

Village of Twin Lakes, Wisconsin



Land Development Standards

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SECTION 1 - ENGINEERING AND ADMINISTRATIVE PROCEDURES

1.1 GENERAL

This manual was prepared to clarify and enhance the Village public improvement standards. If a conflict exists between this document and a Village Ordinance, the Village Ordinances shall apply.

1.2 PRE-DESIGN CONFERENCE

It is recommended that prior to the development of detailed drawings, the Subdivider and the Design Engineer meet with the Village staff and Village Engineer to review Village 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 Subdivider or Design Engineer.

1.3 DRAWING PREPARATION REQUIREMENTS

All drawings submitted for approval shall bear the name of the Design Engineer, their signature, the imprint of the Wisconsin Professional Engineer seal, and their 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.

1.4 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 Road and Bridge Construction", as published by the Department of Transportation, State of Wisconsin, (WDOT Standard Specifications), the "Standard Specifications for Sewer and Water Construction in Wisconsin", 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 Village, 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 and in conformance with the approved drawings and specifications. An insurance certificate may also be required from the contractor meeting the Village requirements.

1.5 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 Village Engineer. Said computations shall be neat and legible and in a form considered acceptable by the Village Engineer. Said computations shall include, but not necessarily be limited to, the following:
 - 1. Storm Water Detention Basin Capacity and Routing
 - 2. Storm Water Quality
 - 3. Storm Sewer System Design Including Inlet Capacity
 - 4. Structural Strength Design for Conduits more than 20 feet below finished grade.
 - 5. Road Pavement Design
 - 6. Sanitary Sewer Capacity Calculations

1.6 OPINION OF PROBABLE COST

The Design Engineer shall prepare an itemized opinion of the probable cost of the work. The opinion shall be delineated public and private (onsite) improvements when applicable.

1.7 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 Village. 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. A copy of said permit application shall be provided to the Village at the time of application.

1.8 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 Village 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 Field Inspector.

1.9 CONSTRUCTION SUPERVISION

Full-time and/or part-time inspection of developments (including private developments) may be conducted by the Village Engineer and/or Field Inspector. Construction staking, confirmation of approved elevations, and preparation of Record Drawings are the responsibility of the Design Engineer or other independent professional employed by the Subdivider.

1.10 EXISTING FACILITIES

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

1.11 RECORD DRAWINGS

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. Record drawings shall be submitted to the Village Engineer prior to the Subdivider's request for final inspection of the required improvements. The record drawings shall be based on actual measurements of both horizontal and vertical dimensions, made after the completion of the work.

SECTION 2 - UTILITY EXCAVATIONS

2.1 GENERAL

Any construction, maintenance, or repair of utilities located within the public street right-of-way shall not commence without the issuance of a construction permit from the Village Building Inspector. The construction of all utilities and restoration of all disturbed areas shall be in accordance with these standards.

2.2 PERMIT REQUIREMENTS

Permits shall be issued no later than thirty (30) days from the receipt of an application. The Village may, at its discretion, direct the Village Engineer to review projects prior to approving an application. Any costs incurred by the Municipality for review and inspection of facilities or improvements shall be borne by the applicant. In addition, construction permits shall be issued only upon satisfaction of the following:

- A. Submittal of an application for a construction permit to the Village Building Inspector along with the applicable fee.
- B. Posting with the Village Clerk, a bond or other surety in an amount not to exceed one hundred fifty percent (150%) of the actual cost of the construction, maintenance, or repair of facilities or improvements (minimum amount \$1,200).
- C. Approval of the construction permit application by the Village Building Inspector.

2.3 EXCEPTIONS

The Village Board may, at its discretion, waive permit requirements as necessary. Emergency repairs of facilities or improvements may be made as needed, provided a permit is obtained within 5 working days from the commencement of emergency repairs.

2.4 RETURN OF BOND

Upon completion of any project requiring a construction permit, the bond or surety posted with the Village Clerk shall be returned upon receipt of the following:

- A. Notice to the Village Building Inspector from the permittee that the project has been completed.
- B. Inspection by the duly authorized representative of the Municipality.

2.5 DAMAGES AND LOSS OF BOND

Any damage, as determined by the Village, which is the result of construction, maintenance, or repair of utilities located within the public street right-of-way shall be the responsibility of the applicant. The applicant shall pay the costs of repairing the damages, which amount may be forfeited from the bond.

- A. All repairs, maintenance, or construction shall conform to Federal, State, County, and Village ordinances, specifications, and standards.
- B. Any repairs not in conformity with the foregoing shall be repaired by the Village with the costs for the same withdrawn from the bond.

2.6 PROCEDURE FOR BOND FORFEITURE

In the event the Village elects to repair damages and proceed against the bond of the permittee, the Village may do so only upon the following:

- A. Notice in writing to the permittee from the Village Building Inspector which shall substantially contain the following:
 - 1. The nature of the damage or non-conformity which has led to the Village's claim.
 - 2. The amount claimed by the Village.
 - 3. The permittee has the right to request in writing, a hearing before the Village Board to show cause, if any, why the Village should not forfeit any or the entire amount of the bond, which if requested, said hearing shall be within thirty (30) days from the date of receipt of the written request.
- B. The Village shall not forfeit any part of a bond until and unless no hearing has been requested within thirty (30) days or after a hearing, the Village Board finds that the permittee has failed to properly show cause why their bond should not be forfeited.

SECTION 3 - 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, thicknesses, widths, etc. 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, the edges of the section to be removed shall be cleanly cut with a concrete saw.

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

Where the existing roadway pavement surface is Portland Cement concrete, the pavement replacement shall consist of six (6) inch P.C. concrete pavement or existing concrete depth, whichever is greater. 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 roadway pavement surface is asphaltic concrete, the pavement replacement shall consist of four (4) inches of asphaltic concrete pavement or existing asphaltic concrete pavement depth, whichever is greater, in a minimum of 2 lifts, and conforming to the requirements of the (WDOT) Standard Specifications.
- B. 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 above.

3.6 SEAL COATED PAVEMENT

Where the existing pavement is comprised of seal coat material and the base consists of a flexible material such as gravel or crushed stone, the base replacement shall consist of a 9-inch compacted thickness of crushed aggregate base course conforming to the (WDOT) Standard Specifications and special provisions thereof. The surface replacement shall be asphaltic concrete pavement as specified above.

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 Village Ordinance regulating the construction of driveways, approaches and sidewalks.
- B. Curb or curb and gutter dimensions and cross sections shall conform, as nearly as practicable, with the existing installations except that at intersections with sidewalk that does not conform to State of Wisconsin handicap requirements, sufficient depressed curb and gutter along with sidewalk shall be replaced to meet said handicap specifications. 1/2-inch preformed expansion joints shall be placed at intervals not exceeding 50 feet and at the junction with existing work. Saw cut crack control contraction joints shall be made every 20 feet (minimum) and shall be a minimum of 1/2-inch in depth. Sidewalks shall be finished to match existing adjacent sidewalk surfaces.

3.8 CULTIVATED LAWNS

Provide topsoil, fertilizer, seeding, mulching, 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, having at least 90 percent passing a No. 10 sieve, 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 20 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 Village 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. Seed all grassed areas disturbed by construction operations and not receiving sod, in accordance with Section 630 of the (WDOT) Standard Specifications. Seed shall be sown between September 1 and November 1, or in spring from the time the ground can be worked until May 15. Do not seed in windy weather or when soil is very wet. Sow seed either mechanically or by broadcasting in two directions at right angles to each other to achieve an even distribution.
2. After seeding, rake seed lightly into ground and roll with a roller weighing between 100 and 200 pounds per foot of roller width.
3. Immediately after rolling seeded areas, apply vegetative mulch unless hydraulic seeding method is used. Apply mulch in accordance with Section 627 of the (WDOT) Standard Specifications. Place erosion control excelsior blanket or fiber mat 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.

4. 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 - EROSION CONTROL

4.1 GENERAL

- A. Erosion and sediment control due to run-off, equipment leaving and entering a construction site, wind, etc., are required for all construction, including individual single family lots, in the Village. 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 required by the Village Building and Zoning Regulations, as found in the "Wisconsin Construction Site Erosion and Sediment Control Technical Standards", Natural Resources Conservation Service Standards and Specifications, design guidance and technical standards developed by the Wisconsin Department of Natural Resources, or as directed by the Village Engineer or Building Inspector.
- B. The stripping of topsoil and grading work for all developments shall be completed such that no more than 15 acres of area is unvegetated at any one time and as required by the Village Engineer or Building Inspector.
- C. Steep slopes (exceeding 4:1) are to be avoided whenever possible. A minimum 25-foot buffer area of natural vegetation should be retained adjacent to storm water detention basins, and a minimum 50-foot buffer area retained for lakes, creeks, or other natural water sources. For concentrated flow drainageways with a drainage area greater than 130 acres, the minimum buffer area shall be 10 feet on either side of the drainageway.
- D. The erosion control plan should indicate the location of soil stockpiles that are to remain onsite longer than four weeks.
- E. Erosion control measures should be used which include but are not limited to sediment traps, sediment basins, diversion channels, haul roads at all construction entrances and pavement cleaning operations, silt fences, straw bales, and any other measures necessary or as directed by the Village Engineer or Building Inspector.
- F. Best management practices shall be designed to meet the requirements of NR 151 of the Wisconsin Administrative Code.

4.2 DESIGN REQUIREMENTS

- A. On-site sediment control measures, as specified by the following criteria shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

1. For disturbed areas draining less than one (1) acre, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all off-site runoff as specified in referenced handbooks. Vegetated filter strips, with a minimum width of 25 feet, may be used as an alternative only where runoff in sheet flow is expected. Silt filter fences and straw bales shall be inspected weekly and after rainfall events for repair or replacement. Straw bales shall be replaced as a minimum, every three months.
2. Sediment traps, sediment basins, or equivalent control measures shall be constructed at the downslope point of the disturbed area as required by the Village Engineer or Building Inspector.
3. Sediment storage shall be designed such that sediment removal from the basin is only required once a year.
4. Disturbed areas shall be stabilized within seven (7) days with any of the temporary or permanent measures defined in this section.

4.3 MAINTENANCE OF CONTROL MEASURES

- A. All soil erosion and sediment control measures necessary to meet these requirements 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. All soil erosion and sediment control measures shall be inspected by the landowner after each rain of 0.5 inches or more to determine if these control measures are functioning properly. Any substandard control measures shall be corrected to ensure adequate performance.
- B. At the completion of any project, the storm sewers, culverts, gutters, etc., will be inspected by the Village Engineer or Building Inspector to determine any cleaning of trapped sediment that may be required.

4.4 INSPECTION

- A. The Village may make periodic inspections and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with erosion and sedimentation control plan as approved. Plans for grading, stripping, excavating, and filling work approved by the Municipality shall be maintained at the site during progress of the work. Inspections can take place during any or all of the following:
 1. Upon completion of installation of sediment and runoff control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading;
 2. After stripping and clearing;

3. After rough grading;
4. After final grading;
5. After seeding and landscaping deadlines; and
6. After final stabilization and landscaping, prior to removal of sediment controls.

4.5 SPECIAL PRECAUTIONS

- A. If at any stage of the grading of any development site the Village 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 Village 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 drainage facilities, berms, terracing, compaction, or cribbing, 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 Municipality 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.

4.6 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 of 10-inches and larger. The plan shall be taken to the extent practicable to preserve healthy trees over 10-inches in diameter. 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 Village Engineer. Tree tunneling, where necessary, shall be determined by the Village 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 banks 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 Municipality.
- D. Trees which do not survive (in good condition) for a period of 18 months after planting shall be removed and replaced.

SECTION 5 - UNDERGROUND IMPROVEMENTS

5.1 INTERRUPTION TO UTILITIES AND DAMAGE TO SURFACE IMPROVEMENTS

- A. A minimum of 72 hours prior to commencement of work, the Municipality 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.
- 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 Municipal utilities, the cost of such work will be billed to the Contractor.

5.2 TRAFFIC CONTROL

- A. All work within public rights-of-way shall conform to the requirements of the latest edition of the (WDOT) Standard Specifications and the Manual on Uniform Traffic Control Devices. 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 Village Board President prior to commencing construction. Signing will be required in strict conformance to the Manual on Uniform Traffic Control Devices. No construction operation is to commence until such time that all required signs and barricades have been erected.

5.3 PAVEMENT CROSSING

- A. Unless otherwise specifically approved by the Village 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 Municipality. All excavations shall be backfilled with AGGREGATE SLURRY BACKFILL MATERIAL and a temporary asphaltic patch of at least 2-inches in thickness shall be constructed. Provide AGGREGATE SLURRY MATERIAL, thoroughly mixed in a concrete mixer truck in accordance with Section 6.43.8 of the Standard Specifications for Sewer and Water Construction in Wisconsin. It is understood that such pavement patching is only temporary and that permanent pavement repair will be required as specified in these Standards.

5.4 UTILITY LOCATIONS WITHIN THE ROAD RIGHT-OF-WAY

- A. Sanitary sewers in proposed street right-of-ways shall be located in the centerline of the right-of-way.
- B. Storm sewers in proposed urban street right-of-ways shall be located in the parkway approximately 5-feet behind the back of curb. Storm sewers shall be generally located on the south or east side of the street.
- C. Water mains in proposed street right-of-ways shall be located in the parkway approximately 8-feet behind the back of curb or in the shoulder area on the opposite side of the street from the storm sewer. Water mains shall be generally located on the north or west side of the street.
- D. Gas lines and facilities shall be, where possible, installed parallel to and within 10 feet of the inside of the right-of-way.
- E. Replacement or new installation of buried utility lines, conduits or cable for electric, telephone, cable television and other communication services within an existing road right-of-way shall be, where possible, installed parallel to and within 10 feet of the inside of the right-of-way.
- F. All proposed utility lines, conduits or cable for electric, telephone, cable television and other communication services for new development shall be placed a minimum of 24 inches underground within rear yard easements (or within 10 feet of the right-of-way line if approved by the Municipality). All transformer boxes shall be located so as not to be hazardous to the public and at least 10-feet from the edge of pavement.
- G. Utility and streetlight poles along rural roads shall be placed a minimum of 10 feet from the edge of the road shoulder.

5.5 TRENCHING

- A. Trenches shall be excavated to the depths and grades necessary for pipelines including allowances for bedding material.
- B. As determined by the Village Engineer, unsuitable soils found at or below the bottom of the trench shall be excavated to meet firm subsoil.
- C. Comply with the following maximum trench widths at the top of pipelines:

| <u>Nominal Pipe Sizes (Inches)</u> | <u>Trench Widths (Inches)</u> |
|--|-----------------------------------|
| 12 or smaller | 30 |
| 14-18 | 36 |
| 20-24 | 42 |
| 27-30 | 48 |
| 33 or larger | 1-1/3 times pipe O.D. |

- D. If trench widths will exceed the maximum limitations above, higher strength pipe may be required or a concrete cradle may be used to achieve the necessary load factor.

5.6 BRACING AND SHEETING

Open-cut trenches shall be sheeted and braced as required by governing federal and state laws including all OSHA Safety and Health Standards, and as may be necessary to protect life, property and the work.

5.7 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 shall be a minimum thickness of 4-inches and consist of well graded, washed, mixture of 100 percent crushed gravel or crushed stone aggregate free of clay, loam, dirt, calcareous or other foreign matter conforming to the "Standard Specifications for Sewer and Water Construction in Wisconsin", and shall be properly compacted.

- 1. For sewer pipe 18 inches in diameter and smaller, use bedding material of 3/8-inch crushed stone chips with the following gradation:

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 1/2-inch | 100% |
| 3/8-inch | 90-100% |
| No. 8 | 0-15% |
| No. 30 | 0-3% |

- For sewer pipe larger than 18-inches in diameter, use bedding material of 3/4-inch crushed stone chips with the following gradation:

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 1-inch | 100% |
| 3/4-inch | 90-100% |
| 3/8-inch | 20-55% |
| No. 4 | 0-10% |
| No. 8 | 0-5% |

- Wherever two or more pipe or conduits are placed in the same trench or excavated area, backfill the trench with granular bedding material to support the uppermost pipe or conduit.

B. Backfill:

- For conduits requiring excavation beneath or within 4 feet horizontally of proposed pavement, driveways, sidewalks, or existing driveways and sidewalks, or in other areas which, in the opinion of the Village Engineer, are or may be subject to vehicular traffic loading, GRANULAR BACKFILL shall be provided above the pipe bedding and covering material, and shall extend upward to the surface of the ground or pavement. The material shall be free from large rocks and be carefully compacted in 12-inch lifts. Provide either sand, pit run gravel, granular material, or excavated granular materials:

- Sand: Well graded, free from organic matter, cohesionless, complying with the "Standard Specifications for Sewer and Water Construction in Wisconsin", with the following gradation:

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-----------------------------|------------------------|
| 1-inch | 100% |
| No. 16 | 45-80% |
| Material finer than No. 200 | 2-10% |

- b. Pit run gravel: Free from organic matter, cohesionless granular material obtained from natural deposits of sand and gravel, passing 3/4-inch sieve, and not more than 15 percent passing the No. 200 sieve.
- c. Granular material: Use 100 percent crushed stone or gravel complying with the "Standard Specifications for Sewer and Water Construction in Wisconsin", with the following gradation:

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 1-inch | 100% |
| 3/4-inch | 90-100% |
| 3/8-inch | 20-55% |
| No. 4 | 0-10% |
| No. 8 | 0-5% |

- d. Excavated granular materials: A mixture of sand and gravel, free from organic matter, clay, loam, dirt, and other foreign material, passing the 1-1/2-inch sieve, with not more than 15 percent passing the No. 200 sieve.
- e. Crushed stone: Clean, hard, tough, durable, angular material crushed from bedrock limestone, dolomite, or granite.

(1). Gradation requirements:

| <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 3-inch | 100% |
| 2-1/2-inch | 90-100% |
| 2-inch | 35-70% |
| 1-1/2-inch | 0-15% |
| 3/4-inch | 0-5% |

2. Unless otherwise specifically approved by the Village Engineer, all conduits crossing existing pavements shall be installed by tunneling, jacking or auguring. For conduits requiring excavation beneath or within 4 feet horizontally of existing pavements that cannot be completed by trenchless methods, or in other areas at the direction of the Village Engineer, AGGREGATE SLURRY MATERIALS shall be provided above the bedding and covering material, and shall extend to the surface of the pavement.

- a. Provide AGGREGATE SLURRY MATERIAL, thoroughly mixed in a

concrete mixer truck in accordance the “Standard Specifications for Sewer and Water Construction in Wisconsin”.

3. For conduits not requiring GRANULAR BACKFILL, OR AGGREGATE SLURRY MATERIAL, backfill may be made with materials available from the trench excavation and compacted in lifts.

SECTION 6 - SANITARY SEWERAGE FACILITIES

6.1 INTRODUCTION

All developments, regardless of size within the Sewer Service Area of the Municipality, shall include provisions for the construction of sanitary sewerage facilities designed in accordance with this Section. Sanitary sewers shall be constructed throughout and to the limits of all developments to facilitate future extension of the Municipal sewer system to adjacent areas.

6.2 SERVICE AREAS

- A. The proposed service area shall include the entire area to be ultimately served by all or a portion of the sanitary sewer system submitted for approval.
- B. If oversizing of sanitary sewers greater than 12-inches in diameter is required to serve tributary areas lying outside of the proposed development or an extension of the sanitary sewer system beyond the limits of the development is required, provisions shall be made for the Subdivider's recapture of the incremental construction cost upon submittal of all waivers of lien and paid invoices for such on-site and off-site improvements.
- C. Adequate details shall be shown on submitted drawings relative to future sewer sizes, elevations and topography to establish the adequacy of the proposed improvements to ultimately serve future sewer extensions.

6.3 SEWER DESIGN

- A. The Municipality will complete an analysis of the existing wastewater collection system to determine if downstream capacity is available. The analysis will be completed on an as needed basis and the costs
- B. Residential Development: Sanitary sewage flow used in developing Design Average Flow from residential areas shall be computed using not less than 100 gallons per capita per day, and the Design Peak Flow need not exceed 400 gallons per capita per day but shall not be less than 250 gallons per capita per day.
- C. Flow Estimation:
 - 1. Sanitary sewage flow from both single family and multiple family residential areas shall be based on the population after full development of the area. For areas where the details of a proposed development are known, population shall be estimated as follows:

| <u>Type of Dwelling Unit</u> | <u>Number of Persons</u> |
|------------------------------|--------------------------|
| Studio | 1 |
| 1 bedroom | 2 |
| 2 bedroom | 3 |
| 3 bedroom | 4 |
| 4 bedroom | 5 |

2. For undeveloped residential areas where the details of future development are not known, design population per acre shall be estimated based on the zoning classification and any comparable developments within the Municipality.
3. For areas other than residential, estimated sanitary sewage flow shall be based on the type of development, Village Ordinance, and the following table:

| <u>Type of Establishment</u> | <u>Unit</u> | <u>Average Flow in Gal/ day /unit</u> | <u>Maximum Flow for Sewer Design in Gal/ day /unit</u> |
|------------------------------|--------------------|---------------------------------------|--|
| Shopping Centers | Employee (1 shift) | 50 | 200 |
| Store | Employee (1 shift) | 30 | 120 |
| Offices | Person (1 shift) | 25 | 100 |
| Industrial | Person (1 shift) | 35 | 140 |
| Restaurant | Per Seat | 7 | 30 |
| Theater | Per Seat | 5 | 20 |
| Hotel | Per guest | 100 | 400 |

4. For other than residential developments where the details of the development are not established, sanitary sewage flow shall be estimated by the Design Engineer and approved by the Village Engineer. Such approval shall not relieve the Subdivider of the responsibility of providing adequate sanitary sewers to meet any and all future requirements within the development.
- C. Design Formula: Sanitary sewers shall be designed to provide adequate capacity without surcharge for the Design Flow, using: Manning's formula:

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

(Where R=the hydraulic radius, S=the slope of the energy grade line, n=appropriate coefficient of roughness for the pipe material proposed). Flowing-full velocity shall not be less than 2.0 feet per second. Where velocities greater than 10 feet per second will occur in a sanitary sewer flowing full, special provisions shall be taken to prevent erosion or displacement of the pipe. Design flow at any point in the system shall be the total of the allowable infiltration at that point plus sanitary sewage flow from the fully developed service area (computed in accordance with the above requirements) plus all potential additional flow from the Ultimate Service Area. Infiltration shall not exceed 200 gallons per 24 hours per mile per inch diameter of the sewer pipe for any section of the system at any time during its service life.

6.4 DESIGN DETAILS FOR SANITARY SEWERS

- A. Pipe and Joint Types: Sanitary sewer pipe and the joint specification required for the various types of pipe shall be as follows:

| <u>Pipe</u> | <u>Pipe Material</u> | <u>Joint</u> |
|------------------------------------|----------------------|--------------|
| Ductile Iron Pipe | ANSI A-21.51 CL50 | ASA A-21.11 |
| PVC SDR 26 | ASTM D-3034 | ASTM D-3212 |
| Reinforced Concrete Pipe | ASTM C-76 CL-V | ASTM C-361 |
| Prestressed Concrete Pressure Pipe | AWWA C-301 | AWWA C-301 |

- B. Minimum Size: No sanitary sewer shall be less than 8 inches in diameter.
- C. Alignment: Sewers with diameters less than 36-inches shall be laid straight in both horizontal and vertical planes between manholes.
- D. Location: All sanitary sewers shall be located in the centerline of the roadway or in side yard easements as required and as approved by the Village Engineer.
- E. Sewer Size Changes: Under normal conditions, when sanitary sewers of different diameters join, the invert elevations shall be adjusted to maintain a uniform energy gradient. The alignment of the 0.8 depth points of the sewers will be accepted as meeting this requirement.
- F. Outside drops shall be required where sewers enter a manhole more than 6-inches above the bench.
- G. Internal chimney seals are required in paved areas and external chimney seals are required in lawn areas.

- H. Manhole frames shall be initially set to pavement binder elevation, and adjusted to finished grade at the time of final paving.
- I. Dewatering: Prior to pipe laying and jointing, the trench shall be sufficiently dewatered to maintain the water level in the trench at or below the base of the bedding.

6.5 BEDDING

Bedding shall be provided for all sanitary sewers constructed in trench in accordance with Section 5.7.

6.6 DESIGN DETAILS FOR SANITARY MANHOLES

Manholes shall be provided at all changes in grade, size or alignment. Manholes shall be no less than 48 inches in diameter and shall be constructed according to the sanitary manhole detail.

6.7 SANITARY SEWER SERVICE LINES

- A. Description: A sanitary sewer service line, for the purposes of these standards, is defined as a pipe designed to receive flow from a single building, extending from the sewer to the building.
- B. Minimum Diameter/Material: Minimum diameter of sanitary sewer service lines is 4 inches. If the service line is larger than 6-inch diameter, a manhole shall be constructed at the point of its connection with the sewer. Allowable service materials are ductile iron and PVC as specified above.
- C. Design Standards: Capacity requirements and design details for sanitary sewers shall apply to sanitary sewer service lines, except the minimum slope shall be 1/8-inch per foot (1%).
- D. Plugs: In those instances when the service line is not immediately connected to the building to be served, it shall be tightly plugged, using a plug provided by the pipe manufacturer for such use.
- E. Locator Wire: A single strand, single conductor, No. 8 AWG insulated copper locator wire shall be provided over all sanitary lateral pipes secured to the pipe at maximum intervals of 10-feet. A 2 1/2-inch diameter by 18-inch long terminal box shall be set at the right-of-way line. Terminal box manufacturer shall be C.P. Test Services or equal.

6.8 SANITARY SEWER SERVICE LINE CONNECTIONS

- A. When sanitary sewer service lines are constructed as part of the same project as the sewer, they shall be connected to the sewer using a wye.

- B. Where a sanitary sewer service line is to connect to an existing sewer, or where specific approval has been granted by the Village Engineer for the construction of a service line after the completion of the sewer main or lateral, the connection shall be made by one of the methods detailed below:
 - 1. Install a manhole.
 - 2. Circular saw-cut sewer using proper tools. Install a hub wye saddle or a hub tee saddle in accordance with manufacturer's recommendations.
 - 3. Using pipe cutter, neatly and accurately cut out desired length of pipe for insertion of proper fittings. Use "Band-Seal" couplings and shear rings and clamps to fasten the inserted fitting. Follow manufacturer's recommendations for the installation. Cement joints are prohibited.
- C. Risers shall be required for services where sewers are over twelve (12) feet deep and shall extend within ten (10) feet of finished grade as a minimum.

6.9 TEMPORARY CLOSURES

- A. Place a 2" x 4" stake from the invert of the service line to 1-foot above the ground surface and painted orange; or
- B. Where curbs or sidewalks are available, notch the top of the curb or back side of the walk directly opposite the end of the service line.
- C. Where service piping has been installed, make connection to the building piping system.
- D. Keep a record on forms available from the Engineer of branch fittings, riser pipes, and service lines by measurement to the nearest downstream manhole.
- E. Deliver the records to the Village Engineer on completion of the project.

6.10 SEWER DEPTH

Sanitary sewers shall be sufficiently deep to provide gravity service for all sanitary sewage within the Service Area, both existing and future, assuming all present and future basement floor drains and sanitary fixtures below finished grade will be connected to ejector pumps discharging to the sanitary sewers. Sanitary sewers shall be constructed such that the service lines are a minimum of 9-feet deep at the property line. Where the required depth cannot be attained, the sewer shall be sufficiently deep so as to prevent freezing. For the purposes of this specification, a depth of 6-feet to the sewer invert shall be required. Other measures such as rigid insulation may be allowed on a case by case basis between the depths of 4 ½ and 6-feet. Sewers at depths of less than 9-feet will be considered for approval on a case-by-case basis.

6.11 WATER MAIN PROTECTION

The Wisconsin Administrative Code requirements relative to water main protection are applicable to sanitary sewer facility construction.

6.12 TESTING AND INSPECTING

- A. Test sewers and service connections for watertightness by the low pressure air testing, or exfiltration, or infiltration method as selected by the Village Engineer.
- B. Leakage tests:
 - 1. Low pressure air test:
 - a. Prior to testing for leakage, flush and clean the sewers by passing a snug-fitting inflated rubber ball through the sewer by upstream water pressure.
 - b. Seal pipe openings with airtight plugs and braces.
 - c. Whenever the sewer to be tested is submerged under groundwater, insert a pipe probe by boring or jetting into the backfill material adjacent to the center of the sewer to determine the groundwater hydrostatic pressure by forcing air to flow slowly through the probe pipe.
 - d. Add air to the plugged sewer sections under test until internal air pressure reaches 4.0 psig greater than any groundwater hydrostatic pressure.
 - e. Allow at least two minutes for air temperature to stabilize and adding air to maintain the initial test pressure.
 - f. Shut off the air supply after stabilizing the air temperature and record the time in seconds for the internal sewer pressure to drop from 3.5 psig to 2.5 psig greater than any groundwater hydrostatic pressure.
 - g. Air testing techniques shall be in accordance with the latest edition of the Standard Specifications for Sewer and Water Construction in Wisconsin for testing sewer lines by low-pressure air test method for the appropriate pipe material.
 - h. The required times will be adjusted by the Engineer for main line sewers larger than 24-inches and for lateral pipes connected and tested with the main line sewer.
 - i. If the air test fails to meet these requirements, locate and repair, or remove and replace the faulty sections of sewer in a manner approved by the Engineer, as necessary to meet the allowable limits upon retesting.
 - j. Do not use acrylamid gel sealant to correct leakage. If the air test fails to meet these requirements, locate and repair, or remove and replace the faulty sections of sewer in a manner approved by the Engineer, as necessary to meet the allowable limits upon retesting.

- k. Provide and use measuring devices approved by the Village Engineer. Provide water, materials, and labor for making required tests.
 2. Allowable limits for water infiltration or exfiltration test: Not to exceed 200 gallons per inch of pipe diameter per 24 hours per mile of sewer, including building service connections.
 3. Make tests in the presence of the Village Engineer, giving at least three days advance notice of being ready for test observation.
- C. Deflection test for flexible thermoplastic pipe:
 1. Test the deflection of installed PVC and other flexible thermoplastic pipe.
 2. Perform the test no sooner than 30 days after backfilling has been completed.
 3. Perform the test by pulling a mandrel or rigid ball having a diameter equal to 95 percent of the inside diameter of the pipe through the pipe from manhole to manhole without using mechanical pulling devices.
 4. Allowable deflection limits: 5.0 percent of the base inside diameter of the PVC pipe.
 5. Wherever the deflection limitation is exceeded, uncover the pipe, carefully replace compacted embedment and backfill material, and retest for deflection.
- D. Internal Television Inspection: All public sanitary sewer extensions shall be internally inspected by remote camera. Provide high resolution digital imaging on DVD's and submit to the Village Engineer for review and approval prior to acceptance of the sewer improvements by the Municipality.

SECTION 7 - STORM WATER DRAINAGE

7.1 INTRODUCTION

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

7.2 GENERAL PROJECT REQUIREMENTS

A. Surface Flow

Surface swales/ditches described below shall be encouraged for use as designed in accordance with the requirements of this Section. Natural swales and depressional storage areas shall be incorporated into storm water facilities design wherever practicable. Swales and ditches, together with any underground storm sewer system, shall provide an adequate outfall for runoff from the 100-year frequency 24-hour duration rainstorm. In areas where swales/ditches can not be provided, the underground storm sewer system shall be designed for the 100-year storm condition.

B. Storm Sewer

Where required by the Village Engineer, storm sewers may be constructed to drain the development and any contiguous drainage areas. The Subdivider shall submit to the Village Engineer two (2) copies of the storm water drainage computations.

C. Storm Water Detention

Storm detention may be required as determined by the Village Engineer. Storm water detention, where required, is subject to the review of the Village Engineer. In concept, a detention pond shall have high-water level, with one (1) foot of freeboard, based on a 100-year design storm. Detention to be provided shall be for the entire site evaluated in its natural state and shall be constructed prior to all other improvements, including mass earthwork grading. Existing mapped wetlands, as determined by the Municipality, may not be used to provide the required storm water detention unless authorized by the Wisconsin Department of Natural Resources, the US Army Corps of Engineers, and the Village Engineer.

D. Total Suspended Solids

Best management practices shall be designed, installed or applied, and maintained to control total suspended solids carried in runoff from the post-construction site meeting the requirements of NR 151 of the Wisconsin Administrative Code and as follows:

1. Except as provided in paragraph (3), for new development, by design, reduce the average annual total suspended solids load by 80 percent, as compared to no runoff management controls. The Wisconsin Department

of Natural Resources provided guidance in designing best management practices to meet this performance standard.

2. Except as provided in paragraph (3), for redevelopment, by design, reduce the average annual total suspended solids load by 40 percent, as compared to no runoff management controls.
3. If the design does not achieve the applicable total suspended solids reduction specified above, a written and site-specific explanation shall be submitted to the Village Engineer for approval.

E. Infiltration

1. Except as provided in paragraphs (4) to (7), best management practices shall be installed and maintained with the design capability to infiltrate runoff, to the maximum extent practicable, in accordance with one of the following Wisconsin Department of Natural Resources methods:
 - a. By design, the inches of runoff to be infiltrated, per storm event, shall be equal to or greater than the values given in the table below. An equivalent volume of runoff in cubic feet to be infiltrated is calculated using values from this table divided by 12 and multiplied by the total area in square feet of the post-construction site.

| Hydrologic Soil Group | 1 & 2 Family Residential Land Use | Land Uses Other Than 1 & 2 Family Residential |
|-----------------------|-----------------------------------|---|
| A | 0.26 | 0.40 |
| B | 0.23 | 0.30 |
| C | 0.12 | 0.14 |

- b. By design, the inches of runoff to be infiltrated, per storm event, shall be equal to or greater than the values calculated using the following equation: $I = CI \times F$. "I" is the inches of runoff to be infiltrated. "CI", expressed as a decimal, is the percent of connected imperviousness across the post-construction site and "F" is a factor. The volume of runoff in cubic feet to be infiltrated is calculated by dividing "I" by 12 and then multiplying by the total area in square feet of the post-construction site. The following conditions shall apply:
 - i. For one and two family residential land use, "F" shall have a value of 0.62 for Type A soils, 0.55 for Type B soils, and 0.28 for Type C soils.
 - ii. For land use other than one and two family residential, "F" shall be have value of 0.44 for Type A soils, 0.33 for Type B soils, and 0.15 for Type C soils.
 - c. By design, infiltrate sufficient runoff volume so that the post-development average annual infiltration volume shall be at least 90 percent of the pre-development annual infiltration volume for one and two family residential development and 70 percent for all other land uses.

4. The infiltration of no more than 0.5 inches of runoff, per storm event, from any particular drainage area within the post-construction site shall count toward meeting the infiltration design standard of paragraph (1).
5. Before infiltrating runoff, pretreatment shall be required from commercial and industrial parking lots and access roads within the post-construction site.
6. No person may use best management practices to implement this infiltration standard in any of the following:
 - a. Areas associated with Tier 1 industrial facilities identified in s. NR 216.21(2)(a), Wis. Adm. Code, including storage, loading, rooftop and parking.
 - b. Storage and loading areas of Tier 2 industrial facilities identified in s. NR 216.21(2)(b), Wis. Adm. Code.
 - c. Fueling and vehicle maintenance areas.
 - d. Areas within 1,000 feet upgradient or within 100 feet downgradient of karst features.
 - e. Areas with less than 5 feet separation distance from groundwater or bedrock.
 - f. Areas within 400 feet of a municipal well or within 100 feet of a private well.
 - g. Areas where infiltration would be occurring through contaminants of concern present in the soil as defined in s. NR 720.03(2), Wis. Adm. Code.
 - h. Areas where the soils are less than 10 percent fines. "Percent fines" means the percentage of a given sample of soil, which passes through a No. 200 sieve, in accordance with ASTM C-117.
 - i. Runoff from commercial and industrial areas that contains chloride deicers. A pass-through or diversion mechanism may be installed so that the 1-year, 24-hour storm flows away from or directly through an infiltration device during the months of December through March, or over a longer period of time as necessary, until the level of chlorides within runoff is below the chlorides preventive action limit in Ch. NR 140, Wis. Adm. Code. If chloride deicers are not used in these areas, then this exclusion does not apply.
7. The following are not required to meet this infiltration standard:
 - a. Areas composed of hydrologic soil group D.
 - b. Parking areas and access roads less than 5,000 square feet for commercial and industrial development.
 - c. Redevelopment post-construction sites.
 - d. In-fill development areas less than 5 acres.
 - e. Infiltration areas during periods when the soil on the site is frozen.
8. Where alternate uses of runoff are employed, such as for irrigation, such alternative use shall be given equal credit toward the infiltration volume required by this subsection.
9. Infiltration systems designed in accordance with this subsection shall, to the extent technically and economically feasible, minimize the level of pollutants infiltrating to groundwater and maintain compliance with the preventive action limit at a point of standards application in accordance with

Chapter NR 140 of the Wisconsin Administrative Code. However, if site-specific information indicates that compliance with a preventive action limit is not achievable, then the infiltration BMP may not be installed or shall be modified to prevent infiltration to the maximum extent practicable. Discharge from pretreatment BMPs shall remain below the enforcement standard at the point of standards application.

F. Drainage Basin Divides

The design of storm water drainage systems shall not result in the interbasin transfer of drainage, unless no reasonable alternative exists and there is no legal restraint to prevent such transfer.

G. Lot Grading

The proposed finished yard grade, the location and top of foundation elevation for all proposed structures shall be shown on the engineering drawings. 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 back 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 to ensure positive drainage away from each structure. Lot grading shall be completed so as to prevent drainage problems on adjacent lots and prevent impact to the storm water drainage system of the area.

7.3 DESIGN CRITERIA FOR STORM WATER DETENTION

A. Release Rates

The allowable release rates for the two (2) year, ten (10) year, and one hundred (100) year frequency, 24-hour duration rainstorms shall be no greater than that for the land in its natural state prior to development.

B. Design Calculations

1. The design of storm water detention facilities shall be based on runoff hydrographs from the two (2) year, ten (10) year and one hundred (100) year frequency, 24-hour duration rainstorms.
2. Storm water detention facilities shall be designed using Soil Conservation Service Technical Release 55 (TR-55) or an equivalent methodology as determined by the Village Engineer. The modified rational formula shall not be used for development of hydrographs.
3. All design rainfall events shall be based on the latest edition of the Point Rainfall Intensity-Duration-Frequency Relationships for Milwaukee, Wisconsin, as prepared by Southeastern Wisconsin Regional Planning Commission.
4. Pre-development conditions shall assume "good hydrologic conditions" for land covers identified in TR-55. However, when pre-development land cover is cropland, runoff curve numbers shall not exceed the following:

| Hydrologic Soil Group | Runoff Curve Number |
|-----------------------|---------------------|
| A | 55 |
| B | 68 |
| C | 77 |
| D | 80 |

5. The use of run-off curve numbers for developed conditions shall not be lower than the run-off curve numbers for pre-developed conditions when the pre-development land cover is cropland.
6. Storm water runoff from areas tributary to the site shall be considered in the equations for the design of the project site's drainage system.

C. Basin Design

1. Dry-bottom detention basins shall be designed to be safe, aesthetically pleasing and available for multiple uses. Dry-bottom detention basins shall be designed and sized such that a minimum of 80 percent of the bottom area shall have standing water no longer than 72 hours for the 100-year frequency storm. The basin shall have a minimum slope of one (1) percent, and a maximum embankment slope of twenty (20) percent.
2. Wet-bottom retention basins shall be designed to be safe, aesthetically pleasing, and available for recreational use. Wet-bottom basins shall be at least three feet (3') deep, excluding near-shore banks and safety ledges. If fish habitat is provided, at least 25 percent of the basin bottom shall be a minimum of ten feet (10') deep. Wet-bottom basins shall be designed to remove storm water pollutants and sediments and designed in such a manner to reduce nuisance problems such as embankment erosion and algae. Embankments above normal water levels shall be either terraced or sloped at a maximum of 4:1. A safety ledge is required no greater than 1'-6" below the normal water level. Such ledges shall be no less than 10-feet wide and shall back pitch toward the basin embankment.
3. Wet-bottom retention basins shall include a 25-foot buffer area around the basin perimeter maintained in native grasses and plantings. This area shall remain in a natural state with only annual or semi-annual mowing to extend the life of the retention basin, prevent erosion, and assure good water quality.

D. Outlet

1. All concentrated storm water discharges leaving a site must be directed into a well-defined receiving channel or pipe with adequate capacity for safe conveyance of flows from all design events.
2. 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.

7.4 DESIGN CRITERIA FOR INFILTRATION SYSTEMS

Infiltration systems shall meet the design criteria and technical standards published by the

7.5 DESIGN CRITERIA FOR SURFACE SWALES AND STORM SEWERS

A. Storm Sewer

1. When storm sewer construction is required, storm sewers shall be designed 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. 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 twelve feet (12') per second.
4. In areas where curb and gutter and storm sewers are required, catch basins shall be installed so that the drainage reach for each catch basin shall not exceed four hundred feet (400'). Where the catch basin is located at a low point, additional catch basins may be required by the Village Engineer. No more than two (2) catch basins shall be interconnected. Catch basins shall be placed at the end of radii. Catch basins 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 along the side yard, over the sidewalk and curb. Rear yard inlets shall be placed where approved or as required by the Village Engineer.
6. The minimum size storm sewer or inlet connection shall be twelve inches (12") in diameter.
7. Unless otherwise approved by the Village Engineer, storm sewers shall be reinforced concrete pipe conforming to ASTM C76 minimum Class III with O-ring joints conforming to ASTM C443. All inlet connections shall be concrete sewer pipe, ASTM C14 for extra strength pipe. Additional strength pipe may be required as approved by the Village Engineer.
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 Village Engineer.
9. All manholes, inlet manholes, inlets and catch basins, and headwalls shall be designed in accordance with the standard details of the Municipality.
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. Driveway 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 fifteen 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.
- C. Road culverts shall meet the following minimum standards:
1. Minimum pipe diameter of fifteen inches (15").
 2. Reinforced concrete pipe (RCP) conforming to ASTM C76, min. Class III.
 3. Culvert slope and invert elevations shall match the ditch slope and invert elevations.
 4. Minimum cover at roadways shall be (12) inches.
- D. Manmade swales and ditches shall meet the following minimum design standards:
1. Rear lot swales shall be centered on property lines.
 2. Minimum slope of one percent (1.0%), and maximum slope of ten percent (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 two percent (2%) shall be seeded and mulched or sodded and as required by the WDNR "Construction Site Erosion and Sediment Control Technical Standards."
 6. The bottom and banks of ditches with grades between two (2) and four (4) percent shall be sodded or else seeded in combination with mulch and erosion blanket and as required by the WDNR "Construction Site Erosion and Sediment Control Technical Standards."
 7. The bottom and banks of ditches with grades between four (4) and eight (8) percent shall be sodded and equipped with permanent riprap ditch checks at drive culvert ends or other spacing and as required by the WDNR "Construction Site Erosion and Sediment Control Technical Standards."

8. The bottom and banks of ditches with grades between eight (8) and ten (10) percent shall be riprapped, paved, or otherwise stabilized as approved by the Village Engineer.
9. Whenever practicable, all areas of the property must be provided 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.

SECTION 8 - ROADWAY CONSTRUCTION

8.1 INTRODUCTION

- A. All developments, regardless of size within the Municipal 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 Municipality, shall meet the technical requirements of this Section and the (WDOT) "Standard Specifications".

8.2 STREET CLASSIFICATION

- A. Certain variables in geometric and structural design discussed in this Section are dependent on the functional classification of the street in question. For the purposes of these standards, all streets will be classified as shown in Figures 8.1, 8.2 and 8.3 appended to this section.
- 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 a local street unless otherwise established by the Village Engineer.

8.3 GEOMETRICS

Roadway geometrics shall be as set out in Figures 8.2 and 8.3.

8.4 VERTICAL CURVES

- A. The minimum design length of a vertical curve is based on the formula $L=KA$ where A is the algebraic difference in percent of the 2 grades.
- B. For crest vertical curves, the rate of vertical curvature (K) shall be a minimum of 20 based on a 25 MPH design speed.
- C. For sag vertical curves, the rate of vertical curvature (K) shall be a minimum of 30 based on a 25 MPH design speed.

8.5 ROADWAY EXCAVATION

- A. Topsoil shall be stripped from all proposed roadway areas. The roads shall then be constructed to the lines and grades as shown on the drawings.
- B. No construction required by this Section shall be permitted between November 1st and April 15th without written authorization of the Village Engineer.

8.6 SUBGRADE

- A. The roadway shall be constructed to within +/-0.10 feet of the proposed subgrade elevation with the average subgrade within +/-0.02 feet of the proposed subgrade elevation.
- B. Roadways shall be proofrolled prior to construction of the base course. A minimum 55,000 lb. tandem-axle truck shall be provided to drive slowly over the area to be inspected. Areas which show deflections greater than 1 1/2-inches shall be repaired and pass proofrolling tests before construction may proceed. The Village Engineer shall be present for and should be notified 24 hours prior to proofrolling.

8.7 SUB-BASE COURSE

- A. Sub-base course construction required under this section shall be crushed stone or crushed concrete complying with Section 311 of the WDOT "Standard Specifications" for Breaker Run.
- B. Geotextile fabrics, where allowed by the Village Engineer for subgrade stabilization, shall conform to (WDOT) "Standard Specifications", Type SR.

8.8 BASE COURSE

Base course construction required under this Section may be either asphaltic base course or crushed stone or crushed gravel in accordance with Figures 8.1 and 8.2. Materials shall comply the applicable provisions of the (WDOT) "Standard Specifications", 3/4-inch dense aggregate base. Roadways shall be proofrolled prior to construction of the binder course or pavement section. A minimum 55,000 lb. tandem-axle truck shall be provided to drive slowly over the area to be inspected. Areas which show deflections greater than 1-inch shall be repaired and pass proofrolling tests before construction may proceed. The Village Engineer shall be present for and should be notified 24 hours prior to proofrolling.

8.9 PAVEMENT AND SURFACE COURSES

- A. Pavement construction required under this Section may be either asphaltic pavement in accordance with Figure 8.1 or Portland cement concrete pavement designed in accordance with the Wisconsin Department of Transportation Facilities Development Manual. Materials shall comply with the (WDOT) "Standard Specifications".
- B. Use Superpave asphaltic mix design and nominal aggregate size as follows:
 - 1. Minor Streets: Type E-0.3
 - a. Use 19 mm (3/4") for binder course.
 - b. Use 9.5 mm (3/8") for leveling binder and surface course.
 - 2. Collector Streets: Type E-1
 - a. Use 9.5 mm (3/8") for leveling binder.

- b. Use 19 mm (3/4") for binder course.
 - c. Use 12.5 mm (1/2") for surface course.
 - 3. Arterial Streets: Type E-3
 - a. Use 9.5 mm (3/8") for leveling binder.
 - b. Use 19 mm (3/4") for binder course.
 - c. Use 12.5 mm (1/2") for surface course.
- C. For tacking asphaltic and other stabilized surfaces, comply with the applicable provisions of the (WDOT) "Standard Specifications".
- D. In new construction, the final surface course shall be placed after at least 75% of the construction activities (homes) have been completed, but no later than 5 years from the time in which the base is placed, without written authorization by the Village Engineer.
- E. Each lift of asphaltic pavement shall not exceed 2 inches.

8.10 COMBINATION CONCRETE CURB AND GUTTER

Curb and gutter construction where applicable, shall comply with the (WDOT) "Standard Specifications", and conform to the attached Standard Details. The sawing of the curb head to facilitate a driveway opening is prohibited.

8.11 STANDARD DESIGN METHOD FOR PAVEMENTS

When, in the opinion of the Village 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 strength than those shown in Figure 8.1.

8.12 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.

B. Utility Crossing Protection

- 1. For new construction or when required by the Village Building Inspector, all

concrete sidewalk, curb, gutter and driveways over excavated areas or utility trenches shall be reinforced with a minimum of two No. 4 bars, 12-inches on center for a length of 20 feet.

8.13 SIDEWALKS

- A. All sidewalks shall be a minimum of 4-inches thick. Sidewalks shall be continuous through residential driveways with a minimum thickness of 6-inches through the driveway section. Sidewalk in non-residential areas shall be a minimum of 8-inches thick through non-residential driveways.
- B. Sidewalk width shall be 4-feet or as determined by the Village Board when a greater width is justified on the basis of anticipated traffic.
- C. Urban Streets:
 - 1. Public walks shall be constructed on both sides of the street.
 - 2. Sidewalks shall be located 1-foot inside the right-of-way.
- D. Rural Streets:
 - 1. Public walks shall be constructed on at least one side of the street.
 - 2. Sidewalks shall be located 1-foot outside the right-of-way in a public easement.
 - 3. Street yard setback for lots fronting public sidewalk shall be 30-feet.
- E. All sidewalks shall meet the State of Wisconsin Handicapped Access Requirements.
- F. All sidewalks shall be constructed prior to or within 6-months of occupancy. An occupancy bond shall be provided to the Municipality if the sidewalk is not completed prior to occupancy.

**VILLAGE OF TWIN LAKES, WISCONSIN
LAND DEVELOPMENT STANDARDS
PAVEMENT REQUIREMENTS
FIGURE 8.1**

| STREET CLASSIFICATION | MINIMUM PAVEMENT REQUIREMENTS |
|------------------------------|---|
| Arterial | The structural design for arterial street pavements shall be based on the Wisconsin Department of Transportation Facilities Development Manual. |
| Collector | 8" crushed aggregate base course 4" asphaltic binder course 2" asphaltic surface course |
| Minor Street | 9" crushed aggregate base course 2" asphaltic binder course 1-1/2" asphaltic surface course |

**VILLAGE OF TWIN LAKES, WISCONSIN
LAND DEVELOPMENT STANDARDS
FIGURE 8.2**

RURAL STREET GEOMETRIC CRITERIA

| ROADWAY CLASSIFICATION | ARTERIAL – 4 Lane | ARTERIAL – 2 Lane | COLLECTOR | MINOR |
|---|---------------------------------|--------------------------|------------------|--------------|
| Right-of-way width | 130 ft. | 90 ft. | 90 ft. | 66 ft. |
| Roadway width | 24 ft. Each Side | 24 ft. | 24 ft. | 22 ft. |
| Median width | 18 ft. | N/A | N/A | N/A |
| Shoulder width | 10 ft. Outside, 6 ft. Inside | 10 ft. | 10 ft. | 4 ft. |
| Curb type | 30"-Type D, Inside | N/A | N/A | N/A |
| Number of traffic lanes | 4 ⁽¹⁾ | 2 | 2 | 2 |
| Lane width | 12 ft. | 12 ft. | 12 ft. | 11 ft. |
| Minimum cul-de-sac pavement radius | N/A | N/A | N/A | 45 ft. |
| Maximum cul-de-sac length ⁽²⁾ | N/A | N/A | N/A | 800 ft. |
| Maximum grade | 5% | 6% | 6% | 10% |
| Minimum grade | 0.5% | 0.5% | 0.5% | 0.5% |
| Minimum center line radius ⁽³⁾ | 500 ft. | 500 ft. | 300 ft. | 150 ft. |
| Return radius | 30 ft. | 30 ft. | 30 ft. | 25 ft. |
| ROW return radius | 25 ft. | 25 ft. | 25 ft. | 25 ft. |
| Crown | 2% | 2% | 2% | 2% |

(1) Four (4) lanes required for traffic volumes over 15,000 ADT.

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

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

**VILLAGE OF TWIN LAKES, WISCONSIN
LAND DEVELOPMENT STANDARDS
FIGURE 8.3**

URBAN STREET GEOMETRIC CRITERIA

| ROADWAY CLASSIFICATION | ARTERIAL – 4 Lane | ARTERIAL – 2 Lane | COLLECTOR | MINOR |
|---|--------------------------|--------------------------|------------------|--------------|
| Right-of-way width | 130 ft. | 90 ft. | 90 ft. | 66 ft. |
| Roadway width ⁽¹⁾ | 24 ft. each side | 48 ft. | 36 ft. | 35 ft. |
| Median width | 24 ft. | N/A | N/A | N/A |
| Sidewalk width ^{(2) (3)} | 5 ft. | 4 ft. | 4 ft. | 4 ft. |
| Curb type | 30"-Type D | 30"-Type D | 30"-Type D | Mountable |
| Number of traffic lanes ⁽⁴⁾ | 4 ⁽¹⁾ | 2 | 2 | 2 |
| Lane width | 12 ft. | 12 ft. | 12 ft. | 12 ft. |
| Minimum cul-de-sac pavement radius | N/A | N/A | N/A | 45 ft. |
| Maximum cul-de-sac length ⁽⁵⁾ | N/A | N/A | N/A | 800 ft. |
| Maximum grade | 5% | 6% | 6% | 10% |
| Minimum grade | 0.5% | 0.5% | 0.5% | 0.5% |
| Minimum center line radius ⁽⁶⁾ | 500 ft. | 500 ft. | 300 ft. | 150 ft. |
| Return radius | 30 ft. | 30 ft. | 30 ft. | 25 ft. |
| Crown | 1.5% | 1.5% | 1.5% | 1.5% |

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

(2) Sidewalk shall be placed on both sides of the street and within the public right-of-way, 1-foot from the property line unless otherwise approved by the Municipality.

(3) Sidewalk designated as bike path shall be a minimum width of 8-feet.

(4) Four (4) lanes required for traffic volumes over 15,000 ADT.

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

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

SECTION 9 - DEFINITIONS

9.1 GENERAL DEFINITIONS

For the purposes of this Ordinance, the following definitions shall be used. Words used in the present tense include the future; the singular number includes the plural number; and the plural number includes the singular number. The word "shall" is mandatory and not directory.

9.2 SPECIFIC WORDS AND PHRASES

Alley

A special public way affording only secondary access to abutting properties.

Arterial Street

See Street Classification

Block

A tract of land bounded by streets or a combination of streets, public parks, cemeteries, railroad rights-of-way, shorelines of navigable waters, and municipal boundaries.

Building Line

A line parallel to a lot line and at a distance from the lot line to comply with the terms of this Ordinance.

Collector Street

See Street Classification

Comprehensive Plan

The extensively developed plan, also called a master plan, including detailed neighborhood plans, proposals for future land use, transportation, urban redevelopment and public facilities. Devices for the implementation of these plans, such as zoning, official map, land division, and building line ordinances and capital improvement programs shall also be considered a part of the comprehensive plan.

Conduit

A buried pipe for the installation of wires or cables or the conveyance of gas, water, storm water or sewage.

Contractor

An individual, company, firm or other party or organization who contracts to physically construct all or a portion of a project for either a Subdivider or the Municipality.

Cradle

Bedding placed under and around a conduit for proper support.

Crosswalk

A strip of land dedicated to public use, which is reserved across a block to provide pedestrian access to adjacent areas.

Cul-de-Sac

A local street with only one (1) outlet and having an appropriate turn-around for the safe and convenient reversal of traffic movement.

Design Engineer

The individual or firm retained by the Subdivider who is responsible for the design and preparation of construction documents for a project.

Easement

A grant by a property owner for the use of a strip or parcel of land by the general public, a corporation, or a certain person or persons for a specific purpose or purposes.

Field Inspector

An individual, company or firm appointed by the Municipality to observe construction for compliance with approved drawings and specifications.

Flood Protection Elevation

An elevation two (2) feet above the elevation of the 100-year recurrence interval flood.

Floodplains

Those lands, including the channels, floodways, and floodplain fringe of any given reach, which are subject to inundation by a flood with a given recurrence frequency. The 100-year recurrence interval flood (or that flood having a one percent probability of occurring in any given year) is generally used for zoning regulation. Other flood events used in this Ordinance are the 50-year recurrence interval flood (or that flood having a two percent probability of occurring in any give year) and the 10-year recurrence interval flood (or that flood having a ten percent probability of occurring in any given year).

Frontage Street

See Street Classification

High Groundwater Elevation

The highest elevation to which subsurface water may rise as defined by the Wisconsin Administrative Code. This may be evidenced by the actual presence of water during wet periods of the year, or by soil mottling during drier periods. "Mottling" is a mixture or variation of soil colors. In soils with restricted internal drainage, gray, yellow, red, and brown colors are intermingled giving a multi-colored effect.

Live Storage

That volume available in a reservoir for holding storm water in accordance with the requirements of the Design Standards.

Lot

A parcel of land of at least sufficient size to meet minimum zoning requirements for use, width, and area as set forth in the Village Zoning Ordinance.

Minor Streets

See Street Classification

Municipality

An incorporated Village or City.

National Map Accuracy Standards

Standards governing the horizontal and vertical accuracy of topographic maps and specifying the means for testing and determining such accuracy, endorsed by all federal agencies having surveying and mapping functions and responsibilities. These standards have been fully reproduced in Appendix D of SEWRPC Technical Report No. 7, Horizontal and Vertical Survey Control in Southeastern Wisconsin.

Navigable Stream

Any stream capable of floating any boat, skiff, or canoe of the shallowest draft used for recreational purposes as determined by the Wisconsin Department of Natural Resources.

Outlot

A parcel of land, other than a lot or block, so designated on the plat, but not of standard lot size, which can be dedicated to the public, redivided into lots or combined with one (1) or more other adjacent outlots or lots in adjacent subdivisions or minor subdivisions in the future for the purpose of creating buildable lots.

Parkway

That area of a street right-of-way between the back of curb or pavement edge and the right-of-way line intended for use primarily by pedestrian traffic or roadside ditches and developed in a park-like character.

Private Street

See Street Classification

Public Way

Any public road, street, highway, walkway, drainageway, or part thereof.

Record Drawings

Design drawings checked in the field and which are revised to show as-constructed location, elevation, grading and specification of material for improvements and utilities.

Release Rate

The controlled rate at which storm water is released from a holding reservoir.

Single Purpose Road

Any road, driveway or way which primarily serves a single parcel of property and is determined by the State of Wisconsin Department of Transportation, to be ineligible for highway aids to the Municipality.

Soil Mapping Unit

Soil type, slope, and erosion factor boundaries as shown on the operational soil survey maps prepared by the U.S. Soil Conservation Service.

Standard Specifications

The most current edition of the "Standard Specifications For Road and Bridge Construction", prepared by the Wisconsin Department of Transportation, or the "Standard Specifications for Sewer and Water Construction in Wisconsin", prepared by the Public Works Industry Improvement Program, which may be used in conjunction with the specifications of the Municipality.

Storm Water Detention Basin

A reservoir for the temporary storage of storm water.

Street

An area of land which serves or is intended to serve as a vehicular and pedestrian access to abutting lands or to other streets.

Street Classification

- A. Arterial Street: A street used, or intended to be used primarily for rapid, unimpeded, or heavy through traffic, primarily arranged on section lines.
- B. Collector Street: A street used, or intended to be used, to carry traffic from minor streets to the system of arterial streets including the principal entrance streets to large residential developments, and act as main feeders or connector streets between arterial streets for heavy traffic flow between the various residential districts and areas in and surrounding the Municipality.
- C. Minor Street: An area of land which serves or is intended to serve as a vehicular and pedestrian access to abutting lands or to other streets primarily for use in low or medium density residential districts.
- D. Frontage Street: A minor street auxiliary to and located on the side of any arterial street for control of access and for service to the abutting development.
- E. Private Street: Any street designated for use by specific property owners and not dedicated for public use nor intended for access by the general public, serving more than 2 residences.

Street, Public

All streets which are shown on the subdivision plat and are to be dedicated for public use.

Street, Commercial and Industrial

Those streets which serve commercial and industrial districts from and between arterial or collector streets, serving heavy vehicle and truck traffic regardless of volume.

Subdivider

Any person, firm or corporation, or any agent thereof, dividing or proposing to divide land resulting in a subdivision, Certified Survey Map, or replat, responsible for preparing and recording the plats of the subdivision and for complying with these requirements. The term "Developer" may be used interchangeably with Subdivider for the purpose of these standards.

Surety Bond

A bond guaranteeing performance of a contract or obligation through forfeiture of the bond if said contract or obligation is unfulfilled by the subdivider.

Swale

A ditch or surface drainage channel meeting certain specific criteria as established herein for the surface movement of storm water.

Village Engineer

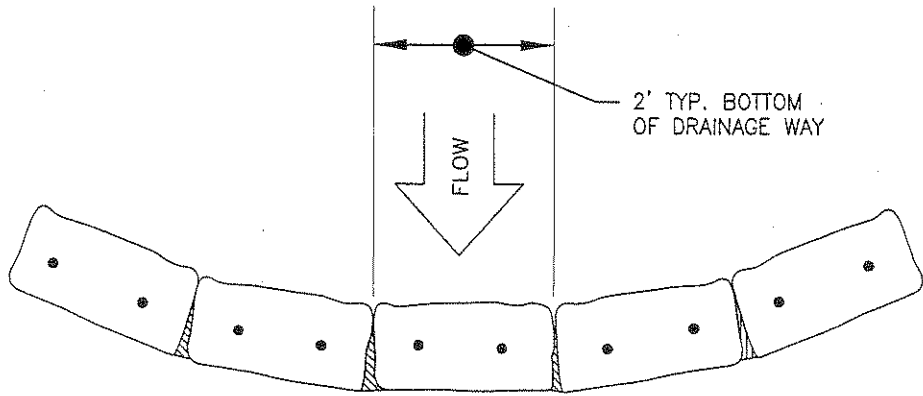
The individual or firm appointed or contracted by the Municipality who is licensed to practice professional engineering in the State of Wisconsin and is responsible for reviewing subdivision and development plans on behalf of the Municipality, recommends changes from time to time to these Design Standards and performs other duties as directed by Village Ordinance.

Wetlands

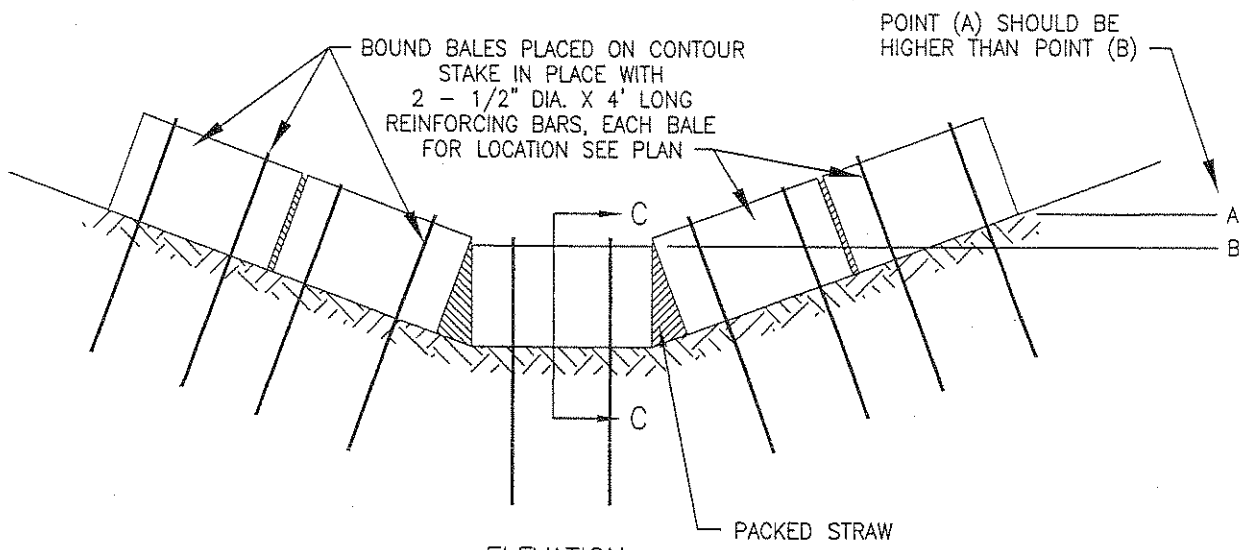
Those lands which are partially or wholly covered by marshland flora and generally covered with shallow standing water or lands which are wet and spongy due to a high water table as determined by the US Army Corps of Engineers or Wisconsin Department of Natural Resources.

Wisconsin Administrative Code

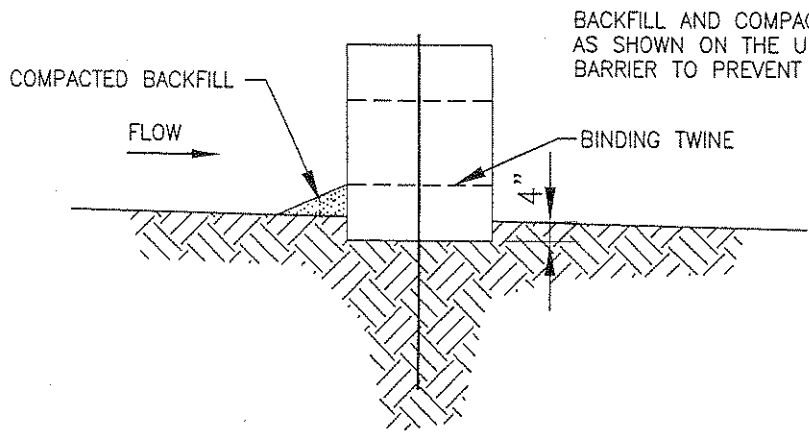
The rules of administrative agencies having rule-making authority in Wisconsin, published in a loose-leaf, continual revision system as directed by Section 35.93 and Chapter 227 of the Wisconsin Statutes, including subsequent amendments to those rules.



PLAN



ELEVATION

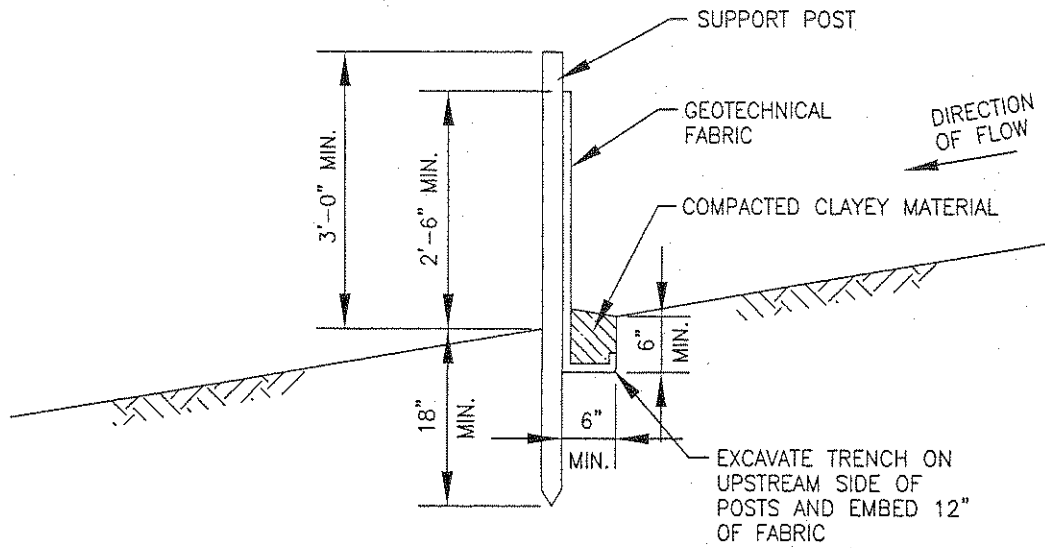


SECTION

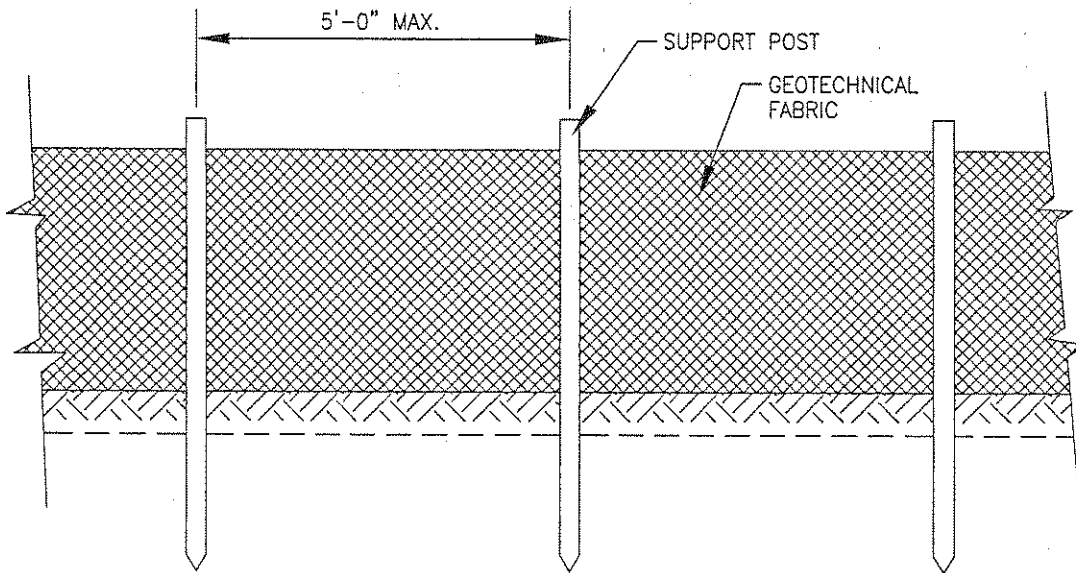
DITCH CHECK
STRAW BALE BARRIER

VILLAGE OF
TWIN LAKES,
WISCONSIN

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SECTION



ELEVATION

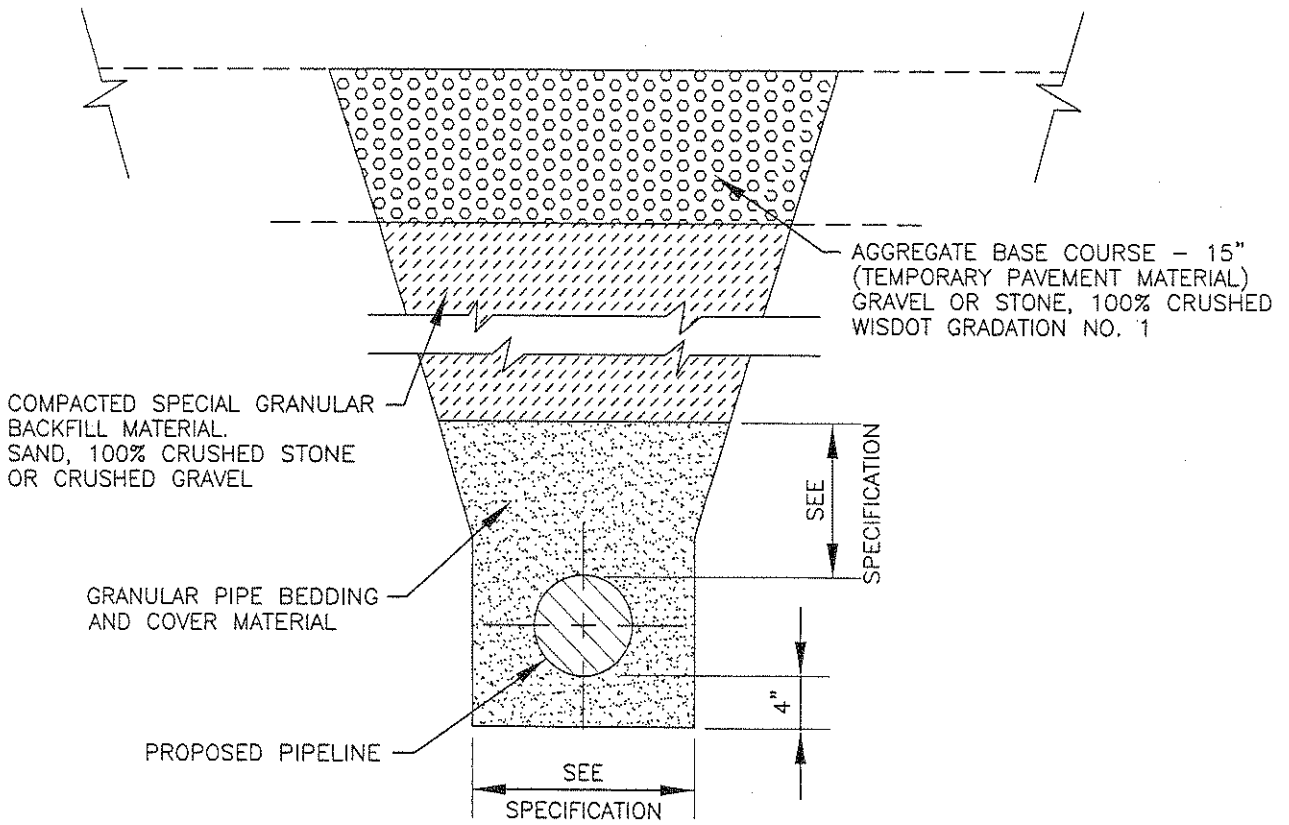
SILT FILTER
FENCE

VILLAGE OF
TWIN LAKES,
WISCONSIN

REVISIONS

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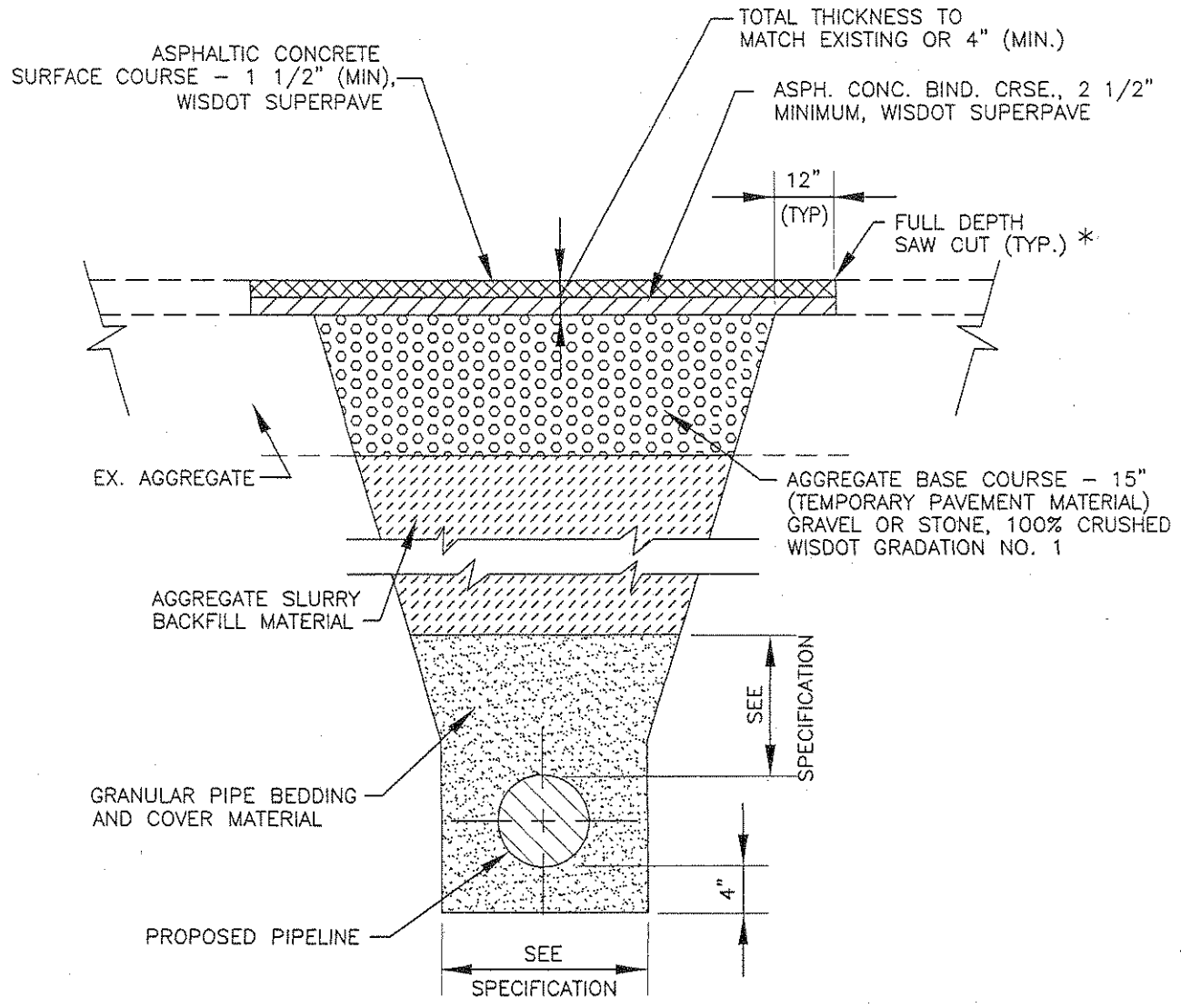
TYPICAL TRENCH DETAIL
AGGREGATE BASE

VILLAGE OF
TWIN LAKES,
WISCONSIN

REVISIONS

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* FULL DEPTH SAWCUT PRIOR TO EXCAVATION. FULL DEPTH SAWCUT REQUIRED AGAIN PRIOR TO RESTORATION AT THE DIRECTION OF THE VILLAGE REPRESENTATIVE.

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| TYPICAL TRENCH DETAIL SLURRY BACKFILL | VILLAGE OF TWIN LAKES, WISCONSIN | REVISIONS | DATE |
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FRAMES AND COVERS SHALL BE HEAVY DUTY AND SHALL BE NEENAH R-1713, OR EAST JORDAN 1050 EXHD, OR EQUAL, WITH CONCEALED PICK HOLES AND SELF SEALING LID.

CRETEX OR EQUAL CHIMNEY SEAL PAVED AREAS - INTERNAL SEAL LAWN AREAS - EXTERNAL SEAL

PRECAST CONC. ADJUSTING RINGS 8" MAXIMUM

PRECAST REINFORCED CONCRETE MANHOLE SECTIONS AS PER ASTM C-478, C-443, OR C-76

INVERT CHANNEL TO CONFORM TO ELEVATION SHOWN ON DRAWINGS

PRECAST FLEXIBLE WATER TIGHT PIPE CONNECTOR

AGGREGATE BASE, 100% CRUSHED STONE OR GRAVEL

NOTES:

1. IN WET AREAS AND BELOW FLOOD ELEVATION PROVIDE BOTH EXTERNAL AND INTERNAL "CHIMNEY SEALS".
2. IF DEPTH OF MANHOLE IS 7'-0" OR LESS, USE REINFORCED CONCRETE FLAT TOP SECTION DESIGNED FOR AASHTO A-520-44 WHEEL LOADING.
3. ECCENTRIC CONES REQUIRED, FLAT SLAB TOPS PERMITTED ONLY FOR MANHOLES TOO SHALLOW FOR CONES.
4. USE 4'-0" MINIMUM DIAMETER FOR SEWER SIZES 24" OR LESS, 5'-0" (MIN.) DIAMETER FOR SEWER SIZES 27" OR LARGER UNLESS OTHERWISE NOTED.
5. ALL JOINTS SHALL BE MORTARED ON INTERIOR OF MANHOLE.
6. BACKFILL WITH GRANULAR MATERIALS.

WATERTIGHT JOINTS
 MANHOLE STEPS 16" O.C.
 M.A. INDUSTRIES COPOLYMER PLASTIC WITH CONTINUOUS 1/2" STEEL REINFORCEMENT OR NEENAH R-1981-1 CAST IRON
 PROVIDE EXTERNAL JOINT PROTECTION AT ALL JOINTS

CONCRETE ENCASUREMENT

"A" - DIAMETER OF INCOMING SEWER
 "B" - DIAMETER OF DROP PIPE

WHEN: "A" = 12-INCH OR LESS,
 "B" = "A" BUT NOT SMALLER THAN 8-INCH.

WHEN: "A" = GREATER THAN 12-INCH, BUT LESS THAN OR EQUAL TO 18-INCH,
 "B" = 12-INCH.

WHEN: "A" = GREATER THAN 18-INCH,
 "B" = 2/3 "A" MINIMUM.

NOTE:

USE OUTSIDE DROP WHEN ANY ENTERING SEWER INVERT DIFFERS BY 2'-0" OR MORE FROM INVERT OF MANHOLE. MATCH CROWN OF OUTLET PIPE WHERE OUTLET PIPE IS 30-INCH DIA. OR SMALLER. SEE PLAN SHEETS FOR INVERT ELEVATIONS FOR PIPE SIZES LARGER THAN 30-INCH DIAMETER.

OUTSIDE DROP DETAIL

NOTE: IT IS RECOMMENDED THAT THE USER OF THIS DETAIL REFER TO THE VILLAGE OF TWIN LAKES DEVELOPMENT STANDARDS FOR MORE SPECIFIC REQUIREMENTS.

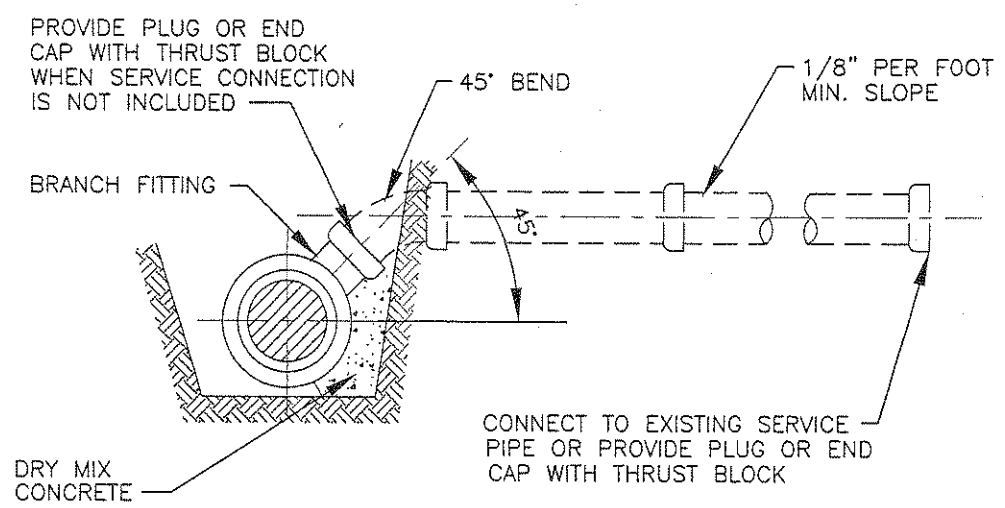
6A

SANITARY MANHOLE
 DETAIL

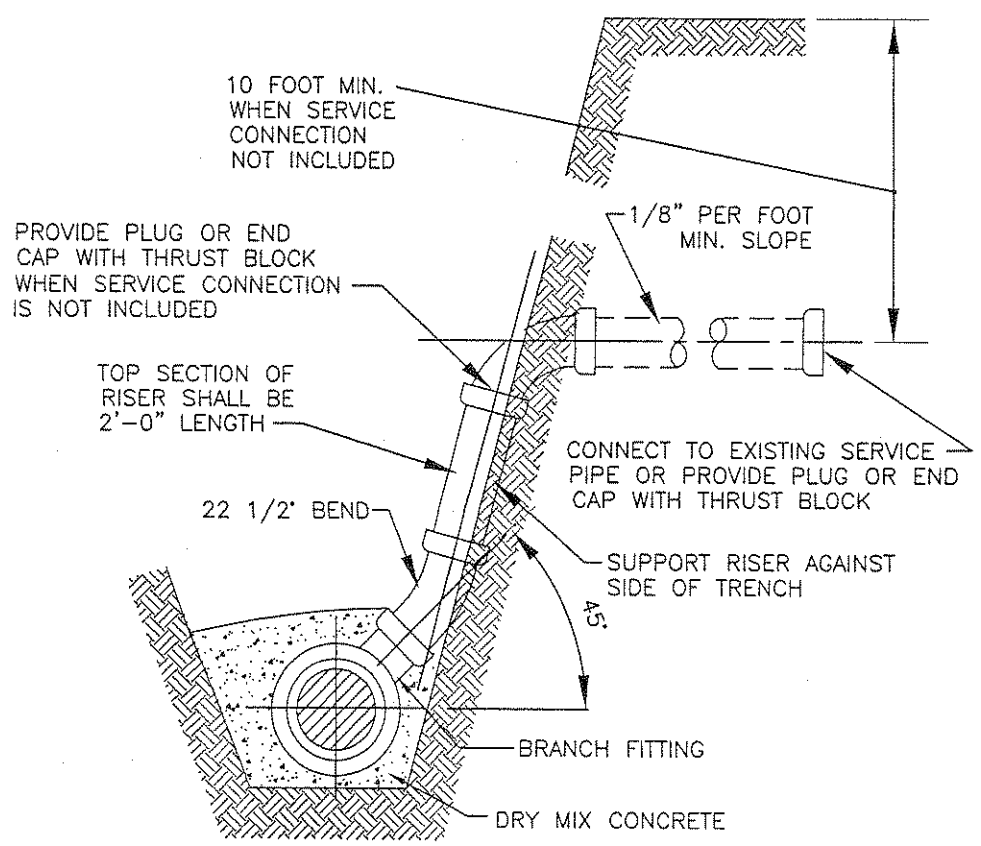
VILLAGE OF
 TWIN LAKES,
 WISCONSIN

DATE

REVISIONS



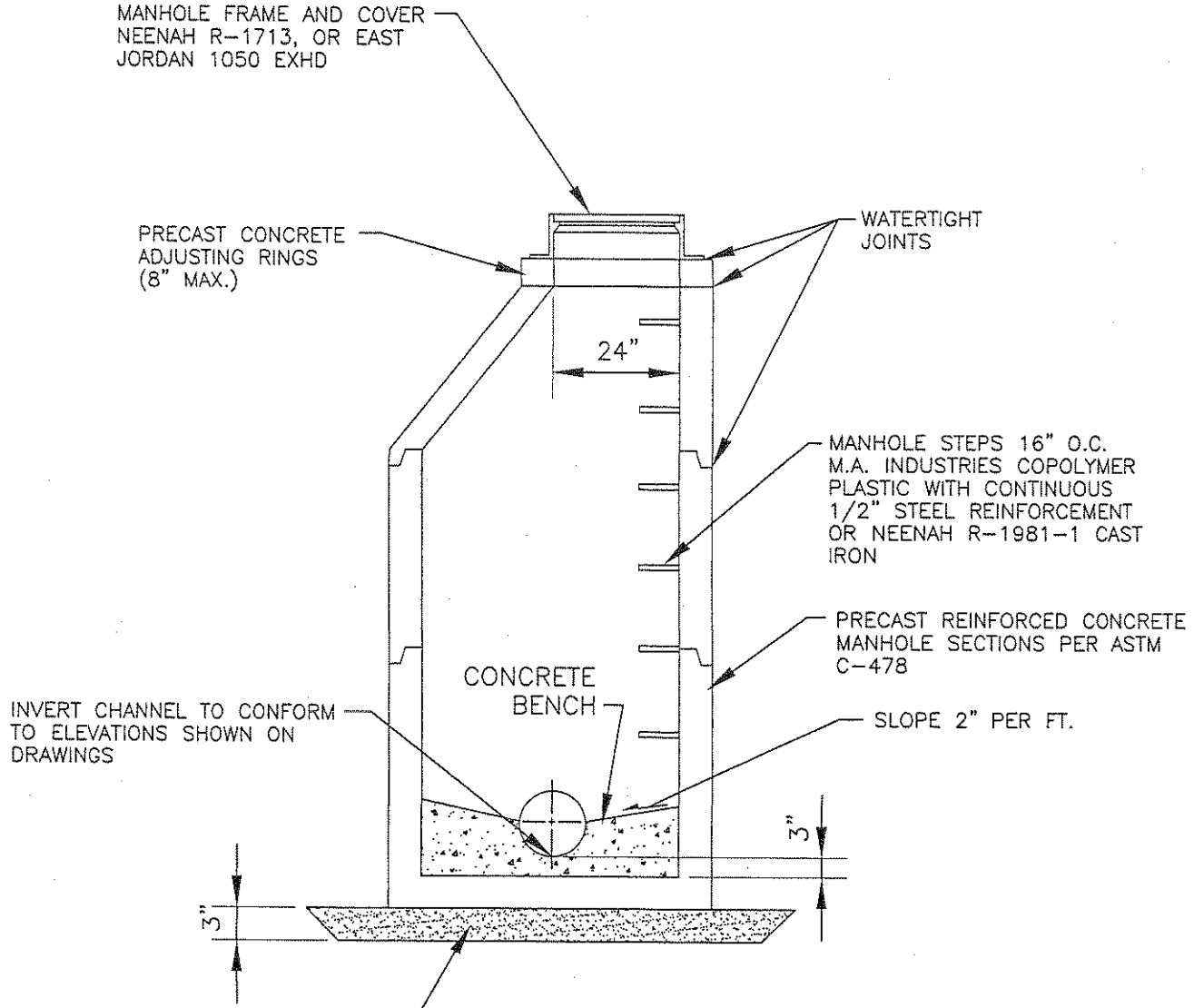
FOR SEWER INVERT DEPTHS TO 12 FEET



FOR SEWER INVERT DEPTHS OVER 12 FEET

NOTE: IT IS RECOMMENDED THAT THE USER OF THIS DETAIL REFER TO THE VILLAGE OF TWIN LAKES DEVELOPMENT STANDARDS FOR MORE SPECIFIC REQUIREMENTS.

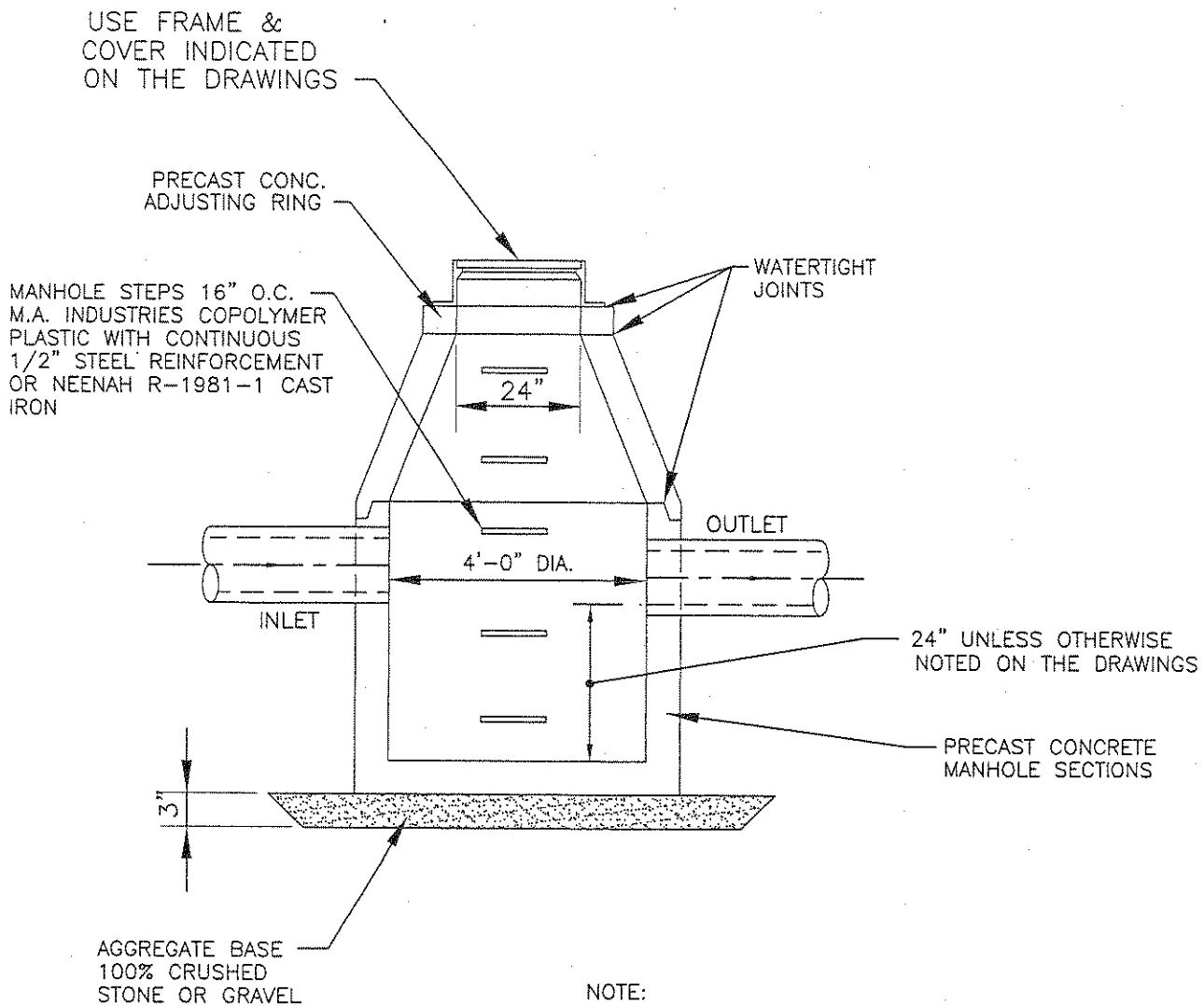
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| BUILDING SERVICE RISER | VILLAGE OF TWIN LAKES, WISCONSIN | REVISIONS | DATE |
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- NOTE:
1. USE ECCENTRIC CONES UNLESS OTHERWISE INDICATED ON THE DRAWINGS. IF DEPTH OF MANHOLE IS 7'-0" OR LESS USE REINFORCED CONCRETE FLAT TOP DESIGNED FOR AASHTO HS20-44 WHEEL LOADING.
 2. USE 4'-0" DIAMETER FOR SEWER SIZES 12" THRU 24", 5'-0" DIAMETER FOR SEWER SIZES 27" AND LARGER UNLESS OTHERWISE NOTED.
 3. FILL LUG HOLE WITH BITUMINOUS COMPOUND
 4. BACKFILL WITH GRANULAR MATERIAL.

NOTE: IT IS RECOMMENDED THAT THE USER OF THIS DETAIL REFER TO THE VILLAGE OF TWIN LAKES DEVELOPMENT STANDARDS FOR MORE SPECIFIC REQUIREMENTS.

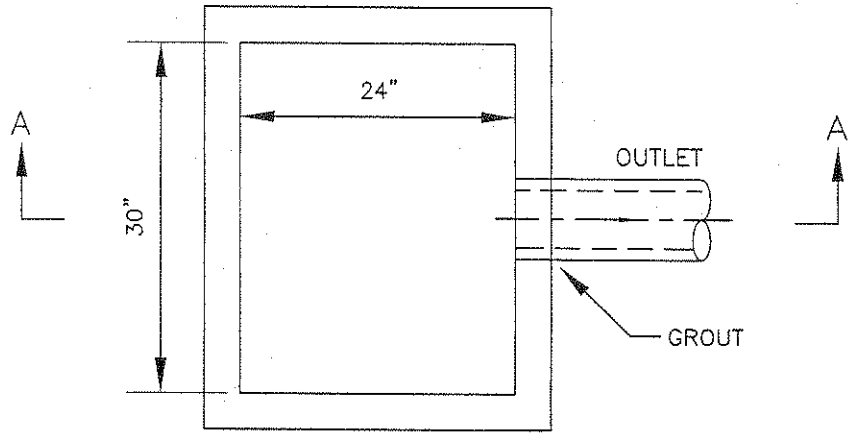
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| <p>STORM MANHOLE DETAIL</p> | <p>VILLAGE OF TWIN LAKES, WISCONSIN</p> | REVISIONS | DATE |
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- NOTE:
1. USE ECCENTRIC CONES UNLESS OTHERWISE INDICATED ON THE DRAWINGS. FLAT SLAB TOPS PERMITTED ONLY FOR MANHOLES TOO SHALLOW FOR CONES.
 2. USE THE TYPE OF FRAME AND COVER INDICATED ON THE DRAWINGS.

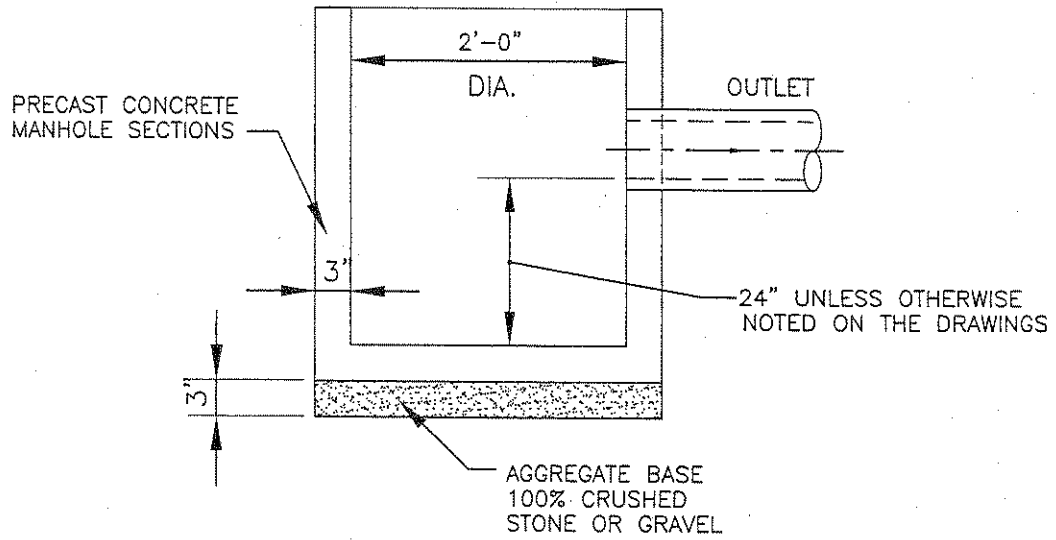
NOTE: IT IS RECOMMENDED THAT THE USER OF THIS DETAIL REFER TO THE VILLAGE OF TWIN LAKES DEVELOPMENT STANDARDS FOR MORE SPECIFIC REQUIREMENTS.

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| <p>CATCH BASIN TYPE 1</p> | <p>VILLAGE OF TWIN LAKES, WISCONSIN</p> | REVISIONS | DATE |
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PLAN

USE FRAME &
COVER INDICATED
ON THE DRAWINGS



SECTION A-A

NOTE: IT IS RECOMMENDED THAT THE USER OF THIS DETAIL REFER TO THE VILLAGE OF TWIN LAKES DEVELOPMENT STANDARDS FOR MORE SPECIFIC REQUIREMENTS.

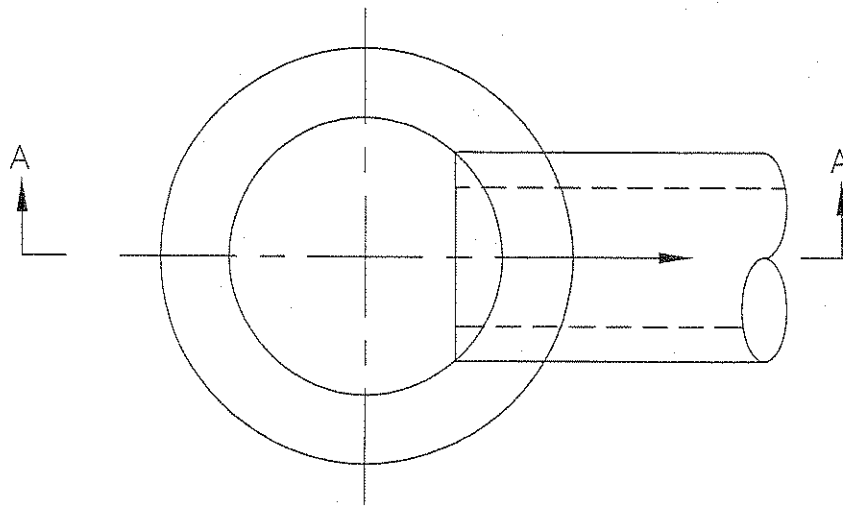
CATCH BASIN
TYPE 3

VILLAGE OF
TWIN LAKES,
WISCONSIN

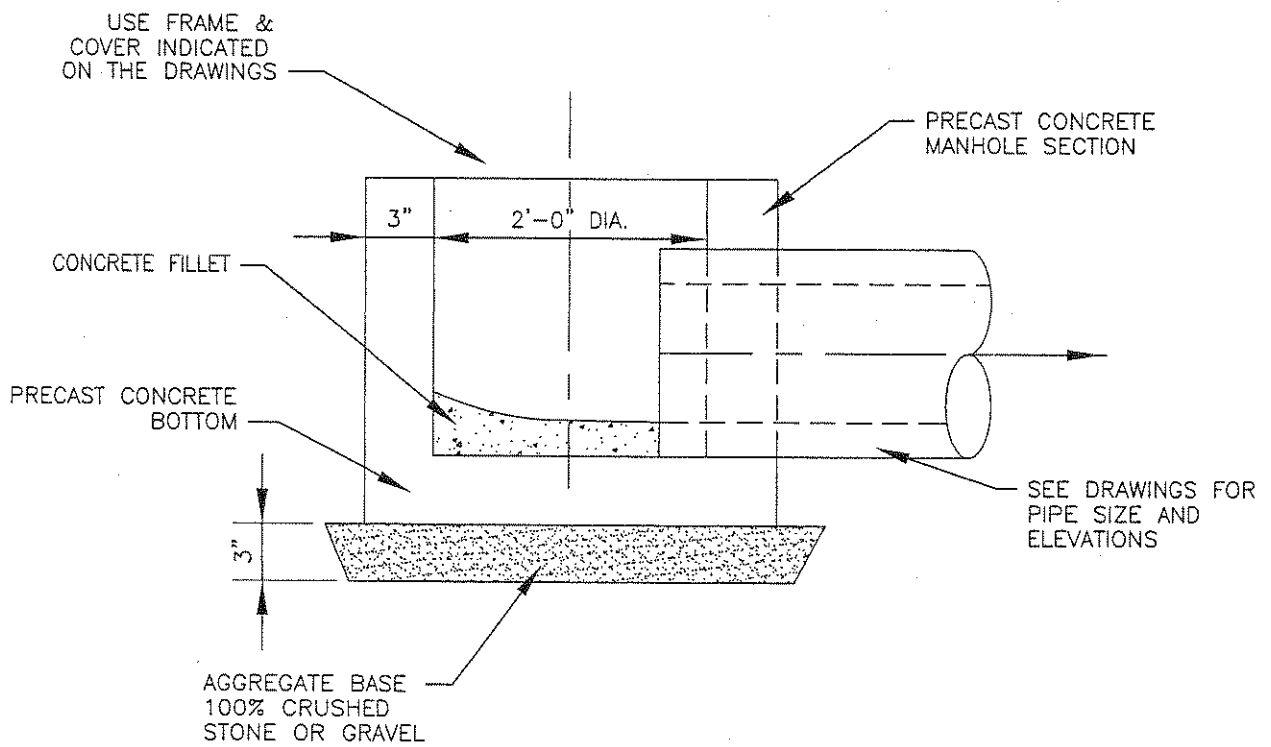
REVISIONS

DATE

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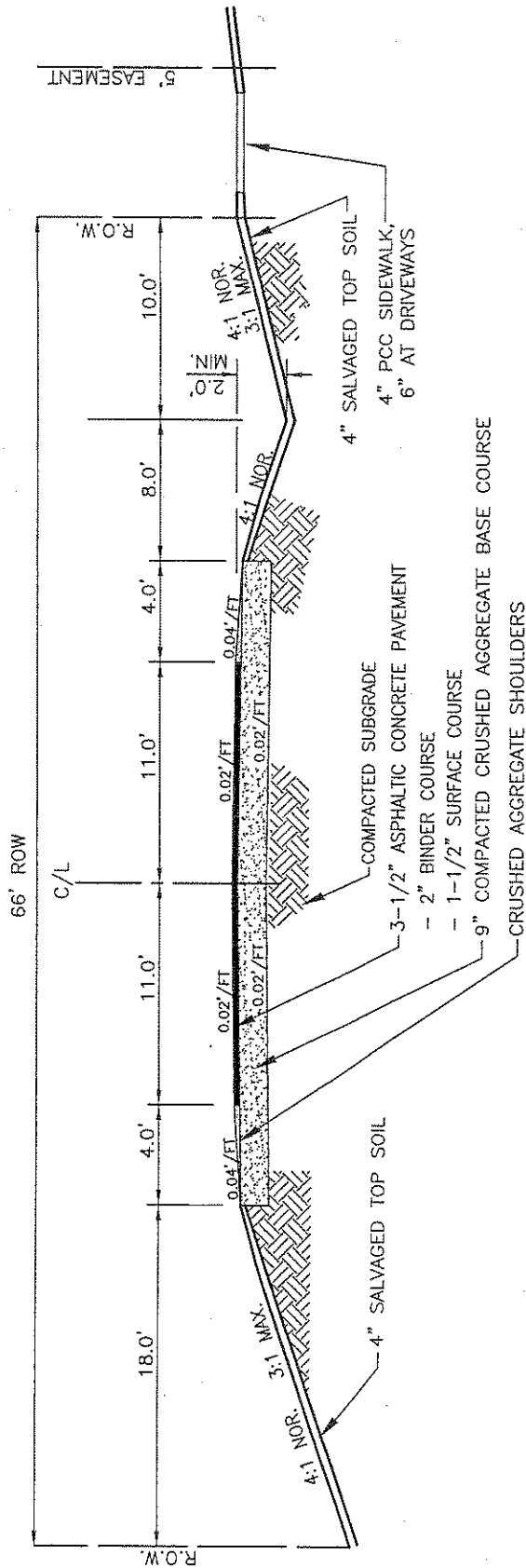
PLAN



SECTION A-A

NOTE: IT IS RECOMMENDED THAT THE USER OF THIS DETAIL REFER TO THE VILLAGE OF TWIN LAKES DEVELOPMENT STANDARDS FOR MORE SPECIFIC REQUIREMENTS.

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| <p>INLET DETAIL</p> | <p>VILLAGE OF TWIN LAKES, WISCONSIN</p> | REVISIONS | DATE |
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* BUILDING SETBACK LINE ON SIDEWALK SIDE OF STREET IS 30' MIN.

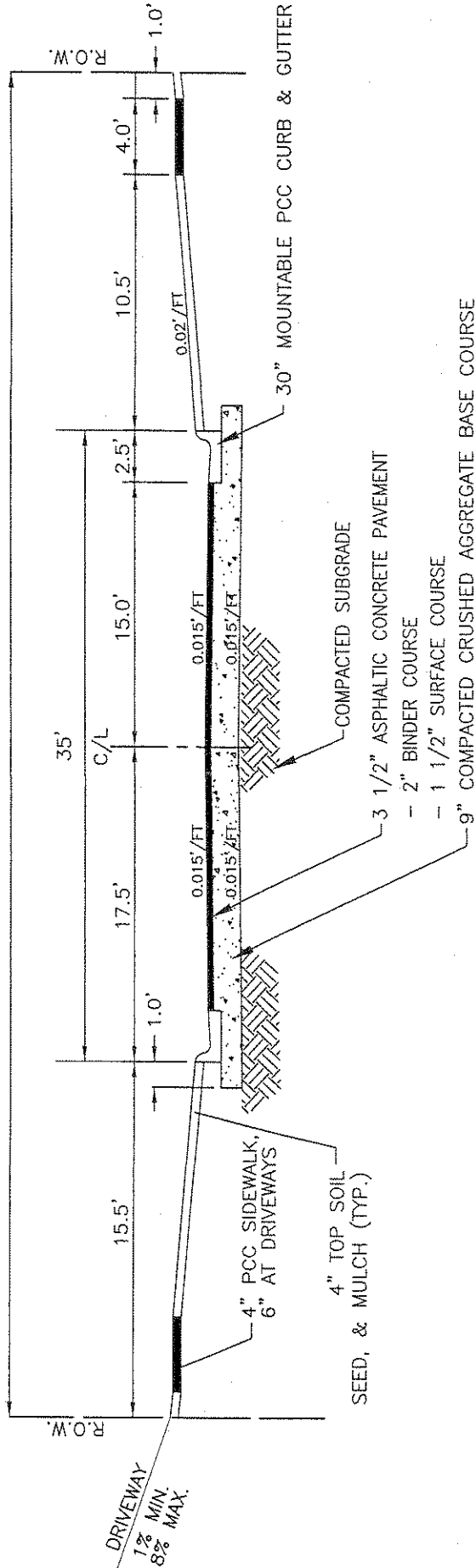
8A

| REVISIONS | DATE |
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VILLAGE OF
TWIN LAKES,
WISCONSIN

MINOR RESIDENTIAL
STREET CROSS SECTION
RURAL

66' ROW

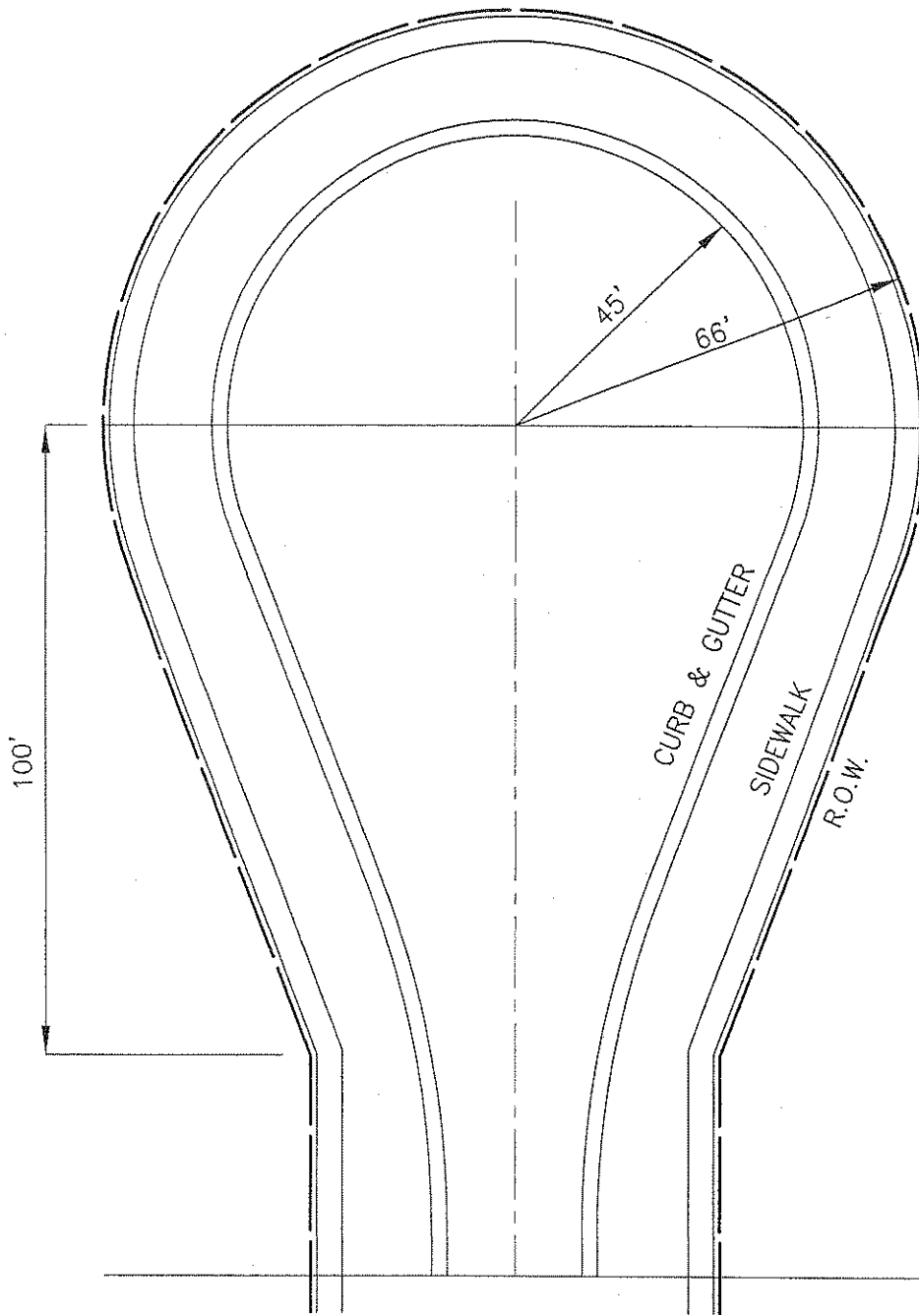


8B

| REVISIONS | DATE |
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VILLAGE OF
TWIN LAKES,
WISCONSIN

MINOR RESIDENTIAL
STREET CROSS SECTION
URBAN



NO SCALE

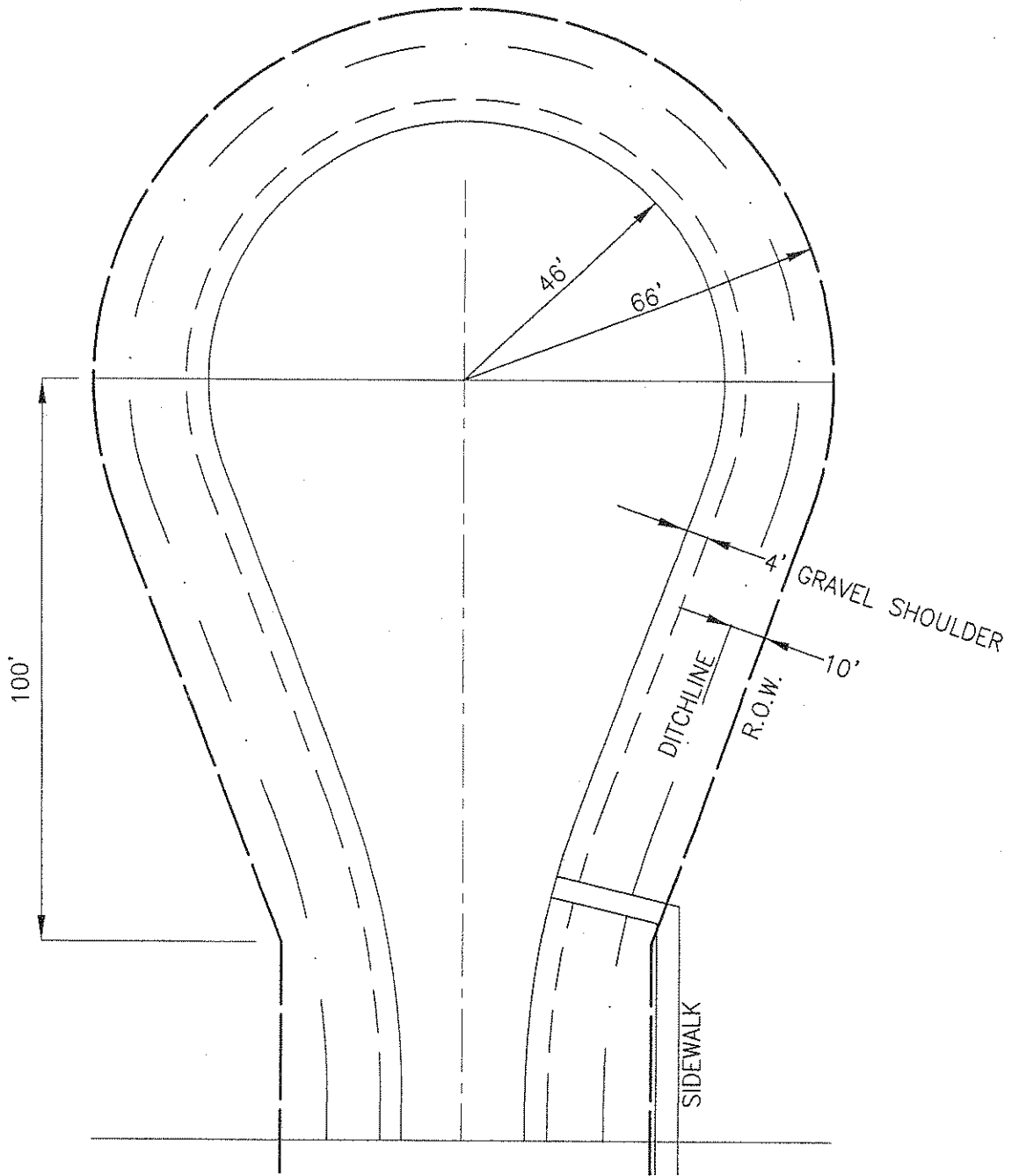
TYPICAL CUL-DE-SAC
MINOR RESIDENTIAL
URBAN STREET

VILLAGE OF
TWIN LAKES,
WISCONSIN

REVISIONS

DATE

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NO SCALE

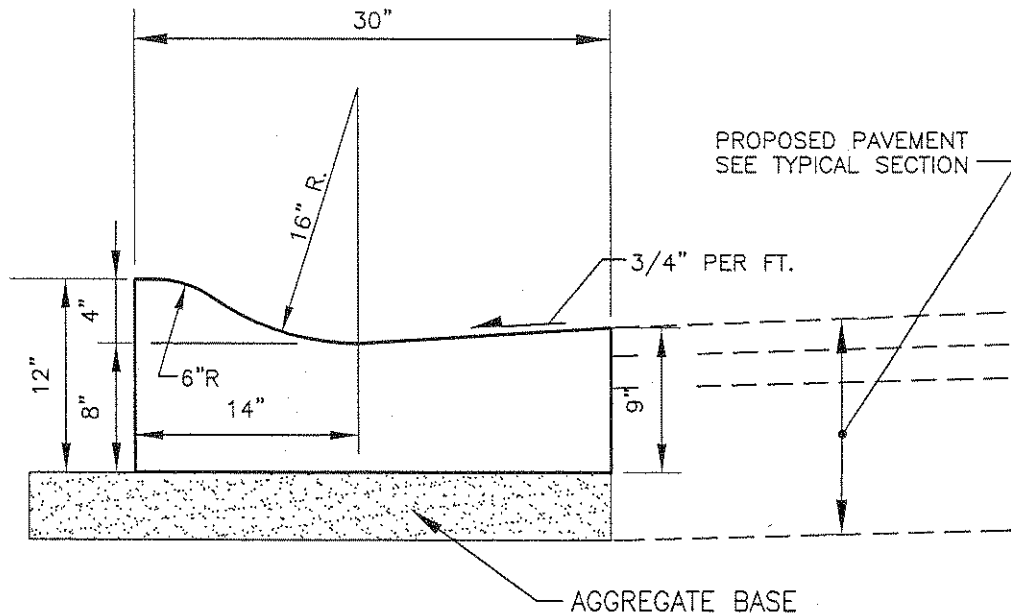
TYPICAL CUL-DE-SAC
MINOR RESIDENTIAL
RURAL STREET

VILLAGE OF
TWIN LAKES,
WISCONSIN

REVISIONS

DATE

| REVISIONS | DATE |
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PCC MOUNTABLE CURB & GUTTER

NO SCALE

NOTES:

1. EXPANSION JOINTS W/ 1/2" PREFORMED EXPANSION JOINT MATERIAL SHALL BE PLACED:
 - a. AT ENDS OF INTERSECTION RADII, P.C.'S, RADIUS POINTS, & END OF CUL-DE-SACS
 - b. 5 FT. ON EACH SIDE OF DRAINAGE STRUCTURES
 - c. MAX. OF 60 FT. INTERVALS
2. TOOL OR SAWCUT CONTRACTION JOINTS AT 12 TO 15 FT. INTERVALS 2" DEEP.
3. SAWCUTS SHALL BE MADE WITHIN TWENTY-FOUR (24) HRS. AND SEALED W/ JOINT SEALANT, JOINTS SHALL BE CLEAN AND DRY PRIOR TO APPLICATION OF SEALANT.

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| MOUNTABLE CURB DETAIL | VILLAGE OF TWIN LAKES, WISCONSIN | REVISIONS | DATE |
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APPENDIX A

VILLAGE OF TWIN LAKES, WISCONSIN

STANDARD MATERIAL SPECIFICATIONS

SANITARY SEWER

SANITARY SEWER PIPE

- Minimum 8-inch PVC SDR-26 conforming to ASTM D-3034.
- Bedding & cover material shall be crushed stone or crushed stone screening (pea gravel is not acceptable).
- Granular backfill is required below or within 4-feet of any paved surface.
- Consolidation of backfill by mechanical means to 95% standard Proctor density for imported granular material and 100% for excavated material of existing aggregate material in the adjacent trench wall.
- Mandrel test after 30-days.

SANITARY MANHOLE

- 48-inch ID precast concrete w/eccentric cones.
- Design flat slab top for H-20 loading.
- Frames and covers shall be Neenah R-1530, East Jordan 1050 EXHD, or equal, w/Type B non-rocking lid, stamped with the word "SANITARY", gaskets, and concealed pick holes.
- For bolted and gasketed watertight frame and cover: Neenah R-1916-C, East Jordan 1058 WT, or equal.
- Concrete adjusting rings not to exceed 8-inches.
- Internal chimney seals in paved areas, and external chimney seals in lawn areas, and shall be Cretex Specialty Products, or equal.

SANITARY LATERALS

- 4" minimum lateral pipe material shall be same as sewer main materials.
- Wye Connections.
- Terminated with a wooden 2 x 4 to one foot above finish grade and painted orange.
- Lateral pipe locator wire and terminal post shall consist of No. 8 AWG single strand, single conductor, insulated copper wire and 2 1/2-inch by 18-inch C.P. test Services – VALCO terminal box.

STORM SEWER

STORM SEWER PIPE

- All storm sewers within the road right-of-way shall be a minimum 12-inch diameter.
- Reinforced concrete pipe, minimum Class III, conforming to ASTM C76 or ASTM C507.
- Rubber ring gasketed pipe required.
- Granular backfill is required below or within 4-feet of any paved surface.
- Consolidation of backfill by mechanical means to 95% standard Proctor density for imported granular material and 100% for excavated material of existing aggregate material in the adjacent trench wall.

STORM MANHOLE

- Manhole frames and closed lids: Heavy duty, indented top solid lid, stamped with the word "STORM", Neenah R-1530, East Jordan 1050 EXHD, or equal.
- Manhole frames and open lids: Heavy duty, Neenah R-2504 with Type D grates, or equal.

CATCH BASINS

- Minimum 12-inch sump.
- Placed at the end of radii.
- Curb inlet frames: Neenah R-3067-R.
- Drainage grates: Beehive type, Neenah R-4340-B, or equal.

DRIVE CULVERTS

- Minimum 15-inch diameter w/ flared end sections.