, and shall include any appurtenances necessary to ensure adequate water pressure.

Water pipes shall be placed in a trench with a cover of not less than six feet (6'). The piping shall be of cement-lined ductile iron, or other suitable material approved by the Water Company. Gates shall be placed along mains and in accordance with the requirements of the Water Company, but in any case, spaced not more than one-thousand feet (1,000') apart. The size of the mains shall conform to the requirements of the Water

Company and approved by the Board, but, in any event, not less than eight (8") inches in diameter.

Pursuant to Section 6.14, where property is not subdivided or where all the property of the Applicant is not being subdivided at the same time, provision shall be made for the extension of the water system by continuing the mains the full length of the streets and to the exterior limits of the subdivision at such grade and size that will, in the opinion of the Board, permit their proper extension at a later date.

All costs associated with the installation and inspection of water lines and appurtenances, including the resurfacing of the entire width of the affected roadway, shall be borne by the Applicant.

Where public water is not available, the Applicant shall provide evidence that available groundwater can adequately serve the subdivision.

6.16 SEWER SYSTEM

When any portion of a subdivision lying outside of the Aquifer and Watershed Protection Overlay District is within one thousand feet (1,000') of a public sanitary sewer line that is accessible by the borders of the property, the subdivision shall be required to extend public sewer to the development unless the Applicant can prove that the cost of sewer installation exceeds two times the cost of septic system installation. An operating sewage collection system, including pipes, connecting wyes, laterals to the edge of the street right-of-way, manholes, lift station (if necessary), and other related equipment shall be installed to serve all lots in the subdivision. Dry sewer lines shall not be deemed an operating sewerage collection system. All sewerage collection systems shall conform to the Town of Millbury Sewerage Commission's Rules and Regulations, as may be amended, and shall be installed under the supervision of the Sewerage Commission or its designee.

Where an operating sewer main is to be extended by the Applicant from existing sewer service to the subdivision, the main shall serve each existing building and buildable lot, as determined by the Board, along the proposed line by the installation of wyes and laterals in the main at each building and buildable lot location. All laterals shall extend to the edge of the street right-of-way. Pursuant to Section 6.14, where property is not subdivided or where all the property of the Applicant is not being subdivided at the same time, provision shall be made for the extension of the sewer system by continuing the mains the full length of the streets and to the exterior limits of the subdivision at such grade and size that will, in the opinion of the Board, permit their proper extension at a later date.

All costs associated with the installation and inspection of sewer lines and appurtenances, including the resurfacing of the entire width of the affected roadway, shall be borne by the Applicant.

Where public sewers are not available, on-site (septic) systems or private sewer treatment facilities shall be provided. The Applicant shall provide evidence that soils are suitable for such on-site system. All on-site septic systems that are intended to remain under private ownership and control shall be installed under the supervision of the Board of

Health and in strict compliance with Title V of the State Environmental Code. All private sewer treatment facilities shall be installed under the supervision of the Massachusetts Department of Environmental Protection.

6.17 STORMWATER MANAGEMENT

1. General Approach

Lots shall be prepared and graded consistent with drainage into the subdivision, and in such a manner that development of one lot shall not cause detrimental drainage on another lot, or on areas outside the subdivision, to the extent permitted by law.

Any man-made pond or swale constructed for stormwater detention or retention shall be located on a separate lot, to be owned in common by the owners of all lots within the subdivision. Written provision shall be made to ensure that any such facility is properly maintained at no cost to the Town.

Storm drains, culverts, and related facilities shall be designed to permit the unimpeded flow of all natural water courses, to ensure adequate drainage at all low points along streets, to control erosion, and to intercept storm water run-off along streets at intervals reasonably related to the extent and grade of the area being drained.

To the maximum extent feasible, ground water recharge shall be maximized and ground water quality shall be protected. Various techniques shall be used to maximize recharge and create a hydrologically functional lot or site, including the following: vegetated open channel systems along roads, rain gardens, buffer strips, use of amended soils that will store, filter and infiltrate runoff, bioretention areas, and use of permeable pavement. In addition, reduction of impervious surfaces where possible, reduction of heat island effects, and use of water quality units such as grease traps or gas/oil separators will be encouraged. (rev. 1/22/07)

Where the water table is not too high and where the soil is reasonably permeable, low impact development best management practices are encouraged such that the site's natural features and environmentally sensitive areas, such as wetlands, native vegetation, mature trees, slopes, natural drainage courses, permeable soils, floodplains, woodlands, and soils are preserved. Use of stormwater management components that provide filtration, treatment and infiltration such as vegetated areas that slow down runoff, maximize infiltration and reduce contact with paved surfaces are strongly encouraged. (rev. 1/22/07)

Peak stream flows and run-off at the boundaries of the development in a two (2) year, ten (10) year, twenty-five (25) year and one hundred (100) year frequency storm shall be no higher following development than prior to development. (rev. 1/22/07)

2. Design Basis

All subdivision applications, regardless of whether the project is subject to the State's Wetlands Protection Act, shall design the stormwater management system in compliance with the goals and objectives of the Massachusetts Department of Environmental Protection's Stormwater Management Policy (DEP SMP) and any applicable local and federal regulations, with the SMP's nine Stormwater Management Standards, as most recently amended. These apply to industrial, commercial, institutional, and residential subdivision and roadway projects, including site preparation, construction, redevelopment, and ongoing operation. The Applicant

shall also provide calculations indicating compliance with each standard. Refer to the DEP SMP and its referenced sources for specific application of these stormwater management categories.

The design shall include the size, quality, and type of pipe; inlets, manholes, storm water treatment and detention areas; and the percent of grade. The applicable design criterion shall be a zero percent (0%) increase in the peak rate for the two (2), ten (10), twenty-five (25), and one hundred (100) year storm event.

Storm sewers and retention basins shall be designed to convey peak discharge of the twenty-five (25) year frequency storm, and culverts shall be designed to convey the peak discharge of the one-hundred (100) year frequency storm. Detention ponds shall be designed to provide no increase in peak discharge to any off-site area in the two (2) year, ten (10) year, twenty-five (25) year and one-hundred (100) year storm event.

3. Design Method

Storm Drainage calculations shall be based upon the modified soil cover complex method with Storm Drainage design based upon the objectives, principles and design considerations set forth in Residential Storm Water Management, published jointly by the Urban Land Institute, the American Society of Civil Engineers and the National Association of Home Builders, 1975 and upon the guidelines for Soil and Water Conservation in Urbanized Areas of Massachusetts, published by the USDA, Soil Conservation Service, 1975. These publications are hereby incorporated as a part of these Rules and Regulations.

The sediment forebay at the inlet of a detention basin shall be sized for a minimum of one year sediment volume and shall be at least ten feet (10') long. The sediment forebay shall have a maintenance access of ten feet (10') or wider, with a maximum slope of fifteen percent (15%) and a maximum cross slope of three percent (3%). A detention basin shall be sized to store one inch (1") of rainfall times the impervious area below the primary spillway. The basin shall have a long flow path rather than a low flow channel, with a length twice as long as it is wide. The detention basin shall have maximum side slopes of 4:1, and a minimum of six inches (6") topsoil and six percent (6%) organic content. (rev. 1/22/07)

Water velocities in pipes and gutters shall be not less than two feet (2') per second, and not more than ten feet (10') per second, and not more than five feet (5') per second on ground surfaces.

For determination of the extent of development, all undeveloped tributary areas shall be assumed to be fully developed in accordance with the Millbury Zoning Bylaw.

4. Storm Drainage Structures

a. Piping

All drain pipes shall be at least twelve inches (12") inside diameter, made of High Density Corrugated Polyethylene (HDPE) Smooth Lined Pipe conforming to Massachusetts Highway Department (MHD) requirements as identified in the

Standard Specifications for Highways and Bridges, as last updated. Castings shall be manufactured in the United States or Canada, and conform to MHD specifications.

Unless otherwise specified herein, thermoplastic pipe and joint fittings shall conform to the following:

1. High Density Polyethylene (HDPE) Corrugated and Smooth Lined Pipe & Fittings shall be manufactured in accordance with requirements of ASTM F 2306, latest editions.
2. High Density Polyethylene (HDPE) Corrugated and Smooth Lined Pipe shall be manufactured from virgin PE compounds which conform with the requirements of cell class 335400C as defined and described in ASTM D 3350.

Installation shall be in accordance with ASTM D 2321, "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications".

Thermoplastic pipe shall be unloaded and handled with reasonable care. Pipe shall be placed in the bed starting at the downstream end. Trenches must be excavated in such a manner as to insure that the sides will be stable under all working conditions. Trench walls shall be sloped or supported in conformance with all standards of safety. Only as much trench as can be safely maintained shall be opened. All trenches shall be backfilled as soon as practicable, but no later than the end of each working day.

Trench width shall be sufficient to ensure working room to properly and safely place and compact haunching and other backfill materials. Minimum trench width shall not be less than 1.25 times the pipe outside diameter plus twelve inches (12"). (1.25 x O.D. + 12") Note: On multiple pipe barrel runs the clear distance between pipes is as follows:

12"-24" Diameters: Clear span = 12"

24" & Greater Diameter: Clear span = $\frac{1}{2}$ x Diameter

Foundation and bedding shall meet the requirements of AASHTO M 145, A-1, A-2-4, A-2-5, or A-3. A stable and uniform bedding shall be provided for the pipe and any protruding features of its joint and / or fittings. The middle of the bedding equal to one-third (1/3) of the pipe O.D. may be loosely placed, while the remainder shall be compacted to a minimum ninety percent (90%) of maximum density per AASHTO T99. A minimum of four inches (4") of bedding shall be provided prior to placement of the pipe, unless an unyielding material (rock cuts) is present in the trench bottom, then a six inch (6") cushion of bedding is recommended. Bedding material size shall be one and one-half inch (1 1/2") maximum granular material.

Structural backfill shall also meet the requirements of AASHTO M 145, A-1, A-2-4, A-2-5, or A-3. Structural backfill shall be placed and compacted in layers eight inch (8") loose lift thickness and brought up evenly and simultaneously on

both sides of the pipe to an elevation not less than one foot (1') above the top of the pipe. Structural backfill must be worked into the haunch area and compacted by hand. Structural backfill shall be one and one-half inch (1 1/2") maximum granular size and a minimum compaction level of ninety percent (90%) Standard Proctor Density per AASHTO T99 shall be achieved.

The minimum cover is one foot (1.0') for HS-25 Live Loads (12"-48" Diameters) and two feet (2.0') for larger diameter structures (60" Diameters). However, care should be taken when heavy construction equipment loads cross the pipe trench during construction. If the passage of construction equipment over an installed pipeline is necessary during project construction, compacted fill in the form of a ramp shall be constructed to a minimum elevation of three (3.0') feet over the top of the pipe. Any damaged pipe shall be replaced at the contractor's expense.

b. Catch Basins and Manholes

A catch basin to manhole drain configuration shall be used. Generally, catch basins will be required on both sides of roadway on continuous grade at intervals of not more than two hundred fifty feet (250'). Any catch basins and manholes used shall be at least six feet (6') deep and four feet (4') diameter (inside measurements), with a four foot (4') or greater sump below pipe invert and shall be constructed of concrete blocks or precast concrete units. Manhole covers and grates shall be in conformance with Massachusetts Highway Department specifications, designed and placed so as to cause no hazard to bicycles. All materials used shall be of a type and manufacture approved by the Director of Public Works.

c. Security Bars

Security bars shall be provided at the entrance to all culverts, or open pipe drains over eighteen inches (18") in diameter. The grate shall be constructed of steel bars not less than one-half inch (1/2") diameter welded together to provide a grate not smaller than the pipe opening. The vertical bars shall be placed with two inch (2") clear openings between them, and the horizontal bars shall be placed twelve inches (12") on center. The grate shall be installed not closer than one pipe diameter upstream from the entrance in a manner approved by the Planning Board or its agent. A suitable sketch of the grate and method of installation shall be submitted for approval with the plans for the drains and appurtenances.

d. Headwalls

Concrete or field stone masonry headwalls shall be provided at both ends of culverts and the discharge ends of storm drains, and be placed a distance of not less than sixty-five feet (65') from the way line.

5. Scour Protection

The discharge ends of all drains with flowing full velocities of four feet (4') per second or more shall be protected with a rip-rap apron of a width not less than three times the nominal diameter of the pipe. The rip-rap apron shall extend for a distance

of not less than ten (10) times the nominal pipe diameter from the end of the discharge pipe. The rip-rap for exit velocities of ten (10') feet per second or less shall be composed of a layer of stones twelve (12") inches in thickness or more, placed upon a bed of sand and gravel six inches (6") in thickness. The stones shall be sized so that not less than sixty percent (60%) shall have one dimension twelve (12") inches or more. The stones after being laid shall be carefully chinked by hand to make a reasonably smooth and shaped surface. Where exit velocities are greater than ten feet (10') per second, the thickness of stones and the dimensions of the individual pieces shall be sized to prevent displacement by the flow. In this case, details shall be prepared by an engineer and submitted to the Board for approval.

6. Connections

Proper connections adequate to accommodate the drainage flow from the subdivision shall be made with any existing drains in adjacent streets, or easements on abutting properties. In the absence of such facilities, or inadequacy of the same, it shall be the responsibility of the developer to extend drains from the subdivision as necessary to properly dispose of all drainage from said subdivision in a manner determined to be proper by the Board.

Pursuant to Section 6.14, where property is not subdivided or where all the property of the Applicant is not being subdivided at the same time, provision shall be made for the extension of the drainage system by continuing the mains the full length of the streets and to the exterior limits of the subdivision at such grade and size that will, in the opinion of the Board, permit their proper extension at a later date.

6.18 FLOOD HAZARD AVOIDANCE

Any subdivision located in any part within the Flood Plain District established under the Zoning Bylaw shall comply with the following:

1. Subdivision design shall be consistent with the need to minimize flood damage within the flood-prone area, through use of clustering, open space reservation, street profile design, and drainage.
2. All public utilities and facilities, such as sewer, gas, electrical, and water systems shall be located and constructed to minimize or eliminate flood damage.
3. Drainage systems shall be designed in consideration of possible flooding to the Base Flood Elevation.

6.19 STREET LIGHTING

Lighting shall be cast downward to prevent light from shining into residences or the eyes of pedestrians or drivers. At a minimum, lighting fixtures shall be placed at all street intersections and in the area of fire hydrants when applicable. Additional lighting fixtures shall be placed at a maximum of three hundred (300') feet apart, on curves or other hazardous locations as determined by the Planning Board, and in the vicinity of fire hydrants. Lighting fixtures shall have a maximum height of twenty (20) feet. All lighting

fixtures must be energy-efficient (i.e. LED), compatible with National Grid Company-owned equipment and be constructed in accordance with National Grid Company specifications, so as to assure equipment eligibility for National Grid Company service under Street Lighting Rate S-3 Option B or the most recently effective equivalent rate. Other types of luminaries and/or poles desired by the Applicant may be used if approved by the Planning Board and National Grid Company (or its successor). (rev. 12/13/10)

The Applicant shall purchase and install all streetlights in accordance with the approved street lighting plan. The Applicant shall dedicate the street lights to a homeowner's association or the Town of Millbury at the time of acceptance of the streets as public ways. The Applicant shall provide electrical power to street lights, and shall be responsible for their operation and maintenance until such time as streets and ways within the subdivision are conveyed to a homeowner's association or accepted by the Town.

6.20 FIRE PROTECTION

Where a public water supply will be installed within the subdivision, no hydrant shall be placed more than five hundred feet (500') from a dwelling. Hydrant location shall be subject to the approval of the Fire Chief and a flow test shall be conducted on all hydrants to determine water availability for fire protection **before** any construction is allowed to begin. All gates, valves and hydrants shall conform to the requirements of the Fire Chief and the Water Company.

Where no public water supply is available, an adequate water supply shall be provided in accordance with the Fire Chief's and Planning Board's recommendations.

6.21 INDUSTRIAL SUBDIVISION

Industrial subdivisions shall comply with all requirements of the Rules and Regulations except as noted in this section.

All streets shall be constructed as collector streets and all appropriate design standards shall apply.

Curb radii shall not be less than fifty feet (50').

A dead-end street shall contain no more than two hundred fifty thousand (250,000) square feet of floor area. To construct more than two hundred fifty thousand (250,000) square feet of floor space, a secondary means of access, adequate in the opinion of the Board, shall be provided.

6.22 IMPROVEMENTS OUTSIDE THE SUBDIVISION

Existing streets and sidewalks providing access to streets and sidewalks within a proposed subdivision shall be considered to provide adequate access where, prior to construction on any lots, the Applicant ensures that such access will be in compliance with the Rules and Regulations for right-of-way width, pavement width, maximum grade,

and sight distance requirements applicable to ways within a subdivision. When existing streets, sidewalks and utilities to service a proposed subdivision are deemed inadequate to handle the impact of the development, the Applicant may be required to complete, at the Applicant's expense, improvements outside the boundaries of the subdivision to insure adequate access that is safe and convenient to travel and for securing adequate provisions for drainage and other requirements as may be necessary. Said street, sidewalk and utility improvements outside the boundaries of the subdivision shall not exceed fifty percent (50%) of the total cost of the street, sidewalk and utility costs within the subdivision.