

APPENDIX A - DESIGN STANDARDS

SECTION 1.0 - ENGINEERING AND ADMINISTRATIVE PROCEDURES

1.1 INTRODUCTION

These standards have been prepared to insure that the design and construction of public improvements will meet the minimum requirements of the Town. The intent of Section 1 is to provide an overview of requirements and procedures required by the Land Division Ordinance, which govern the design and construction of public improvements. These standards are also intended to provide uniform design criteria for facilities designed for or directly by the Town, as well as provide specifications for private development within the Town. These standards shall also apply to previously platted subdivisions where improvements have not yet been installed.

1.2 DEFINITION OF TERMS

(See Section 18.15 of the Land Division Ordinance)

1.3 SCOPE

In addition to the Town, the review and approval of contract documents for certain types of improvements may also fall within the jurisdiction of other public agencies. These standards are not intended as a substitute for the requirements of other public agencies. It shall be the Subdivider's responsibility to insure that the proposed contract documents meet the requirements of all other public agencies and that any and all permits and bonds required by such agencies are secured.

1.4 PRE-DESIGN CONFERENCE

It is recommended that after preliminary plat approval and prior to the development of detailed drawings, the Subdivider and the Design Engineer meet with the Town Engineer to review Town requirements and any other proposed projects or existing conditions that may affect the final project design. The request for this preliminary meeting, if desired, shall be initiated by the Design Engineer.

1.5 DRAWING PREPARATION REQUIREMENTS

All drawings submitted for approval shall bear the name of the Design Engineer, his/her signature, the imprint of the Professional Engineer seal, and his/her address and telephone number. Where feasible, drawings shall consist of 24-inch x 36-inch sheets. Drawings shall be clear and legible, and shall be drawn to a conventional, even scale which will permit all

necessary information to be plainly shown. All elevations shall be referenced to National Geodetic Vertical Datum (mean sea level) datum where available and benchmarks shall be noted. All improvements proposed for use on the project shall be indicated on the drawings. All proposed improvements and all existing municipal and privately owned utilities shall be shown in both plan and profile.

1.6 SPECIFICATION REQUIREMENTS

- A. Technical specifications shall be complete in themselves, except that appropriate specific sections of the most recent edition of the "Standard Specifications for Highway and Structure Construction", as published by the Department of Transportation, State of Wisconsin, (WDOT Standard Specifications), the "Standard Specifications for Sewer and Water Construction in Wisconsin", published by the Public Works Industry Improvement Program, and the various standard published material specifications prepared by associations such as the "American Society for Testing and Materials" (ASTM) or the "Concrete Reinforcing Steel Institute" (CRSI), may be incorporated by reference.
- B. The specifications shall include, but not be limited to, all information not shown on the drawings which is necessary to establish in detail the quality of materials and work required in the project, allowable parameters for testing the various parts of the project and instructions for testing material and equipment. Wherever there is conflict between the written specifications and the drawings, the more stringent requirements, as determined by the Town, shall apply.
- C. The specifications shall include a clause that all work included shall be guaranteed by the Contractor to be free from defects in construction and materials for a period of one (1) year after completion of all construction items. The specifications shall include a statement that all work was performed in conformance with the approved drawings and specifications. A statement of comprehensive liability insurance shall also be provided as required in Section 18.14(3) of the Land Division Ordinance.

1.7 DESIGN COMPUTATION REQUIREMENTS

A. Design computations shall be made by the Design Engineer for all phases of the project when such computations are required to facilitate review by the Town Engineer. Said computations shall be neat and legible and in a form considered acceptable by the Town Engineer. Said computations shall include, but not necessarily be limited to, the following:

1. Detention, Retention or Infiltration Basin Design
2. Temporary and Permanent Erosion and Sediment Control Designs
3. Storm Sewer System Design Including Inlet Capacity
4. Road and Driveway Culverts
5. Drainage Ditch Design
6. Water Quality Facility Designs

1.8 OPINION OF PROBABLE COST

The Design Engineer shall prepare an itemized opinion of the probable cost of the work. The opinion shall delineate public and private (onsite) improvements when applicable. This opinion of probable cost shall be submitted with the construction plans and reviewed by the Town Engineer to assure adequate bond amounts and to set the review fees.

1.9 OTHER PERMIT APPLICATIONS AND APPROVALS

Other governmental agencies may review and approve, for construction, all or certain parts of the work included in a project and may require a permit for such work. They may also require that an application for a permit be executed by the Town. When such permit application is required, it shall be prepared by the Design Engineer. All required permits and necessary authorizations from other governmental agencies shall be secured by the subdivider.

1.10 REVISIONS TO APPROVED DRAWINGS AND SPECIFICATIONS

Any deviations from previously approved drawings or specifications affecting capacity, stability or operation of the system shall be approved in writing by the Town Engineer before such changes are made. Minor changes not affecting capacity, stability or operation of the system will not require formal approval, but must be approved in writing by the Town Building Inspector or Town Engineer.

1.11 CONSTRUCTION SUPERVISION

The Town Engineer shall conduct construction review of all utilities and improvements, that when completed, shall be dedicated to the Town. This includes, but is not limited to, streets and roadways, underground utilities, storm water management facilities and mass grading. Performance certifications and as-built drawings shall be the responsibility of the design engineer or other independent professionals employed by the subdivider.

1.12 EXISTING FACILITIES

Drawings and specifications shall provide for the continuous operation of existing facilities without interruption during construction, unless otherwise specifically authorized by the Town Engineer.

1.13 RECORD DRAWINGS

Reproducible record drawings signed and sealed by the Design Engineer or other independent professional employed by the Subdivider shall clearly show any and all changes from the approved drawings. The record drawings shall be based on actual measurements of both horizontal and vertical dimensions, made after the completion of the work. Record drawings shall be submitted to the Town Engineer upon final acceptance of the work.

1.14 WAIVER OF DESIGN STANDARDS

Where conditions so warrant, the Town Plan Commission of the Town of Bloomfield may consider waiving any of the requirements found in these standards upon appeal by the Subdivider, per Section 18.02(5) of the Land Division Ordinance.

SECTION 2.0 EROSION CONTROL

2.1 INTRODUCTION

Project construction required in connection with a development often occurs in or adjacent to areas with existing surface or underground improvements. The intent of this Section 2 is to specify Town requirements relative to construction affecting existing and future improvements. Drawings and specifications presented for Town approval shall provide for the implementation of the requirements of this Section.

2.2 EROSION CONTROL

- A. Erosion and sediment control due to run-off, equipment leaving and entering a construction site, wind, etc., are required for all construction. Site engineering or grading plans for projects shall either contain specific provisions for erosion control or a separate erosion control plan. The provisions or plan will follow accepted techniques and details as found in the "Wisconsin Construction Site Best Management Practice Handbook", or as directed by the Town Engineer.
- B. Channelized runoff from adjacent areas passing through the site shall be diverted around disturbed areas, if practical. Sheet flow runoff from adjacent areas greater than 10,000 square feet in area shall also be diverted around disturbed areas unless shown to have resultant runoff velocities of less than 0.5 feet/second across the disturbed area based upon a ten-year, 24-hour design storm. Diverted runoff shall be conveyed in a manner that will not erode the conveyance and receiving channels. Diverted runoff shall not create adverse effects to neighboring properties.
- C. All activities on the site shall be conducted in logical sequence to minimize the area of bare soil exposed at any one time.
- D. Runoff from the entire disturbed area on the site shall be controlled by meeting either Subsections 1 and 2 or 1 and 3 below:
 - 1. All disturbed ground left inactive for seven or more days shall be stabilized by temporary or permanent seeding, temporary or permanent seeding and mulching, sodding, covering with tarps or equivalent control measures. If temporary seeding is used, a permanent cover shall also be required as part of the final site stabilization. Seeding or sodding shall be conducted as specified in the WDNR's Wisconsin Construction Site Best Management Handbook or the National Resources Conservation Service technical standards. Variances from the requirements of this subsection may be granted by the Town Engineer upon application, but only if failure to comply is due to extended period of rain or other construction delays beyond the control of the responsible party.

2. For sites with five or more acres disturbed at any one time, or if a channel originates in the disturbed area, one or more sedimentation basins shall be constructed. Each sedimentation basin shall be designed and constructed as specified in the WDNR=s Wisconsin Construction Site Best Management Practice Handbook or in accord with Natural Resources Conservation Service Technical Standards manual.
 3. For sites with two to five acres disturbed at any one time, one or more temporary sediment trap shall be designed and constructed as specified in the WDNR=s Wisconsin Construction Site Best Management Practice Handbook or in accord with Natural Resources Conservation Service Technical Standards manual.
 4. For all disturbed sites, filter fences, straw bales or equivalent control measures shall be placed along all side slope and down slope sides of the site. If a channel or area of concentrated runoff passes through the site, filter fences shall be placed along the channel edges to reduce sediment reaching the channel.
- E. Runoff from sites on slopes of 12 percent or more slope may require additional or different erosion controls. Requirements for such shall be as specified in accord with Natural Resources Conservation Service Technical Standards or the WDNR=s Wisconsin Construction Site Best Management Practices Handbook.
- F. No soil or dirt storage pile containing more than ten cubic yards of material shall be located within a down slope drainage length of less than 25 feet to a street, highway, roadway or channel. Immediately below such piles, on the down slope side, straw bales or filter fence barriers shall be placed. If such storage piles are to remain in place for more than 30 days, they shall be stabilized by mulching, vegetative cover, tarps or other means. In street utility repair or construction work, soil or dirt piles located closer than 25 feet to a street, highway or roadway or drainage channel shall be covered with tarps or suitable alternative control measures are to be used if such piles are exposed for more than seven days at a time, and storm drain inlets must be protected from sediment laden runoff.

2.3 MAINTENANCE OF CONTROL MEASURES

- A. All soil erosion and sediment control measures necessary to meet the requirements of this ordinance shall be maintained periodically by the applicant or subsequent land owner during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance. The erosion control measures shall be inspected after each 0.5 inches or more of rainfall and at least once each week. Repairs shall be made within 24 hours of discovery.
- B. At the completion of any project, the storm sewers, culverts, gutters, etc., will be inspected by the Town Engineer to determine any cleaning of trapped sediment which may be required.
- C. Once all disturbed areas have been vegetated, the temporary erosion control measures shall be removed. Land disturbed by the removal of the temporary erosion controls shall be restored.

2.4 INSPECTION

- A. The Town Engineer shall make periodic inspections of the erosion and sediment control measures. The Town Engineer shall notify the permittee wherein the work fails to comply with erosion and sedimentation control plan as approved. Approved plans for grading, stripping, excavating, and filling of the site shall be maintained at the site during progress of the work.

2.5 SPECIAL PRECAUTIONS

- A. If at any stage of the development site that the Town determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the Town may require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as is considered advisable to avoid the likelihood of such peril. "Special precautions" may include, but shall not be limited to, a more level exposed slope, construction of additional erosion and sediment control facilities, berms, terracing, compaction, or crimping, installation of plant materials for erosion control, and recommendations of a soils engineer which may be made requirements for further work.
- B. Where it appears that storm damage may result because the

grading on any development site is not complete, work may be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. In large developments or where unusual site conditions prevail, the Town may specify the time of starting of grading and time of completion or may require that the operations be conducted in specific stages so as to insure completion of protective measures or devices prior to the advent of seasonal rains.

2.6 PROTECTION OF PROPERTY AND SURFACE STRUCTURES

- A. Trees, shrubbery, fences, poles and all other property and surface structures shall be protected during construction operations. Any fences, poles or other man made surface improvements which are moved or disturbed shall be restored to their original condition, after construction is completed. A tree preservation plan may be required for all areas of a project that will be affected by the development activity. The plan shall show the location and trunk diameter of all trees of a diameter breast height (DBH) of 10-inches and larger. The plan shall be taken to the extent practicable to preserve healthy trees over 10-inches DBH. Any trees, shrubbery or other vegetation which are approved for removal shall be removed completely, including stumps and roots.
- B. Where trees which are to remain, proper care should be taken during excavation operations. Do not machine excavate in the "root protection zone" defined as a circle around the tree with a radius equal to one foot for every inch of tree diameter. Roots encountered outside this zone which are over 2-inch diameter shall not be cut unless approved by the Town Engineer. Tree tunneling, where necessary, shall be determined by the Town Engineer. Shrub and tree limbs shall be tied back to prevent loss or damage. Any damaged limbs and branches shall be pruned and sealed. Spoil materials shall be removed by hand from around trees to prevent damage to trunks by construction machinery.
- C. Trees and shrubs which cannot be protected or are damaged during construction shall be replaced in kind or replace 4-inch diameter and larger trees with one 4-inch diameter size tree for each 6-inch of original tree diameter or fraction thereof. Replacement species shall be approved by the Town.
 - 1. Trees which do not survive (in good condition) for a period of 24 months after planting shall be removed and replaced.

2.7 CONTENT OF EROSION CONTROL PLAN

The content of an erosion control plan for land developing and disturbing activities shall be as follows:

- A. Existing Site Conditions. The plan must show existing site conditions on a scale of at least one inch equals 100 feet showing the site and surrounding areas. The map shall depict accurately:
 1. Site boundaries and adjacent lands which accurately identify site locations.
 2. Lakes, streams, wetlands, channels, ponds, ditches or other watercourses on and immediately adjacent to the site.
 3. 100-year floodplains, flood fringes and floodways.
 4. Location of the predominant soil types.
 5. Vegetative cover.
 6. Location and dimensions of storm water drainage systems and natural drainage patterns on and immediately adjacent to the site.
 7. Locations and dimensions of utilities, structures, roads, highways and paving.
 8. Site topography at a contour interval not to exceed two feet when construction site has more than five acres of drainage or has a ten percent slope or greater. All sites within County regulated 75 foot shoreland setback areas must show 2 foot existing and proposed contours for any proposed grade changes. Areas with less than five acres or less than ten percent slope shall not require any topography map unless the site requires storm water review according to applicability of this article. Both existing and proposed contours must be shown on the same plan to the same scale.
- B. Plan of Final Site Conditions. A plan of final site conditions on the same scale as the existing site map showing the site changes.
- C. Site Construction Plan. A site construction plan including:

1. Locations and dimensions of all proposed land disturbing activities.
2. Locations and dimensions of all temporary soil or dirt stockpiles.
3. Locations and dimensions of all construction site erosion and sediment control measures necessary to meet the requirements of this article.
4. Schedule of anticipated starting and completion date of each land disturbing or land developing activity, including the installation of construction site control measures needed to meet the requirements of this article.
5. Provision for maintenance of the construction site control measures during construction.

SECTION 3.0 RESTORATION OF EXISTING IMPROVED SURFACES

3.1 GENERAL

The Contractor shall restore all permanent type pavements, sidewalks, driveways, curbs, gutters, trees, shrubbery, lawns, fences, poles and other property and surface structures removed or disturbed during or as a result of construction operations to a condition that existed before the work began. The surface of all improvements shall be constructed of the same material and match in appearance the surface of the improvements which were removed.

3.2 SAW CUTTING

When necessary to remove sections of existing pavement, sidewalk, or curb and gutter, and prior to removal of existing pavement, the edges of the section to be removed shall be cleanly cut to full depth with a pavement saw. Prior to any pavement restoration, any unsawn edges shall be cleanly cut to full depth with a pavement saw. Saw cutting should be performed with cuts that are parallel to or perpendicular to the longitudinal edge or centerline of the pavement, sidewalk, driveway, or curb and gutter.

3.3 REMOVAL OF ROADWAY PAVEMENTS, SIDEWALKS, DRIVEWAY AND CURB

Where concrete pavement, sidewalk, driveway or curbing is cut, the width of the cut shall exceed the actual width of the top of the trench at subgrade by twelve (12) inches on each side.

Exposed surface of Portland Cement or asphaltic concrete shall be cut with a pavement saw to full depth before removal.

3.4 CONCRETE PAVEMENT SURFACE

Existing Portland cement concrete shall be replaced with a minimum 8 inch depth of Portland cement concrete pavement. If the existing concrete pavement is thicker than 8 inches, the thickness of new concrete pavement shall match the thickness of the existing concrete pavement. The new concrete pavement shall be tied to existing concrete pavement using #4 steel reinforcing tie bars spaced 2 feet on center. Existing traverse contraction joints shall perpetuate through the new concrete pavement section using dowel bars instead of #4 steel reinforcing bars in accordance with WDOT Standard Specifications. Portland Cement concrete and construction methods for Portland Cement concrete pavement shall conform to the current requirements of the (WDOT) Standard Specifications. Pavement joints and reinforcing in the replacement pavement shall conform to and match that in the adjacent pavement area.

3.5 ASPHALTIC CONCRETE PAVEMENT SURFACE

- A. Where the existing pavement surface is asphaltic concrete and the base consists of a rigid material such as brick or Portland Cement concrete, the base replacement shall consist of 8-inch Portland Cement concrete base course. Portland Cement concrete shall be as noted in Section 3.4 above.
- B. Asphalt pavement replacement shall consist of a minimum 4 inch thick asphaltic concrete pavement placed in two (2) layers. The lower layer shall be a minimum 2-1/4 inches in thick. The upper layer shall be a minimum 1-3/4 inches thick. If the existing asphaltic concrete pavement is thicker than 4 inches, the thickness of new asphalt pavement shall match the thickness of the existing asphalt pavement. Lower layer thickness shall not exceed 4 inches in depth and upper layer thicknesses shall not exceed 3 inches. All asphaltic concrete pavements shall comply with WDOT specifications.

3.6 BASE COURSE

All base courses shall be replaced with dense graded base aggregate conforming to WDOT Specifications. The minimum depth of dense grade based placed under roadways shall be a minimum of 10 inches when placed under asphaltic concrete pavement and a minimum of 6 inches when placed under concrete pavement. If the existing base course is thicker than as stated above, the base course thickness shall be that of the existing base course.

3.7 CONCRETE SIDEWALKS, DRIVEWAYS, CURB, CURB AND GUTTER

- A. Where necessary to remove and replace concrete sidewalk, driveways, curb and curb and gutter, replacements shall be made according to the Town Ordinance regulating the construction of driveways, approaches and sidewalks.
- B. Curb or curb and gutter dimensions and cross sections shall be replaced to meet "Americans with Disabilities Act" specifications. Preformed expansion joints in sidewalks shall be one-half inch thick and shall be spaced at intervals not exceeding 96 feet. Expansion joints in concrete curb and gutter shall be placed to match any existing expansion joints, at radii ends, and 3 feet either side of storm water structures. Concrete curb and gutter expansion joints shall be three-quarter (3/4) inch preformed joints. Contraction joints shall be saw cut a minimum 2 inches deep and spaced to match preformed joints. Contraction joints shall be saw cut a minimum 2 inches deep and spaced at intervals of 20 feet. Contraction joints in concrete sidewalk shall be saw cut a minimum one (1) inch deep and spaced at intervals of a minimum of 4 feet and a maximum of 10 feet. Sidewalks shall be finished in accordance with WDOT Specifications.

3.8 CULTIVATED LAWNS

Provide topsoil, seeding, sodding, and care of grass during establishment period for a complete surface restoration of lawns, parkways, and other areas disturbed as a result of the construction.

A. Topsoil

- 1. Topsoil shall be furnished and properly placed, raked, and rolled to minimum depth of 4-inches. The topsoil furnished shall consist of loose, friable, loamy, non-acid soil, free of large roots, brush, sticks, weeds, stones larger than 1/4-inch in diameter, and any other debris.

2. Before topsoil is placed, the area to be covered shall be brought to the proper grade. If the existing surface has become hardened or crusted, it shall be raked or otherwise loosened to provide suitable bond with the topsoil.
3. Apply commercial grade fertilizer uniformly at a rate of seven (7) pounds per 1,000 square feet. Work fertilizer into soil prior to seeding or sodding.

B. Sodding

1. Provide sod in developed areas that were grassed prior to construction and as indicated on the drawings. Sodding shall also be used in ditches and drainage swales and on all embankment slopes steeper than 4 to 1 unless protection is provided against erosion of seeding. At the Contractor's option, sodding may be substituted for seeding.
2. The cut sod shall be not less than 2-inches thick. Sod which has been cut more than 48 hours prior to installation shall not be used without the approval of the Town Engineer.
3. Sod shall be placed according to Section 631 of the (WDOT) Standard Specifications. Place sod with edges in close contact and alternate courses staggered. On slopes 2 to 1 or steeper, sod shall be staked with at least one stake for each piece of sod. Do not place sod when the ground surface is frozen or when air temperatures may exceed 90 degrees F.
4. New sod shall be watered daily at the rate specified in Section 631 of the (WDOT) Standard Specifications for a minimum of 10 days after the specified initial watering. Any defective, dead or dying sod shall be removed and replaced up to one year after completion of the sodding.
5. In ditches, the sod shall be placed with the longer dimension perpendicular to the flow of water in the ditch. On slopes, starting at the bottom of the slope, the sod shall be placed with the longer dimension parallel to the contours of the ground.

C. Seeding

1. All disturbed grassed areas shall be seeded in accordance with WDOT Specifications. Seed may be sowed by broadcasting at a uniform rate or by spreading using hydro seed methods. Seed may be sown at any time during the growing season and as weather permits. Seeding shall not be performed during windy conditions or on frozen soil.
2. Apply vegetative mulch unless hydraulic seeding method is used. Apply mulch in accordance with Section 627 of the (WDOT) Standard Specifications. Place erosion control mats on slopes steeper than 4 horizontal to 1 vertical. Unless otherwise indicated, also place erosion control material at sides and bottoms of ditches, swales, and all areas within 10 feet of catch basins in seeded areas.
3. Immediately after placing erosion control matting or mulch, water seeded areas thoroughly. Keep soil thoroughly moist until seeds have sprouted and achieved a growth of 1-inch.

SECTION 4.0 UNDERGROUND IMPROVEMENTS

4.1 INTERRUPTION TO UTILITIES AND DAMAGE TO SURFACE IMPROVEMENTS

- A. A minimum of 48 hours prior to commencement of work, the Town, Sanitary District and Diggers Hotline (1-800-242-8511) must be notified for location of any existing utilities. All reasonable precautions shall be taken against damage to existing utilities. No work shall commence until all known underground utilities are located and marked in the field.
- B. In the event of a break in an existing gas main, sewer or underground cable, the Contractor shall immediately notify a responsible official from the organization operating the utility interrupted. The Contractor shall lend all possible assistance in restoring services and shall assume all costs, charges or claims connected with the interruption and repair of such services unless it is determined that the utility has not been properly located.
- C. In the case of the Town utilities, the cost of such work will be billed to the Contractor.

4.2 TRAFFIC CONTROL

- A. All work within public rights-of-way shall conform to the requirements of the latest edition of the (WDOT) "Standard Specifications for Highway and Structure Construction". The provisions of these standards will be enforced:
1. When an opening is made into the existing pavement,
 2. When construction takes place adjacent to the edge of the existing pavement,
 3. When a utility crossing is made beneath the existing pavement, and
 4. When it is necessary to close a lane of traffic due to construction operations.
- B. Permission for land or road closure must be obtained from the Town Board Chairman prior to commencing construction. Signing will be required in strict conformance with the "Manual on Uniform Traffic Control Devices," published by the Federal Highway Administration. No construction operation is to commence until such time that all required signs and barricades have been erected.

4.3 PAVEMENT CROSSING

- A. Unless otherwise specifically approved by the Town Engineer, all conduits crossing existing pavements shall be installed by tunneling, jacking or auguring. When the carrier pipe is a conduit intended to operate under internal pressure, a casing pipe of adequate strength for all applied loads shall be used. The nearest face of pits or other open excavations on each side of a traveled pavement shall be at least 10 feet from the edge of the pavement.
- B. When open cutting is allowed or other pavement opening required, they shall be backfilled prior to the end of the working day unless otherwise authorized by the Town. All excavations shall be backfilled with 3/4-inch crushed stone chips and a temporary bituminous patch of at least 2-inches in thickness shall be constructed. It is understood that such backfilling and patching is only temporary and that permanent pavement repair will be required as specified in Section 3 of this Appendix. In lieu of a bituminous patch, a steel plate (minimum depth of 1-inch of thickness) over the excavation may be approved upon request by the Contractor.

4.4 UTILITY LOCATIONS

- A. Sanitary sewers in proposed streets shall be located in the centerline of the right-of-way or as approved by the Sanitary District. Sanitary sewers in existing pavements shall, where possible, be located in the gravel shoulder 4 feet from the edge of the pavement. The shoulder portion within 3 feet of manhole covers shall be paved with the same material used in construction of the roadway.
- B. All utility lines, conduits or cable for electric, telephone, cable television and other communication services should generally be placed along the rear lot lines of the subdivision and be placed a minimum of 24 inches underground within easements, or within 10 feet of the right-of-way line of dedicated public ways as recommended by the Town Engineer and as approved by the Town Plan Commission in conjunction with the approval of any final plan of subdivision, condominium or planned unit development. All transformer boxes shall be located so as not to be hazardous to the public.
- C. Gas lines and facilities shall be, where possible, installed parallel to and within 10 feet of the inside of the right-of-way.

4.5 TRENCHING

- A. Trenches shall be excavated to the depths and grades necessary for pipelines including allowances for bedding material.
- B. As determined by the Town Engineer, unsuitable soils found at or below the bottom of the trench shall be excavated and replaced with crushed stone per Section 3.2.2 of "Standard Specifications for Sewer and Water Construction in Wisconsin".
- C. Gas lines and facilities shall be, where possible, installed parallel to and within 10 feet of the inside of the right-of-way.

4.6 BRACING AND SHEETING

Open-cut trenches shall be sheeted and braced as required by the "Standard Specifications for Sewer and Water Construction in Wisconsin," and governing federal and state laws including all OSHA Safety and Health Standards (29CFR 1926/1910), and as may be necessary to protect life, property and the work.

4.7 BEDDING AND BACKFILL REQUIREMENTS

A. Bedding

Bedding shall be provided for all underground pipelines, except where concrete encasement, concrete cradles, boring or jacking are indicated. Bedding requirements shall conform to the "Standard Specifications for Sewer and Water Construction in Wisconsin".

B. Backfill

Backfilling of utility trenches shall conform to the requirements specified in the "Standard Specifications for Sewer and Water Construction in Wisconsin."

SECTION 5.0 STORM WATER DRAINAGE

5.1 INTRODUCTION

All developments, regardless of size within limits or under the control of the Town, shall include provisions for the construction of storm water drainage facilities designed in accordance with this Section. The design of all storm water drainage facilities proposed for construction as independent projects under the control of the Town shall also meet the technical requirements of this Section.

5.2 GENERAL PROJECT REQUIREMENTS

A. Post-development release rates for two, ten and 100 year, 24 hour storm events must be no greater than the pre-development natural state discharge from the site. Runoff curve numbers for pre-development land use calculations must be consistent with natural state hydrologic soil groups on site. Determination of peak flow rates and volume of runoff for purposes of meeting the requirements of this article shall be computed by procedures described in technical release 55 published by the Engineering Division, United States Natural Resource Conservation Service, United States Department of Agriculture, June 1992. Other calculation methods may be used upon approval of the Town Engineer.

B. The Town of Bloomfield will not accept the use of the modified rational formula for development of required hydrographs.

- C. Design rainfalls to be used in stormwater calculations must be from the point rainfall intensity-duration-frequency relationships for Southeastern Wisconsin according to the Southeastern Wisconsin Regional Planning Commission Technical Report No. 40, "Rainfall Frequency in Southeastern Wisconsin," April 2000.
- D. Soil conditions for design computations must either provide continuous accounting of antecedent soil moisture conditions or assume wet conditions.
- E. All naturally occurring contribution runoff entering the project site must be included in the design of the drainage system.
- F. Contribution runoff entering the project from off site may be excluded from detention calculations if the water is routed around disturbed areas by use of stable water course. All contributions of runoff entering the project site must be included in the design of the drainage system.
- G. Swales, overland flows and ditches, combined with underground sewer systems shall provide adequate outfall and save conveyance for runoff from a 100 year frequency, 24 hour rainfall event. Conveyance for the peak flow runoff from a 100 year 24 hour event shall be provided such that no inundation of or damage to built structures shall occur (such structures shall include access to the site). All open channel stormwater conveyance systems shall provide safe conveyance for peak flow from a 25 year frequency, 24 hour rainfall event within the defined channel banks.
- H. Drainage systems may not result in transfer of drainage from one delineated natural drainage area to another if reasonable alternatives exist which would preserve natural drainage patterns. Drainage area delineations must be shown on the storm water plan.
- I. All stormwater basins shall be permanent, aesthetically pleasing, practical, and safe. Subsurface bottoms of wet basins must provide a safety ledge consistent with required design criteria as identified in the "Wisconsin Storm Water Manual", published by the WNDR.
- J. Perforations in the riser for dual purpose sediment/detention basins shall not be allowed in the two foot sediment settling zone as identified by the Wisconsin Construction Site Best Management Practice Handbook for sediment basins, unless calculations are provided showing

that settling velocities provide for adequate soil particle size capture within the proposed basin.

- K. All calculations must be provided to the Town Engineer to demonstrate that required stormwater criteria have been met. All calculations must be prepared by a licensed Wisconsin professional engineer and be certified as complying with the technical standards and construction specifications of the Town of Bloomfield.
- L. Stormwater quality practices must be installed with all stormwater facilities to insure removal of suspended solids. Stormwater quality practices shall be designed to accommodate, at a minimum, the runoff volume resulting from 1.5 inches of rainfall over a four hour period and provide for trapping of particulates which are fifteen microns or larger in size.
- M. The recorded plat, certified survey, or land title for lands which shall have stormwater controls must identify the permanent location of all proposed stormwater facilities and state that the facilities shall be maintained by the property owner of record according to the standards of approval. Stormwater easements must be used exclusively for stormwater transport and may not be combined with other uses (IE pedestrian access).
- N. Wetlands shall not be used for reduction of stormwater or nonpoint source pollution in runoff water from proposed project sites.
- O. The proposed finished yard grade, rear and side yard swales, and the location and top of foundation elevation for all proposed structures shall be shown on a lot grading plan. Generally, the top of foundation of any structure must be constructed at least 8 inches above the proposed finished yard grade and approximately 18 inches above the centerline (or top of curbs) of the abutting street. Where foundations are lower than the street centerline, or in the case of depressed driveways, alternate means of surface drainage diversion must be shown to avoid structure flooding. Sufficient finished grade elevations must be shown on the drawings ensure positive drainage away from each structure.

5.3 SPECIAL STORMWATER POND REQUIREMENTS

A. General

Detention basins shall have a high water level, with one foot of freeboard, based on a 100 year, 24 hour design storm and shall have an outlet which allows runoff no greater than that for the land in its natural state prior to development. The basin shall be designated as a wet basin to provide water quality benefits.

B. The project plans for pond construction must be drawn to scale, provide proposed and existing 2 foot contours for the pond dimensions, and indicate setbacks from neighboring property. The project plan must show the location and proposed strategy for stabilization of the spoils (earthen material excavated from a pond) site.

C. Ponds proposed to be constructed in state or federally regulated wetlands must meet the dimensions of wildlife pond construction. Wildlife ponds have a maximum depth of four feet with 4h to 1v side slopes and do not provide for more than 20 percent open water within a wetland boundary with a deeper portion proposed outside of the wetland. Wildlife ponds may not have a significant adverse effect on the natural hydrologic water regime of a wetland area and must be a wetland enhancement.

D. No spoils may be disposed of in any state or federally regulated wetland area.

E. If a pond is proposed to be constructed in a floodplain area, the design engineer must demonstrate that the project restores or improves functional values including increasing flood and stormwater storage, maintaining groundwater recharge-discharge, enhanced fisheries and wildlife habitat, improved filtration or storage of sediments, nutrients, and toxins, improved shoreline protection against erosion, and any additional wetland functional values. The enhancement of functional values of a floodplain may not be conducted as part of mitigation for loss of wetlands.

F. Spoils from pond construction may not be hauled off site or sold without obtaining proper zoning and conditional use approval from Walworth County.

G. No spoils for pond construction may be placed in any floodplain area without first conducting an engineering study showing that the fill will not violate Wisconsin

Administrative Codes or State Statutes. The applicant must obtain conditional use approval for fill in the floodplain from Walworth County.

- H. Applicants must obtain all approvals required by the State of Wisconsin Department of Natural Resources, U.S. Army Corps of Engineers, Walworth County and local agencies prior to commencing pond construction within the Town of Bloomfield.
- I. Site specific guidelines may be established during the review and approval process which are more restrictive based on unique characteristics of property.
- J. Single pipe outlets shall have a minimum inside diameter of 12-inches. If design release rates call for smaller outlets, structures such as perforated risers, flow control orifices, etc., shall be used.

5.4 DESIGN CRITERIA FOR SURFACE SWALES AND STORM SEWERS

A. Storm Sewer

1. When storm sewer construction is permitted or required, storm sewers shall be designated to flow full, using Manning's Formula with an appropriate roughness coefficient based on pipe material. If a storm sewer is designed with a constantly submerged outfall, the sewer shall be designed using the "hydraulic gradient" with the maximum allowable water level an elevation one foot (1') below centerline of pavement.
2. The rational method shall be employed when computing storm runoff and designing storm sewers. The storm system shall be designed with "positive street and swale drainage" such that storm water runoff will be directed overland to the storm water detention area in a manner to minimize property damage due to flooding.
3. Storm sewers shall be designed for a minimum 10-year storm event flowing full and have a maximum velocity not to exceed ten feet (10') per second.
4. In areas where curb and gutter and storm sewers are approved, inlets shall be installed so that the distance between each inlet shall not exceed four hundred feet (400') and each inlet drain a maximum street gutter length of four hundred feet (400').

Where the inlet is located at a low point, additional inlets may be required by the Town Engineer. No more than two (2) inlets shall be interconnected. Inlets shall be so located that storm water runoff will not "pond" greater than the top of the street curbs. Depressed street crowns to facilitate drainage will not be permitted.

5. Rear lot drainage should not drain over the curb. Yard inlets shall be placed where approved or as required by the Town Engineer.
6. The minimum size storm sewer or inlet connection shall be twelve inches (12") in diameter.
7. Unless otherwise approved by the Town Engineer, storm sewers shall be reinforced concrete pipe conforming to ASTM C76 minimum Class III with 0-ring joints conforming to ASTM C433. All inlet connections shall be concrete sewer pipe.
8. Minimum cover shall be generally three feet (3') for all storm sewers unless special precautions are taken to protect the pipe, as approved by the Town Engineer.
9. All manholes, inlet manholes and inlets and catch basins, shall be designed in accordance with the "Standard Specifications for Sewer and Water Construction in Wisconsin."
10. Connections to sanitary sewers or existing agricultural drainage systems (tiles) will not be permitted for any new developments. All developments will utilize separate drainage systems to avoid disruption or overloading of the existing agricultural tile drainage system. Any field tile systems cut during the process of land development must be reconnected. Connection of existing agricultural drain tiles to new storm water management systems may be approved if proper allowance for flows from said tiles is incorporated in the new design system.

B. Culverts

Culverts shall be sized for each lot along rural streets and placed on the grading plan. Culverts shall meet the following minimum standards:

1. Minimum pipe diameter of twelve inches (15").

2. Corrugated metal pipe (CMP) shall be hot-dipped galvanized steel or aluminum steel conforming to AASTO M36. Provide 16 gauge CMP for pipe diameter twenty-one inches (21") and smaller. Provide 12 gauge CMP for pipe diameters twenty-four inches (24") and larger.
3. Reinforced concrete pipe (RCP) shall conform to ASTM C76, minimum Class III.
4. Culvert slope and invert elevations shall match the ditch slope and invert elevations.
5. Minimum cover at driveways shall be (6) inches.
6. All culverts shall include end sections.

C. Swales and Ditches

Manmade swales and ditches shall meet the following minimum design standards:

1. Minimum grade of one percent (1.0%).
2. Maximum grade of ten (10%).
3. Minimum depth of twenty four inches (24") below the shoulder of the street. At high points in the roadway, a depth of eighteen inches (18") is allowable.
4. Maximum bank slope of 4:1 under normal conditions.
5. The bottom and banks of ditches with grades of less than four percent (4%) shall be sodded or else seeded in combination with mulch and/or erosion mat.
6. The bottom and banks of ditches with grades between 4 and 6 percent shall be sodded and stabilized.
7. The bottom and banks of ditches with grades between 6 and 10 percent shall be stabilized by methods approved by the Town Engineer.
8. Whenever practicable, all areas of the property must be provided with an overland flow path that will pass the 100-year flow at a stage at least 1 foot below foundation grades in the vicinity of the flow path. Overland flow paths designed for flows in excess

of the minor drainage system capacity shall be provided in drainage easements. Street ponding and flow depths shall not exceed curb heights.

5.5 STORMWATER MANAGEMENT PLAN REQUIREMENTS.

A. The stormwater management plan shall contain at a minimum the following information:

1. Name, address, and telephone number for the following or their designees: landowner; developer; project engineer for practice design and certification; person(s) responsible for installation of stormwater management practices; and person(s) responsible for maintenance of stormwater management practices prior to the transfer, if any, of maintenance responsibility to another party.
2. A proper legal description of the property proposed to be developed, referenced to the U.S. Public Land Survey system or to block and lot numbers within a recorded land subdivision plat.
3. Pre-development site conditions, including:
 - a. One or more site maps at a scale of not less than 1 inch equals 100 feet. The site maps shall show the following: site location and legal property description; predominant soil types and hydrologic soil groups; existing cover type and condition; topographic contours of the site at an interval not to exceed 2 feet; topography and drainage network including enough of the contiguous properties to show runoff patterns onto, through, and from the site; watercourses that may affect or be affected by runoff from the site; flow path and direction for all stormwater conveyance sections; watershed boundaries used in hydrology determinations; lakes, streams, wetlands, channels, ditches, and other watercourses on and immediately adjacent to the site; limits of the 100 year floodplain; location of wells and wellhead protection areas covering the project area and delineated pursuant to s. NR 811.16, Wis. Adm. Code.
 - b. Hydrology and pollutant loading computations. All major assumptions used in developing input parameters shall be clearly stated. The

geographic areas used in making the calculations shall be clearly cross-referenced to the required map(s).

4. Post-development site conditions, including:
 - a. Explanation of the provisions to preserve and use natural topography and land cover features to minimize changes in peak flow runoff rates and volumes to surface waters and wetlands.
 - b. Explanation of any restrictions on stormwater management measures in the development area imposed by wellhead protection plans and ordinances.
 - c. One or more site maps at a scale of not less than 1 inch equals 100 feet showing the following: post-construction pervious areas including vegetative cover type and condition; impervious surfaces including all buildings, structures, and pavement; post-construction topographic contours of the site at an interval not to exceed 2 feet; post-construction drainage network including enough of the contiguous properties to show runoff patterns onto, through, and from the site; locations and dimensions of drainage easements; locations of maintenance easements; flow path and direction of all stormwater conveyance sections; location and type of all stormwater management conveyance and treatment practices, including the on-site and off-site tributary drainage area; location and type of conveyance system that will carry runoff from the drainage and treatment practices to the nearest adequate outlet such as a curbed street, storm drain, or natural drainage way; watershed boundaries used in hydrology and pollutant loading calculations and any changes to lakes, streams, wetlands, channels, ditches, and other watercourses on and immediately adjacent to the site.
 - d. Hydrology and pollutant loading computations. The computations shall be made for each discharge point in the development, and the geographic areas used in making the calculations shall be clearly cross-referenced to the required map(s).

- e. Results of investigations of soils and groundwater required for the placement and design of stormwater management measures. Detailed drawings including cross-sections and profiles of all permanent storm water conveyance and treatment practices.
5. A description and installation schedule for the stormwater management practices.
6. A maintenance plan developed for the life of each stormwater management practice including the required maintenance activities and maintenance activity schedule.
7. Cost estimates for the construction, operation, and maintenance of each stormwater management practice.
8. Other information requested in writing by the Town of Bloomfield and Town Engineer to determine compliance of the proposed stormwater management measures with the provisions of these design standards.
9. All site investigations, plans, designs, computations, and drawings shall be certified by a licensed Wisconsin professional engineer to be prepared in accordance with accepted engineering practice and requirement of this ordinance.

SECTION 6.0 ROADWAY CONSTRUCTION

6.1 INTRODUCTION

- A. All developments, regardless of size within the Town limits shall include provisions for the construction of roadways and appurtenant construction to serve each parcel of property within the development. Where more than one building, other than an accessory building is located or planned on one parcel of property, the proposed construction shall also include access roadways as required to serve each such building.
- B. The design of all roadways proposed for construction or as independent projects under the control of the Town, shall meet the technical requirements of this Section and the (WDOT) "Standard Specifications".

6.2 STREET CLASSIFICATION

- A. All roads and streets shall be functionally classified by the Town Engineer as one of the following:
 - 1. Arterial
 - 2. Collector
 - 3. Minor Collector
 - 4. Local
- B. In developments where more than one building is located or planned on one parcel of property and a roadway is provided to serve such buildings, that roadway shall be classified as local unless otherwise established by the Town Engineer.

6.3 GEOMETRICS

Roadway geometric design shall conform to the criteria stated in Figures 1 and 2 appended to this section.

6.4 ROADWAY EXCAVATION

- A. Topsoil and unsuitable materials shall be removed from all proposed roadway areas prior to road subgrade construction. Roadways shall then be constructed to the lines and grades as shown on the construction plans.
- B. Roadway construction shall not be permitted on frozen ground.

6.5 SUBGRADE

- A. Road areas constructed in fill sections shall be built by layering and compacting the fill material using a maximum of 8 inch thick lifts.
- B. Roadways shall be proofrolled prior to construction of the basecourse. A fully loaded tandem-axle truck shall be provided to drive slowly over the area to be inspected. Areas which show deflections greater than 1 2-inches shall be repaired and pass proofrolling tests before construction may proceed. The Town Engineer shall be present for and should be notified 24 hours prior to proofrolling.

6.6 SUB-BASECOURSE

- A. When a sub-basecourse is required in the roadway design, it shall be comprised of crushed aggregate material. The sub-base shall be built in conformance with WDOT Specifications.
- B. Geotextile fabrics, where allowed by the Town Engineer for subgrade stabilization, shall conform to WDOT Specifications.

6.7 ROADWAY STRUCTURE

- A. Roadway structure design shall conform to the criteria stated in Figure 3 appended to this section.
- B. Base course construction shall conform to the requirements stated in Figure 1 and WDOT Specifications. Materials for base course shall be crushed stone or crushed gravel unless otherwise approved by the Town Engineer. Roadways shall be proofrolled in accordance with Subsection 6.5.B above prior to placement of the base course.
- C. Pavement construction shall conform to the requirements stated in Figure 1 and WDOT Specifications. The pavement course may be either Portland cement concrete or asphaltic concrete, unless otherwise approved by the Town Engineer. Roadways shall be proofrolled in accordance with Subsection 6.5.B above prior to placement of the pavement course.
- D. Each layer of asphaltic concrete pavement is not to exceed 3 inches for upper layer and 4 inches for lower layers.
- E. For new roadway construction, the final upper layer of asphaltic concrete pavement shall not be placed any earlier than one (1) year and no later than three (3) years after, or after 75% of the lots have been improved.
- F. For new roadway construction, all manhole covers in the asphalt paved areas shall be initially to the elevation of the lower layer of pavement. Immediately prior to paving the final upper layer of asphalt pavement, all manhole covers shall be adjusted to the final pavement surface elevation in accordance with WDOT Specifications.

6.8 CONCRETE CURB AND GUTTER

Curb and gutter, when required, shall comply with WDOT Specifications for 30-inch Type D when placed adjacent to asphalt pavement and 30 inch Type A when placed adjacent to concrete pavement.

6.9 STANDARD DESIGN METHOD FOR PAVEMENTS

When, in the opinion of the Town Engineer, the volume and composition of the traffic anticipated to be carried by the pavement can be estimated within reasonable limits and, in all cases, where the roadway is designed as a four or more lane facility, the structural design for pavements shall be based on the latest revision of the (WDOT) Facilities Development Manual. However, in no case shall the design result in a pavement of lesser thickness than those shown in Figure 3.

6.10 SPECIAL REQUIREMENTS FOR UNDERGROUND UTILITIES

A. Structure Adjustment

1. Where finished grade or alignment for existing underground structures, such as inlet basins, catch basins, manholes or valve vaults is affected by proposed work, the project drawings shall provide for the adjustment of such structures as required.
2. Where a project is to be constructed under two or more construction contracts, one or more of which includes the construction of pavement, the contract documents for those contracts including paving work should provide for the adjustment of underground structures that may be constructed under other contracts as may be required to fit the proposed pavement.

6.11 SIDEWALKS

- A. All sidewalks, when required, shall be constructed of Portland cement concrete and shall be a minimum of (4) feet wide or as determined by the Town Board when a greater width is justified on the basis of anticipated pedestrian traffic.
- B. The minimum thickness of the concrete sidewalk across driveways shall be as follows:
 1. Eight (8) inches for Major Commercial

2. Eight (8) inches for Industrial
 3. Six (6) inches for Minor Commercial/Major Residential
 4. Six (6) inches for Residential
- C. All public sidewalks shall be located one (1) foot inside the roadway right-of-way line and shall meet all requirements of the "Americans with Disabilities Act" for accessibility.

FIGURE 1

URBAN STREET GEOMETRIC CRITERIA⁽⁹⁾

<u>ROADWAY CLASSIFICATION</u>	<u>ARTERIAL</u>	<u>COLLECTOR</u>	<u>MINOR COLLECTOR</u>	<u>LOCAL</u>
Right-of-way width	80 ft.	66 ft.	66 ft.	66 ft.
Roadway width ⁽¹⁾⁽²⁾	36 ft.	36 ft.	36 ft.	30 ft.
Sidewalk width ^{(6) (7)}	5 ft.	5 ft.	4 ft.	4 ft.
Curb type ⁽²⁾	Concrete 30" - Vertical Face			
Number of traffic lanes ⁽⁸⁾	2	2	2	2
Travel Lane width	12 ft.	12 ft.	12 ft.	11 ft.
Minimum cul-de-sac pavement radius ⁽³⁾	N/A	N/A	N/A	45 ft.
Maximum cul-de-sac length ⁽⁴⁾	N/A	N/A	N/A	750 ft.
Maximum centerline grade	6%	6%	8%	10%
Minimum centerline grade	0.5%	0.5%	0.5%	0.5%
Minimum center line radius ⁽⁵⁾	300 ft.	300 ft.	300 ft.	100 ft.

(1) Dimensions are measured back to back of curb.

(2) Roadway width shown as minimum. Exact roadway width shall be determined by forecasted traffic volume.

(3) Cul-de-sac right-of-way radius shall be 60 feet.

(4) The combined length of the street and diameter of the cul-de-sac.

(5) To be introduced when the centerline deflects at any one point by more than 3 degrees.

A tangent of at least 100 feet shall be introduced between reverse curves on arterial and collector streets.

- (6) Sidewalk shall be placed in public right-of-way, 1-foot from the property line unless otherwise approved by the Town.
- (7) Sidewalk designated as bike path shall be a minimum width of 8 feet.
- (8) Four (4) lanes required for traffic volumes over 13,000 ADT in urban area and over 10,000 ADT in rural areas.

FIGURE 3

ROADWAY STRUCTURE CRITERIA

ROADWAY CLASSIFICATION	MINIMUM PAVEMENT STRUCTURE REQUIREMENTS		
		ASPHALT	CONCRETE
Arterial	Pavement Thickness	5-1/2 inches	8 inches
	Base Thickness	12 inches	8 inches
Collector	Pavement Thickness	5 inches	8 inches
	Base Thickness	12 inches	8 inches
Minor Collector	Pavement Thickness	4-1/2 inches	8 inches
	Base Thickness	10 inches	6 inches
Local	Pavement Thickness	4 inches	8 inches
	Base Thickness	8 inches	6 inches

**FIGURE 2
RURAL STREET GEOMETRIC CRITERIA**

<u>ROADWAY CLASSIFICATION</u>		<u>ARTERIAL</u>		<u>COLLECTOR</u>		<u>MINOR COLLECTOR</u>		<u>LOCAL</u>
Right-of-way width	80 ft.		66 ft.		66 ft.		66 ft.	
Pavement width		48 ft.		30 ft.		26 ft.		22 ft.
Shoulder width	10 ft.		6 ft.		4 ft.		4 ft.	
Minimum ditch depth	1.0 ft.	1.0 ft.		.05 ft.		.05 ft.		
Number of traffic lanes	2		2		2		2	
Minimum cul-de-sac pavement radius		N/A		N/A		N/A		45 ft.
Maximum cul-de-sac length	N/A		N/A		N/A		750 ft.	
Maximum grade	6%		6%		8%		10%	
Minimum centerline grade	0.5%		0.5%		0.5%		0.5%	
Minimum ditch grade	1.0%		1.0%		1.0%		1.0%	
Minimum center line radius	500 ft.		300 ft.		300 ft.		100 ft.	

(1) Dimensions are measured edge of pavement to edge of pavement.

(2) As measured from subgrade elevation.

- (3) Cul-de-sac right-of-way radius shall be 60 feet.

- (4) The combined length of the street and diameter of the cul-de-sac.

- (5) To be introduced when the centerline deflects at any one point by more than 3 degrees. A tangent of at least 100 feet shall be introduced between reverse curves on arterial and collector streets.

- (6) Four (4) lanes required for traffic volumes over 10,000 ADT in urban areas and over 10,000 ADT in rural areas.