

Village of Somers, Wisconsin

Development Standards



Prepared by:

BAXTER & WOODMAN
Consulting Engineers
www.baxterwoodman.com

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SECTION 1 - ENGINEERING AND ADMINISTRATIVE PROCEDURES

1.1 GENERAL

- A. 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.
- B. When the Village receives a plan submittal for a proposed development, the Village Engineer will conduct an initial review for completeness and accuracy. If the submittal is found to be incomplete, a letter of incompleteness will be sent to the applicant indicating additional items that need to be submitted prior to a plan review being initiated. If the Village does not receive the additional items within 30 calendar days from the date of the letter, the submittal will be considered null and void and discarded. A complete separate submittal will then need to be made by the applicant upon readiness.
- C. When a plan submittal is found to be complete, the Village Engineer will conduct an office review of the submittal documents and provide plan review comment or a recommendation of approval by the Village. The review comments or approval recommendation letter will be forwarded to the applicant. The Engineer of Record for the project or the Land Developer as applicable must address review comments. Plans may be re-submitted only once all review comments have been addressed. Re-submittals shall include a cover letter addressing each review comment, item by item, and the revised documents.
- D. Review fees are based on the Village Engineer's current hourly rate schedule and the actual time spent reviewing the plan submission. The Village may, at their discretion, require an escrow credited to the Village for plan review fees. The escrow amount(s) are subject to the complexity of the project. The Land Developer is responsible for costs of actual time spent for the review of plans submitted if they exceed the escrow amount. An appropriate refund will be made if the actual cost is less than the escrow amount.

1.2 PRE-DESIGN CONFERENCE

- A. It is recommended that prior to the development of detailed drawings, the Property Developer 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 Property Developer or Design Engineer shall initiate the request for this preliminary meeting, if desired.

1.3 DRAWING PREPARATION REQUIREMENTS

- A. All drawings, specification manuals, and reports 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.

- B. All elevations shall be referenced to National Geodetic Vertical Datum (mean sea level) where available and benchmarks shall be noted. Location coordinates shall be tied to the State Plane Coordinate System. The limits of any wetlands, lakes, ponds, streams, floodplains, primary environmental corridors, and WDNR Chapter 151 protective areas shall be shown on the drawings.
- C. 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. Plans must include a dimensioned site plan and landscaping plan.
- D. If the plans contain the construction of any public road, sewer, water main, or other Village-owned facility, the following note shall be provided: "Prior to construction, a pre-construction conference shall be held at the Village Hall. The pre-construction conference shall be scheduled and moderated by the designing engineer of record."

1.4 SPECIFICATION REQUIREMENTS

- A. A project construction and specifications manual (Project Manual) is required for all Village-owned facility construction, including sewers, water mains, and roadways.
- B. 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.
- C. 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.
- D. 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, accompanied by narratives addressing the computations 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 Management Capacities and Routings
 2. Storm Water Quality Calculations
 3. Storm Water Infiltration Analysis from Soil Borings or Test Pits and Comparison with NR151 Performance Goals
 4. Compensatory Floodplain Storage
 5. Storm Sewer System Design Including Inlet Capacities
 6. Structural Strength Design for Conduits More than 20 Feet below Finished Grade
 7. Road Pavement Design
 8. Water System Fire Flow Calculations
 9. Sanitary Sewer Capacity Calculations
- B. A storm water management report shall be prepared by the Design Engineer for all developments disturbing one acre or more of land. The report shall generally contain the following items:
1. Title sheet with official project name, date of preparation, applicable revision, and seal and signature of the preparer.
 2. Narrative of required storm water management performance goals for the development.
 3. Description of the project site location and existing conditions including, land use, topography, existing drainage patterns, point of discharge, identification of wetlands, floodplains, and other relevant features effecting storm water drainage.
 4. Description of soil types and hydrologic soil classifications.
 5. Description of the proposed development and post-construction site conditions including storm water management facilities being used to meet the site's performance goals, drainage patterns, points of discharge, protective areas, and other relevant features effecting storm water drainage.
 6. Description of the analytical procedures used to quantify the pre-developed and post-developed storm water runoff rates, volumes, and water quality performance standards.
 7. Summary of the pre-developed and post-developed hydrologic and hydraulic parameters used in evaluation.
 8. Summary of the pre-developed and post-developed storm water runoff rates and comparison with peak flow performance goals.
 9. Summary of the post-developed water quality and infiltration analyses and comparison with the performance goals.
 10. Maintenance plan/agreement covering all storm water management facilities.

11. Appendices to the report including the following items:
 - a. Pre-developed and post-developed drainage area exhibits showing topography, time of concentration paths, and identified drainage basins.
 - b. Computer model printouts and worksheets demonstrating compliance to the performance goals for runoff rates, water quality, and infiltration.
 - c. Soil investigation reports.

1.6 OPINION OF PROBABLE COST

- A. 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

- A. 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, the Design Engineer shall prepare it. The Land Developer shall secure all required permits and necessary authorizations from other governmental agencies.
- B. A copy of said permit applications and related approval letters shall be provided to the Village prior to construction.

1.8 REVISIONS TO APPROVED DRAWINGS AND SPECIFICATIONS

- A. 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

- A. The Village Engineer and/or Field Inspector may conduct full-time and/or part-time inspection of developments (including private developments). 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 Property Developer.

1.10 EXISTING FACILITIES

- A. 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

- A. Record drawings signed and sealed by the Design Engineer or other independent professional employed by the Property Developer shall clearly show all changes from the approved drawings.
- B. Record drawings shall be submitted to the Village Engineer prior to the Property Developer's request for final inspection of the 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

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

2.2 PERMIT REQUIREMENTS

- A. Permits shall be issued no later than thirty (30) days from the receipt of an application. The Village Board may, at its discretion, direct the Village Engineer to review projects prior to approving an application. Any costs incurred by the Village 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:
 - 1. Completion of an application for a construction permit along with the submission of the applicable fee as established by the Village Board.
 - 2. 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.
 - 3. Approval of the construction permit application by the Village.

2.3 EXCEPTIONS

- A. The Village Board may, at its discretion, waive permit requirements as necessary.
- B. 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

- A. 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:
 - 1. Notice to the Village Clerk from the permittee that the project has been completed.
 - 2. Inspection by the duly authorized representative of the Village.
 - 3. Approval of the Village Board.

2.5 DAMAGES AND LOSS OF BOND

- A. Any damage, as determined by the Village Board, which is the result of construction, maintenance, or repair of utilities located within the Village 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.

1. All repairs, maintenance, or construction shall conform to Federal, State, County, and Village ordinances, specifications, and standards.
2. 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

- A. In the event the Village Board elects to repair damages and proceed against the bond of the permittee, the Village may do so only upon the following:
 1. Notice in writing to the permittee from the Village Administrator, which shall substantially contain the following:
 - a. The nature of the damage or non-conformity that has led to the Village's determination to proceed against the bond.
 - b. The amount claimed by the Village.
 - c. The permittee has the right to request in writing, a review of the determination within thirty (30) days of the Village's Notice. If requested, said review shall proceed in accordance with Chapter 68 of the Wisconsin Statutes.
 2. The Village shall not forfeit any part of a bond until and unless no written request for a review of the determination has been received within thirty (30) days of the Village's Notice, or after completion of the Chapter 68 proceedings, and after any applicable appeal period has run.

SECTION 3 - RESTORATION OF EXISTING IMPROVED SURFACES

3.1 GENERAL

- A. 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.
- B. The surface of all improvements shall be constructed of the same material, thicknesses, widths, etc. and match in appearance the surface of the improvements that were removed.

3.2 SAW CUTTING

- A. 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

- A. 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.
- B. Driveway openings installed after the initial installation of concrete curb/gutter shall have the existing curb/gutter removed by removing to the nearest joint spacing or by removing the curb head using approved sawing equipment for the intended removal.

3.4 CONCRETE PAVEMENT SURFACE

- A. Where the existing roadway pavement surface is Portland Cement concrete, the pavement replacement shall consist of seven (7) inch Portland Cement concrete pavement or existing concrete depth, whichever is greater.
- B. Portland Cement concrete and construction methods for Portland Cement concrete pavement shall conform to the current requirements of the (WDOT) Standard Specifications.
- C. 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 five (5) 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

- A. 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 10-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 Village Ordinances and these Design Standards for 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.
- C. 1/2-inch preformed expansion joints shall be placed at intervals not exceeding 50 feet and at the junction with existing work.
- D. Saw cut crack control contraction joints shall be made every 20 feet (minimum) for curb, curb and gutter, and driveways. Saw cut crack control contraction joints shall be made equidistant to the pavement width for sidewalk. Contraction joints shall be a minimum of 1/2-inch in depth.
- E. Sidewalks shall be finished to match existing adjacent sidewalk surfaces.

3.8 CULTIVATED LAWNS

- A. Provide topsoil, seeding, sodding, and care of grass during establishment period for a complete surface restoration of lawns, parkways, and other areas disturbed as a result of the construction.
 - 1. Topsoil
 - a. 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.
- b. 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.
 - c. Apply commercial grade fertilizer uniformly at a rate of 7 pounds per 1,000 square feet. Work fertilizer into soil prior to seeding or sodding.
2. Sodding
- a. 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.
 - b. The cut sod shall be not less than 2-inches thick. Sod that has been cut more than 48 hours prior to installation shall not be used without the approval of the Village Engineer.
 - c. 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.
 - d. 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.
 - e. 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.
3. Seeding
- a. 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.
 - b. After seeding, rake seed lightly into ground and roll with a roller weighing between 100 and 200 pounds per foot of roller width.
 - c. 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 matting or blanket at sides and bottoms of ditches, swales, and all areas within 10 feet of catch basins in seeded areas.

- d. 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. Soil 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. Site engineering or grading plans for projects shall either contain specific provisions for erosion control or a separate erosion control plan. The provisions or plan will follow accepted techniques and details, as found in the Wisconsin Department of Natural Resources (DNR) Storm Water Construction and Post-Construction Technical Standards, Natural Resources Conservation Service Standards and Specifications, or as directed by the Village Engineer.
- B. Obtain coverage under the WPDES General Permit from DNR, if required.
- C. 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.
- D. 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.
- E. The erosion control plan should indicate the location of soil stockpiles that are to remain onsite longer than four weeks.
- F. 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.
- G. Best management practices, by design, shall reduce the sediment load carried in runoff to the requirements of the current version of Wisconsin Administrative Code Chapter NR 151.

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. For disturbed areas draining more than one (1) but less than five (5) acres, a sediment trap or equivalent control measure shall be constructed at the downslope point of the disturbed area.
3. For disturbed areas draining more than five (5) acres, a sediment basin or equivalent control measure shall be constructed at the downslope point of the disturbed area.
4. Sediment basin design shall provide for both detention storage and sediment storage. The detention storage shall be sized for the 2-year, 24-hour runoff from the site under maximum runoff conditions during construction with a release rate to achieve minimum detention times of at least 10 hours. Sediment storage shall be designed such that sediment removal from the basin is only required once a year.
5. Disturbed areas shall be stabilized within seven (7) days with any of the temporary or permanent measures defined in this section.
6. Any required disturbance of stream channels shall be restabilized within 48 hours of disturbance.

4.3 MAINTENANCE OF CONTROL MEASURES

- A. All soil erosion and sediment control measures necessary to meet the requirements of this ordinance shall be maintained periodically by the Land Developer 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 within 24-hours of 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 to determine any cleaning or flushing 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 Village 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 that 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 Village 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 that 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 4-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 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 Village.
- D. Trees that 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 Village 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 Village 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, boring, 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 Village. 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 8.43.8 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 Section 9.

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 street right-of-ways shall be located 8-feet minimum west or south of the roadway centerline. Appropriate manholes shall be provided to maintain the alignment on curvilinear roads to keep the storm sewer under the pavement.
- C. Water mains in proposed street right-of-ways shall be located 8-feet minimum east or north of the roadway centerline. Appropriate bend/fitting shall be provided to maintain the alignment on curvilinear roads to keep the water main under the pavement. Water main alignments on existing street right-of-ways or in easements shall be approved by the Village on a case-by-case basis. The alignment must be approved prior to submitting construction plans.
- 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 Village). All transformer boxes shall be located so as not to be hazardous to the public.

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

- A. 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 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	85-100%
No. 8	0-10%
No. 30	0-5%

2. 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%

3. 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. For conduits not requiring SPECIAL GRANULAR BACKFILL, OR AGGREGATE SLURRY MATERIAL, backfill may be made with materials available from the trench excavation. The material shall be free from rocks and be carefully placed in 12-inch lifts. For conduits requiring excavation beneath or within 4 feet horizontally of driveways, or sidewalks or in other areas which, in the opinion of the Village Engineer, are or may be subject to vehicular traffic loading, SPECIAL GRANULAR BACKFILL shall be provided above the top of the bedding material and shall extend upward to the top of ground or pavement subgrade. Provide either sand, pit run gravel, granular material, or excavated granular materials:

1. 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%

2. 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.
3. 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%

4. 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.
5. Crushed stone: Clean, hard, tough, durable, angular material crushed from bedrock limestone, dolomite, or granite.
 - a. 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%

6. Unless otherwise specifically approved by the Village Engineer, all conduits crossing existing pavements shall be installed by tunneling, boring, 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 top of pavement subgrade.
 - a. Provide AGGREGATE SLURRY MATERIAL, thoroughly mixed in a concrete mixer truck in accordance with Section 8.43.8 of the "Standard Specifications for Sewer and Water Construction in Wisconsin".

SECTION 6 - SANITARY SEWERAGE FACILITIES

6.1 INTRODUCTION

- A. All developments, regardless of size within limits of the Village, 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 Village sewer system to adjacent areas.
- B. Public sanitary sewers within the Village are owned and maintained by the Village. Wastewater flows are treated by the City of Kenosha Water and Sewer Utility. New sewer extensions must be approved by the Village, City of Kenosha, and the WDNR. Plans submittal to the Village and the City may be done concurrently. Prior to final Village approval of the plans, City approval must be obtained and the approval letter forwarded to the Village.
- C. Plan submittal to the WDNR must be done after the Village approves the plans. A copy of the WDNR Sewer Extension approval shall be provided to the Village prior to the start of construction.

6.2 SERVICE AREAS

- A. The Service Area shall include the entire area proposed to be ultimately served by all or a portion of the sanitary sewer system submitted for approval.
- B. If oversizing on-site facilities or extending the sanitary sewer system beyond the limits of the development results in additional construction cost, provisions shall be made for the Land Developer's recapture of the incremental 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.

6.2 SEWER DESIGN

- A. 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.
- B. 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 Village.
3. For areas other than residential, estimated sanitary sewage flow shall be based on the type of development 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 Land Developer of the responsibility of providing adequate sanitary sewers to meet 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 shall be as follows, unless allowed otherwise by the Village Engineer:

<u>Pipe</u>	<u>Pipe Material</u>	<u>Joint</u>
PVC SDR 26 (min.)	ASTM D-3034	ASTM D-3212

- 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. 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.
- E. 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

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

6.6 SANITARY MANHOLES

- A. 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 in accordance with the "Standard Specifications for Sewer & Water Construction in Wisconsin".
- B. Manhole castings within new public roadways shall be initially constructed to 1/4-inch below the top of the first layer of asphalt and subsequently adjusted at the time the final asphalt layer is placed.
- C. Manhole benches shall be poured in place. Pre-cast bases are allowed, but bench shall be poured in place.

- D. A minimum of 4 inches and a maximum of 19 inches of adjusting rings shall be installed at each manhole.
- E. Adjusting ring dimensions shall match the dimensions of the top of the cone section.
- F. Manholes shall be furnished to minimize the chimney height required.
- G. All sanitary sewer manholes shall have internal/external chimney seals.
- H. Connections to manholes shall be flexible watertight pipe to manhole seals. Connections to existing manholes shall be field cored.

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 6 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 material is 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.

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 Village 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

- A. Sanitary sewers shall be constructed sufficiently deep so as to prevent freezing. For the purposes of this specification, a minimum depth of 6-feet to the sewer invert or 2.5 feet below basement floors, whichever is deeper, shall be required.
- B. In addition, 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.

6.11 WATER MAIN PROTECTION

- A. Comply with 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 ASTM standard practice for testing sewer lines by low-pressure air test method for the appropriate pipe material. The minimum required time for the one pound per square inch pressure drop described in paragraph (f) shall not be less than that calculated as shown in Table 1.

Table 1

MINIMUM ALLOWABLE TIME FOR VARIOUS PIPE SIZES

Nominal Pipe Size	Time - Minutes per 100-feet.
4"	0.3
6"	0.7
8"	1.2
10"	1.5
12"	1.8
15"	2.1
18"	2.4
21"	3.0
24"	3.6

- h. The required times will be adjusted by the Village 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 Village 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 Village 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 in the initial 1,200 feet of installed PVC pipe and not less than 10 percent of the remainder of the sewer project at random locations selected by the Village Engineer.
 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.
 6. In the event 10 percent or more of the sewer tested exceeds the allowable deflection limits, test the entire sewer system.
- D Internal Television Inspection: Provide internal sewer inspection of the entire sewer section (manhole to manhole) by the use of closed circuit television inspection equipment to compile accurate information as to the general and specific conditions of the sewer pipe, as specified herein.
 1. Conduct inspections in digital format and document on DVD discs.
 2. Provide preparatory cleaning of the entire sewer section before conducting the internal sewer inspection.
 3. Submit two copies of the inspection discs and written logs to the Village Engineer.
 4. Provide two sets of professionally prepared index listing the contents of each DVD and a bound document containing the written logs grouped by the DVD content.
 5. Begin each inspection with written and verbal explanation of the current date, project name, and Owner; followed by the general locations, manhole segment and direction of viewing and beginning footage count superimposed on the video signal. Provide continuous footage counter and manhole segment throughout the entire video recording.
- E. Manhole Vacuum Testing
 1. Test in accordance with the "Standard Specifications for Sewer & Water Construction in Wisconsin".
 2. Testing shall be done in the presence of the Village Engineer or his representative.

SECTION 7 - WATER DISTRIBUTION SYSTEM

7.1 INTRODUCTION

- A. All developments within the Village limits shall include provisions for a complete water supply system and the construction of water distribution facilities, complete with valves, fire hydrants, and other appurtenances designed in accordance with this Section. As a minimum, the distribution system shall include a system of water mains and service lines between a connection or connections to the existing distribution system at approved locations.
- C. The design of all water distribution system facilities proposed for construction as independent projects under the Village jurisdiction shall also meet the technical requirements of this Section.
- D. The public water supply system within the Village is supplied by the City of Kenosha Water Utility and is owned and maintained by the Village, unless otherwise determined by the Village or the Kenosha Water Utility. New water main extensions must be approved by the Village, Kenosha Water Utility, and the WDNR. Plans must be submitted to the Village for written approval prior to submitting to Kenosha Water Utility.
- E. Plan submittal to the WDNR must be done after the Village and the Kenosha Water Utility approve the plans. A copy of the WDNR Water Main Extension approval and Kenosha Water Utility approval shall be provided to the Village prior to the start of construction.

7.2 GENERAL DESIGN CONSIDERATIONS

- A. Extensions to the distribution system shall include feeder mains and distribution mains.
- B. Feeder mains are those mains forming the arterial system of the Village and are further defined as mains larger than 8-inches in diameter or as required to meet local fire protection needs. Distribution mains shall form a grid to supply water to the local fire hydrants and service lines, and shall have a minimum diameter of 8-inches. Water distribution systems shall be designed for circulation of flow; dead ends shall be avoided whenever possible.
- C. The Village of Somers Fire Department approval must be obtained for all proposed hydrant locations prior to construction.

7.3 MAIN CAPACITY

- A. Feeders and distribution mains shall be sized to provide sufficient capacity to deliver the required fire flow to all areas served by the proposed construction with consumption at the maximum daily rate.

B. Required Fire Flow:

<u>Type of Development</u>	<u>Fire Flow</u>
Single-family residential	1,500 gpm
Multiple-family residential	2,500 gpm
Commercial/business (general)	2,500 gpm
Office/research	2,500 gpm
General manufacturing	2,500 gpm
Commercial/business (downtown)	2,500 gpm
Institutional	2,500 gpm
High-risk manufacturing	2,500 gpm

- These rates are based on the latest "Fire Suppression Rating Schedule" of the ISO (Insurance Service Office) and must be available while maintaining a twenty (20) psi residual pressure.

C. Maximum Day Consumption: For purposes of water main design, maximum day consumption in residential areas shall be based on a minimum of 200 gallons per capita per day, with population estimated in accordance with Section 6.3 above.

1. In other than residential areas, maximum day consumption shall be based on the following:

<u>Type of Establishment</u>	<u>Unit</u>	<u>Maximum Day Consumption Gal/ Day / Unit</u>
Shopping Centers	Employee (1 shift)	105
Store	Employee (1 shift)	65
Offices	Employee (1 shift)	50

<u>Type of Establishment</u>	<u>Unit</u>	<u>Maximum Day Consumption Gal/ Day / Unit</u>
Industrial	Employee (1 shift)	75
Restaurant	Meal Served	15
Theater	Per Seat	10
Hotel	Per Guest	210

* To the above shall be added all process water requirements.

2. For other than residential developments, when the details of the development are not known, maximum day consumption and fire flow shall be estimated by the Design Engineer, subject to the approval of the Village Engineer. Such approval shall not relieve the Land Developer of the responsibility of providing adequate main capacity for all future developments. In such cases, minimum main size shall be 12 inches.

- D. Storage: Sufficient storage shall be designed and constructed to provide sufficient water to the distribution system (1,000 gallons per minute-residential or 2,500 gallons per minute industrial/commercial) for a six (6) hour period. Water supply facilities with excess capacity may be used to offset up to 50 percent (50%) of the required storage volume.

7.4 FIRE HYDRANTS

- A. Spacing: Fire hydrants shall be installed along all mains constructed in public rights-of-way at a maximum spacing of 400 feet with the most remote part of any building no farther than three-hundred (300) feet from a hydrant.
- B. Material: Fire hydrants shall meet AWWA C-502 and shall be Clow Medallion with a 5-1/4-inch valve opening, O-ring seals, two 2-1/2 inch hose nozzles and one 5-inch Storz Quick Connection pumper nozzle. Threads shall conform with National Standard Specifications. Each hydrant shall be equipped with an auxiliary gate valve. Hydrants shall be installed no closer than three feet nor further than eight feet from the back of curb. No hydrant shall be installed within 48-inches of any obstruction nor shall any obstruction be placed within 48-inches of a hydrant.
- C. Painting: Factory painted red with the nozzle caps and operating nut painted silver gray.

7.5 VALVES

- A. Spacing: A sufficient number of valves shall be provided so that a break or other failure will not affect more than 800 feet of mains in residential areas or 500 feet of mains in other areas. Valves shall be placed so that closure of a maximum of three (3) valves are necessary to shut down any point in the system.
- B. Types:
 - 1. All valves 12-inches and smaller shall be AWWA C509, cast iron body, bronze fitted, resilient wedge and seat type with non-rising stem and O-ring packing designed for 250 pound working pressure, Clow model C-509.
 - 2. All valves larger than 12-inches shall be butterfly valves, iron body rubber seat type conforming to AWWA C504 latest edition, Class 150-B, Clow model 4500. All valves shall open counter clockwise with non-rising stem (except hand valves).
- C. Valve boxes within new public roadways shall be initially constructed to 1/4-inch below the top of the first layer of asphalt and subsequently adjusted at the time the final asphalt layer is placed.
- D. All valves installed at greater than 8 feet of depth shall be provided with valve stem extensions to bring the operating nut up to normal depth (less than 8 feet).

7.6 GENERAL DESIGN CRITERIA

- A. Ductile Iron Pipe, Fittings, and Joint Type:
 - 1. Provide ductile iron pipe complying with AWWA C-151/ANSI A21.51, thickness Class 52, with joints complying with ANSI A21.11. External coating shall be standard, as specified for general use in ASA Specification A21.51.
 - 2. Use internal cement lining complying with ANSI A21.4 or AWWA C205, standard thickness.
 - 3. Whenever river crossing pipe is required, provide restrained joint, or ball and socket type joints allowing 15 degrees maximum deflection.
 - 4. Use ductile iron fittings with mechanical joint complying with AWWA C-110/ANSI A21.10 or A21.53. Use internal cement lining complying with ANSI A021.4, standard thickness.
- B. Polyethylene Encasement: All ductile iron pipe water main shall be wrapped with polyethylene material conforming to ANSI A21.5 or AWWA C105, with a minimum thickness of 8 mils.
- C. PVC Plastic Pipe and Joints:
 - 1. Provide polyvinyl chloride pipe complying with AWWA C-900 for Class 150 pressure pipe with a standard dimension ratio of 18.
 - 2. Pipe 14-inch through 18-inch: Use pipe with a pressure rating of 235 psi and a standard dimension ratio of 18.
 - 3. Pipe 20-inch and 24-inch: Use pipe with a pressure rating of 165 psi and a standard dimension ratio of 25.
- D. Bedding and Cover Material: 3/8" crushed limestone chips in accordance with the "Standard Specifications for Sewer & Water Construction in Wisconsin".
- E. Depth of Cover: The depth between the finished grade and the top of the water main shall normally be not less than six feet (6') nor more than seven feet (7'). Where conflicts arise with other underground improvements, greater depths will be allowed.

7.7 PIPE RESTRAINING SYSTEMS

- A. General: Provide protection from movement of water main piping, plugs, caps, tees, valves, hydrants, and bends of 11-1/4 degrees or greater. Provide restrained joint type fittings at all locations unless conditions warrant installation of concrete thrust blocks.
- B. Restrained type pipe and fittings: Provide restrained joint type fittings that are compatible with system utilized, as specified by the pipe manufacturer. Protect tie rods and clamps with epoxy or bituminous paint.
- C. Concrete thrust blocks: Provide concrete thrust blocking only if conditions prohibit the installation of restrained joint fittings. Provide precast or cast-in-place concrete thrust blocking with a compressive strength of 3000 psi in 28

days. Locate thrust blocking between solid ground and the fitting to be anchored. Place thrust blocking so the fitting joints will be accessible for repair.

7.8 CONNECTIONS TO EXISTING MAINS

- A. All connections to the Village water distribution system shall be made under full water service pressure. The following specifications shall apply when pressure connections are made to the existing Village distribution system:
 - 1. Tapping sleeves: Use two-piece bolted sleeve type with mechanical joints, Cascade CST extra heavy duty, or equal. Provide joint accessories.
 - 2. Tapping valves: Use fully ported gate valves complying with AWWA C500. Use mechanical joints type, Clow F-5093 or Kennedy C950, or equal.
 - 3. Tapping valves shall be placed in valve boxes as specified in Section 7.5.

7.9 WATER SERVICE LINES

- A. Description: A water service line is designed to deliver water from a water main to a single building, extended from the water main to the building, and includes corporation stop, curb stop, and service box. Service lines shall be approximately at a right angle to the centerline of the right-of-way whenever possible.
- B. Materials:
 - 1. Service lines: Type K soft temper seamless copper water tubing complying with ASTM B-88, or High Density Polyethylene, SDR 9, complying with ASTM D2737 in Copper Tubing Sizes (CTS).
 - 2. Minimum water service size: 1-inch diameter and 1 1/2-inch diameter for service lines over 100-feet in length.
 - 3. Service saddles for connecting to PVC pipes: Stainless Steel saddle with neoprene O-ring gaskets as manufactured by Cascade.
 - 4. Corporation stops: McDonald No. 4701BQ ball valve with AWWA/CC taper thread inlet and compression connection outlet.
 - 5. Curb stops: McDonald No. 6106
 - 6. Service boxes: Extension type with stationary rods, McDonald No. 5614 for 3/4" and 1" sizes and McDonald No. 5615 for 1-1/2" and 2" sizes. May not be installed in, or within 2 feet of, any pavement or walk.
- C. Install water service piping with 6-1/2 feet minimum cover.
- D. Curb stops shall be placed one foot from the right-of-way line.

7.10 METERS

- A. Meters shall be purchased through the Village.
- B. All commercial water meters must have bypass valves, which do not interfere with access to the water meter for purposes of removing the meter for testing and/or repair.

7.11 WATER MAIN PROTECTION

All water main, storm sewer, and sanitary sewer construction shall meet the requirements of the Wisconsin Administrative Code with respect to horizontal and vertical separation requirements.

7.12 TESTING AND INSPECTING

A. General:

1. Conduct pressure and leakage test in accordance with the latest edition of AWWA STANDARD C600 as modified herein.
2. The contractor is required to provide all equipment necessary to complete the pressure testing and/or disinfection of the water mains and services.
3. Prior to any test, the contractor shall arrange with the Village Engineer and Public Works Department to have the required tests witnessed, and shall give a minimum of 48 hours advance notice.
4. The contractor shall pressure test all new water main after water services have been installed.
5. The contractor shall not operate any valves in the existing public water supply system. Requests for valve operations are to be made through the Public Works Department. Requests for valve operations shall be made 24 hours prior to any scheduled operations or tests.

B. Hydrostatic tests:

1. Where any section of a water line is provided with concrete thrust blocking for fittings, do not make hydrostatic tests until at least 5 days after installation of the concrete thrust blocking.
2. Devise a method for disposal of waste water from hydrostatic tests, and for disinfection, as approved in advance by the Public Works Department.

C. Pressure tests:

1. Subject the new water mains and service lines, including valves and hydrants, to a hydrostatic pressure of 150 psi by means of a pump connected to the pipe.
2. Hold the test pressure for a duration of one hour without pressure loss or further pressure application.
3. Carefully examine exposed pipe, joints, fittings, and valves.
4. Replace or remake joints showing visible leakage.
5. Remove cracked pipe, defective pipe, and cracked or defective joints, fittings, and valves. Replace with sound material and repeat the test until results are satisfactory.
6. Make repair and replacement without additional cost to the Village.

D. Leakage test:

1. Conduct a leakage test after the pressure test has been satisfactorily completed.
2. Subject the new water mains and service lines, including valves and hydrants, to a hydrostatic pressure of approximately 1.5 times the normal

working pressure at the point of lowest elevation of the test section by means of a pump connected to the pipe.

3. Duration of each leakage test: At least 2-hours.
4. Maximum allowable leakage: Not to exceed the number of gallons per hour (gph) as determined by the following formula:

$$\text{gph} = \frac{SD (P^{1/2})}{133,200}$$

in which:

S = length of pipe tested, in feet

D = diameter of main, in inches

P = average pressure, in pounds per square inch (gage)

5. Should any test of pipe disclose leakage greater than the maximum allowable amount, locate and repair the defective joint or joints and then repeat the leakage test until the leakage is within the specified allowance, and at no additional cost to the Village.

E. Time for making test:

1. Except for joint material setting, or where concrete reaction backing necessitates a 5 day delay, pipelines jointed with rubber gaskets, mechanical, or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill.
2. Perform the pressure and leakage tests satisfactorily prior to requesting the Village Engineer to witness the official tests.
3. Notify the Village Engineer at least 48 hours prior to the time of the requested official tests.
4. Depending on traffic conditions, public hazard, or other reasons, the Village Engineer may direct when to conduct the tests, and may order the tests to be made in relatively short sections of water mains.

7.13 PRELIMINARY FLUSHING

- A. Prior to disinfection, flush main until water runs clear.
- B. Coordinate time of flushing with Public Works Department at least 72 hours in advance of flushing. Do not initiate flushing without Public Works Department's permission.

7.14 DISINFECTION

A. General:

1. After the water main work has been satisfactorily completed and tested, disinfect the work in accordance with AWWA C651, and NR 811.73 of the Wisconsin Administrative Code.

- B. Forms of applied chlorine:
1. Apply chlorine by dry gas feeder unless solution feed chlorinator, solution of chlorine-bearing compounds, or tablet method are approved by the Public Works Department.
 - a. Provide effective diffusion of the gas into the water and regulate the rate of gas flow.
 - b. Provide means for preventing the backflow of water into the feeder.
 2. Chlorine-bearing compounds in water:
 - a. Apply solution of calcium hypochlorite granular or sodium hypochlorite into one end of the section of main to be disinfected while filling the main with water.
 3. Tablet method:
 - a. Apply tablet of calcium hypochlorite to short extensions up to 2,500 feet and water mains diameter up to 12-inch only.
 - b. Utilize only when scrupulous cleanliness has been used in construction.
 - c. Do not use if trench water or foreign material has entered the main or if the water is below 41 degrees F.
 - d. Place tablets at the top of the main and attach by an adhesive, such as Permatex No. 1.
 - e. Place crushed tablets inside the annular space of the pipe joints.
- C. Requirement of chlorine:
1. Apply disinfecting solutions having at least 50 mg/l of available chlorine.
 2. Retain the disinfecting solutions in the work for at least 24 hours.
 3. Chlorine residual after the retention period: At least 25 mg/l.
- D. Flushing and testing:
1. Following chlorination, flush treated water thoroughly from the water mains until the chlorine concentration in the water flowing from the main is no higher than generally prevailing in the Village water system, or less than 1 mg/l.
 2. After flushing, collect water samples on two successive days in sterile bottles treated with sodium thiosulfate. Notify the Village Engineer and the Public Works Department to witness sample collection.
 3. The Public Works Department will deliver the samples to a State approved laboratory for bacteriological analysis.
 4. If the initial disinfection results in an unsatisfactory bacterial test, repeat the chlorination procedure until satisfactory results are obtained.
 5. The Village will provide the water for initial flushing and testing only. Compensate the Village for water used in subsequent flushing and testing.
- E. Swabbing:
1. Flush and swab the piping, valves, and fittings that must be placed in service immediately and cannot be disinfected by the above-specified methods, with 5% solution of calcium hypochlorite prior to assembly.
 - a. Secure the Village Engineer's approval before applying this method of disinfection.

7.15 WORKMANSHIP

As a minimum requirement, the specifications for the construction of water distribution facilities shall not be less stringent than the latest edition of the "Standard Specifications for Sewer and Water Construction in Wisconsin" and as specified above.

7.16 LOCATOR WIRE

- A. Place locator wire on top of the PVC plastic water mains and fittings and secure at min. 10-foot intervals.
- B. Extend locator wire to top of terminal boxes leaving 12 inches of slack for future connection and connect to terminal box.
- C. Secure terminal box to back side of fire hydrant barrel and set top of box flush with the finished grade.
- D. Place locator wire on top of water service lines and extend to top of terminal box located adjacent to the service box.
- E. Terminal Box: 2-1/2 inch diameter by 18-inch shaft ABS plastic with cast iron lid as manufactured by C.P. Test Services – Valvco, Inc.

SECTION 8 - STORM WATER DRAINAGE

8.1 INTRODUCTION

All developments, regardless of size, within limits or under the control of the Village, 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 Village shall also meet the technical requirements of this Section.

8.2 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 Land Developer shall submit to the Village Engineer the storm water drainage computations.

C. Storm Water Detention

Storm detention shall be required as determined by 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 Village, 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. Existing depressional storage volume on site shall be preserved.

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 as required by the Wisconsin Administrative Codes NR 216 and NR 151.

E. Infiltration

Infiltration basins, when required, shall be constructed in accordance with NR 151. Areas intended for infiltration shall be protected from siltation and soil compaction during site development. Such areas shall be fenced off from general construction activities. Any sediment accumulation shall be removed after a majority of the site is stabilized and prior to placing the infiltration area in service.

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.

8.3 DESIGN CRITERIA FOR STORM WATER DETENTION

A. Release Rates

All developments shall be subject to and in compliance with the following Base Level Standards for discharge rates.

1. Storm water practices shall be designed to:
 - a. Reduce the 100-year, 24-hour, post-development runoff rate to less than or equal to the 10-year, 24-hour, pre-development runoff rate.
 - b. Reduce the 10-year, 24-hour, post-development runoff rate to less than or equal to the 10-year, 24-hour, pre-development.
 - c. Reduce the 2-year, 24-hour, post-development runoff rate to less than or equal to the 2-year, 24-hour, pre-development.
 - d. Reduce the 1-year, 24-hour, post-development runoff rate to less than or equal to the 1-year, 24-hour, pre-development.
2. If there is insufficient capacity in storm water conveyance facilities downstream from the proposed development, the Village reserves the right to further restrict the allowable peak discharge rates for developments.

B. Design Calculations

1. Storm water detention facilities shall be designed using hydrograph-producing runoff models such as the 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.
2. The hydrologic and hydraulic analyses for evaluating pre- and post-development runoff characteristics shall utilize the latest NOAA Atlas 14 point precipitation frequency estimates.
3. Pre-development conditions shall assume "good hydrologic conditions" for land covers identified in TR-55. However, when pre-development land cover is cropland, the following runoff curve numbers shall be used:

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

4. 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 and aesthetically pleasing. Dry-bottom detention basins shall be designed and sized such that 100 percent of the bottom area shall have standing water no longer than 48 hours for the 100-year frequency storm. The basin shall have a maximum embankment slope of 4:1.
2. Wet-bottom retention basins shall be designed to be safe and aesthetically pleasing. Wet-bottom basins shall be at least four feet (4') deep, excluding near-shore banks and safety ledges. 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 2' below the normal water level. Such ledges shall be no less than 6 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.
4. Facilities shall be provided to allow vehicular access to the detention basin outlet works.
5. Subdivision detention facilities shall be located and described within a deed or plat restricted area.

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. Emergency overland flow paths shall be shown on the engineering drawings.
3. 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.
4. Direct connection of outlets works to existing farm drain tile systems shall be prohibited, unless recommended by the Village Engineer.

8.4 DESIGN CRITERIA FOR INFILTRATION SYSTEMS

Infiltration systems shall meet the design criteria and technical standards published by the Wisconsin Department of Natural Resources.

8.5 DESIGN CRITERIA FOR SURFACE SWALES AND STORM SEWERS

A. Storm Sewer

1. Storm sewers shall be designed in accordance with the Wisconsin DOT Facilities design manual. 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. The pipes shall be sloped to achieve the minimum two (2) feet per section (fps) self-cleaning velocity and have a maximum velocity not exceeding twelve (12) fps.
4. In areas where curb and gutter and storm sewers are required, inlets shall be installed so that the drainage reach for each inlet shall not exceed four hundred feet (400'). Where the inlet is located at a low point, additional inlets may be required by the Village Engineer. No more than two (2) inlets shall be interconnected. Inlets shall be so located that storm water runoff will not "pond" greater than the top of the street curbs. Depressed street crowns to facilitate drainage will not be permitted.
5. Rear lot drainage should not drain 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. Within road right-of-way, 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. Bedding shall be provided for all storm sewers constructed in trench in accordance with Section 5.7.
9. Outside road right-of-way, an alternate pipe material for storm sewers, such as HDPE ADS N-12, may be permitted by Village Engineer.
10. 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.
11. Storm sewer outfalls and culverts should have flared end sections with geotextile fabric and riprap stone placed at the outlet. Secure the last two

pipe sections, including end sections, at all storm sewer outfall using joint ties. Install steel grating on ends of storm sewers greater than 12-inches in diameter.

12. Six-inch (6") diameter sump pump/storm laterals shall be provided within new subdivisions. Laterals over 100 feet in length shall have a cleanout installed. Place magnetic location tape over all sump pump/storm laterals.
13. Core connections to existing storm sewer structures and sewers. Reinforced concrete pipe shall be connected to structures by means of brick and mortar. Polyvinyl Chloride Pipe shall be connected by an approved flexible pipe to structure seal.
14. All manholes, inlet manholes, inlets and catch basins, and headwalls shall be constructed in accordance with the "Standard Specifications for Sewer and Water Construction in Wisconsin". Manhole benches shall be poured in place. Pre-cast bases are allowed, but bench shall be poured in place.
15. Manhole castings within new public roadways shall be initially constructed to 1/4-inch below the top of the first layer of asphalt and subsequently adjusted at the time the final asphalt layer is placed.
16. A minimum of 4 inches and a maximum of 19 inches of adjusting rings shall be installed at each manhole. Adjusting ring dimensions shall match the dimensions of the top of the cone section/flat top slab opening. Manholes shall be furnished to minimize the chimney height required.
17. 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 hydraulically 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 six (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 by use of apron end walls or headwalls.
4. Minimum cover at roadways shall be twelve (12) inches.

- D. Manmade swales and ditches shall meet the following minimum design standards:
1. Minimum grade of one percent (1.0%).
 2. Maximum grade of ten (10%) percent.
 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 Wisconsin DNR Stormwater Construction and Post-Construction 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 Wisconsin DNR Stormwater Construction and Post-Construction 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 and as required by the Wisconsin DNR Stormwater Construction and Post-Construction 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. All areas of the property must be provided an overland flow path that will pass the 100-year flow at a stage at least one 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.

8.6 SUBSURFACE DRAIN TILES AND GROUND WATER TABLE

A. Subsurface Drainage (Drain Tiles):

The Land Developer shall submit a subsurface drainage inventory. The inventory shall include locations of existing farm and storm drainage tiles by means of slit trenching and other appropriate methods performed by a qualified subsurface drainage consultant. All existing drain tile lines damaged during the investigation shall be repaired to its previous working status.

1. The Land Developer shall provide a topographical map of the development site showing:
 - a. Location of and depth of each slit trench and identified to correspond with the tile investigation report and surveyed points where the tile was field staked at approximately 50 foot intervals;
 - b. Location of each drain tile with a flow direction arrow, tile size, and any connection to adjoining properties; a summary of the tile investigation report showing trench identification number, tile size, material and quality, percentage of the tile filled with water, percentage of restrictions caused by silting, depth of ground cover, and working status;
 - c. Name, address, and phone number of person or firm conducting tile location investigation.
2. Information collected during the drainage investigation shall be used to design and construct a stormwater management system that meets the requirements of the Village Ordinances and these Development Standards,

including connecting tile lines on adjoining properties. Tiles discovered during construction that were not identified during the investigation shall be

incorporated into the development stormwater system design and recorded on the development as-built documents.

B. Groundwater

The developer shall provide a letter from a Professional Engineer or Registered Land Surveyor certifying that the following conditions have been met:

1. Ninety (90%) percent of the buildable lot area shall be at least two (2') feet above the approximate high water elevation of any lake or stream affecting the area, and, eighty (80%) percent of the buildable lot area shall be at least three (3') feet above the highest ground water level, as estimated by the Land Developer or their agent from soil boring test data or septic field soil testing, and as verified by the Village Engineer.
2. The buildable lot area excludes special management areas such as wetlands, floodplains, and conservation areas.

SECTION 9 - ROADWAY CONSTRUCTION

9.1 INTRODUCTION

- A. All developments, regardless of size within the Village 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 and construction of all roadways under the control of the Village, shall meet the technical requirements of this Section, the (WDOT) "Standard Specifications", and the WDOT Facilities Development Manual.

9.2 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 9.1 and 9.2 appended to this section.

9.3 GEOMETRICS

- A. Roadway geometrics shall be as set out in Figures 9.2.

9.4 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.

9.5 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 proof rolled prior to construction of the base course. A minimum 50,000 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 proof rolling tests before construction may proceed. The Village Engineer shall be present for and shall be notified 24 hours prior to proof rolling.
- C. Areas of subgrade, which do not pass a proof rolling test, shall be remediated in order to pass a subsequent proof rolling test. The method of subgrade

remediation shall be as authorized by the Village Engineer.

9.6 SUB-BASE COURSE

- A. Sub-base course construction required under this section shall be crushed stone or crushed gravel complying with the applicable provisions of the (WDOT) "Standard Specifications", Gradation No. 1.
- B. Geotextile fabrics, where allowed by the Village Engineer for subgrade stabilization, shall conform to (WDOT) "Standard Specifications", Type SR.

9.7 BASE COURSE

- A. Base course construction required under this Section may be either asphaltic base course or crushed stone or crushed gravel. Materials shall comply with the applicable provisions of the (WDOT) "Standard Specifications", Gradation No. 1.
- B. Roadways shall be proof rolled prior to construction of the binder course or pavement section. A minimum 50,000 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 proof rolling.

9.8 PAVEMENT AND SURFACE COURSES

- A. Pavement construction required under this Section may be either asphaltic pavement in accordance with Figure 9.1 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 Hot Mix Asphalt (HMA) pavement mix and nominal aggregate size as follows:
 - 1. Minor Streets: Type E-0.3
 - a. Use 19 mm (3/4") for lower layer mixes.
 - b. Use 9.5 mm (3/8") for leveling and surface mixes.
 - 2. Collector Streets & Minor Industrial: Type E-1
 - a. Use 9.5 mm (3/8") for leveling mixes.
 - b. Use 19 mm (3/4") for lower layer mixes.
 - c. Use 12.5 mm (1/2") for surface mixes.
- C. For priming asphaltic and other stabilized surfaces, comply with the applicable provisions of the (WDOT) "Standard Specifications".
- D. Each lift of asphaltic pavement shall not exceed 2 inches.

9.9 COMBINATION CONCRETE CURB AND GUTTER

- A. Curb and gutter construction shall comply with (WDOT) "Standard Specifications".

- B. Concrete curb and gutter shall conform to the 30-inch Type "D" section of the Wisconsin Department of Transportation and shall be constructed in accordance with the (WDOT) "Standard Specifications".

9.10 STANDARD DESIGN METHOD FOR PAVEMENTS

- A. 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 9.1.

9.11 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 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.

9.12 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 shall have a minimum 2-inch thick aggregate base (dense graded 3/4" size) in residential driveways and a minimum 6-inch thick aggregate base (dense graded 3/4" size) in non-residential driveways.
- C. Sidewalk width shall be 5-feet or as determined by the Village Board when a greater width is justified based on anticipated traffic. Public walks should be constructed on both sides of the street and meet the State of Wisconsin Handicapped Access Requirements.

- D. All sidewalks shall be constructed prior to or within 6-months of occupancy. An occupancy bond shall be provided to the Village if the sidewalk is not completed prior to occupancy.

**VILLAGE OF SOMERS, WISCONSIN
LAND DEVELOPMENT STANDARDS
PAVEMENT REQUIREMENTS
FIGURE 9.1**

ROADWAY CLASSIFICATION	MINIMUM PAVEMENT STRUCTURE REQUIREMENTS		
	PAVEMENT LAYER (Aggregate Size)	ASPHALT (inches)	CONCRETE (inches)
MINOR INDUSTRIAL	Surface (12.5 mm)	1.50	10.0
	Binder (19 mm)	3.50	
	Aggregate Base (1 1/4")	8.00	8.0
	Aggregate Sub-Base (3")	6.00	
COMMERCIAL COLLECTOR	Surface (12.5 mm)	1.50	10.0
	Binder (19 mm)	3.50	
	Aggregate Base (1 1/4")	8.00	6.0
	Aggregate Sub-Base (3")	6.00	
RESIDENTIAL COLLECTOR	Surface (12.5 mm)	1.50	8.0
	Binder (19 mm)	3.50	
	Aggregate Base (1 1/4")	10.00	6.0
MINOR	Surface (9.5 mm)	1.50	6.0
	Binder (12.5 mm)	3.50	
	Aggregate Base (1 1/4")	10.00	6.0

**VILLAGE OF SOMERS, WISCONSIN
LAND DEVELOPMENT STANDARDS
URBAN STREET GEOMETRIC CRITERIA
FIGURE 9.2**

ROADWAY CLASSIFICATION	COMMERCIAL COLLECTOR	INDUSTRIAL MINOR	COLLECTOR	MINOR
Right-of-way width	80 ft.	70 ft.	80 ft.	66 ft.
Roadway width ⁽¹⁾	49 ft.	49 ft.	49 ft.	37 ft.
Sidewalk width ⁽²⁾	5 ft.	5 ft.	5 ft.	5 ft.
Curb type	30"-Type D	30"-Type D	30"-Type D	30"-Type D
Number of traffic lanes	2	2	2	2
Travel Lane width	12 ft.	12 ft.	12 ft.	10 ft.
Parking Lane width	10 ft.	N/A	10 ft.	8 ft.
Maximum grade	5%	6%	7%	10%
Minimum grade	0.50%	0.50%	0.50%	0.50%
Minimum center line radius ⁽⁴⁾⁽⁵⁾	300 ft.	300 ft.	300 ft.	100 ft.
Return radius	30 ft.	30 ft.	30 ft.	25 ft. ⁽⁶⁾
Crown	1.5% - 2.0%	1.5% - 2.0%	2.00%	2.00%

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

(2) Sidewalk designated as Bike Path shall be a minimum width of 8-feet.

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

(4) A tangent of at least 100-feet shall be introduced between reverse curves on collector streets.

(5) Larger radius may be required on bus routes.

SECTION 10 – STANDARD DETAIL DRAWINGS

- 10.1 MINOR STREET – TYPICAL ROAD SECTION
- 10.2 RESIDENTIAL COLLECTOR – TYPICAL ROAD SECTION
- 10.3 COMMERCIAL COLLECTOR – TYPICAL ROAD SECTION
- 10.4 INDUSTRIAL ROAD – MINOR STREET – TYPICAL ROAD SECTION
- 10.5 STANDARD CUL-DE-SAC
- 10.6 ALTERNATIVE CUL-DE-SAC
- 10.7 FLEXIBLE RISER TO FLEXIBLE SEWER MAIN – 21” AND LARGER DEEP SEWERS
- 10.8 FLEXIBLE RISER TO FLEXIBLE SEWER MAIN – 8” THROUGH 18” DEEP SEWERS
- 10.9 FLEXIBLE RISER TO FLEXIBLE SEWER MAIN – 21” AND LARGER SHALLOW SEWERS
- 10.10 TRACER WIRE EXAMPLE DETAIL

SECTION 10 – STANDARD DETAIL DRAWINGS

- 10.1 MINOR STREET – TYPICAL ROAD SECTION
- 10.2 RESIDENTIAL COLLECTOR – TYPICAL ROAD SECTION
- 10.3 COMMERCIAL COLLECTOR – TYPICAL ROAD SECTION
- 10.4 INDUSTRIAL ROAD – MINOR STREET – TYPICAL ROAD SECTION
- 10.5 STANDARD CUL-DE-SAC
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- 10.9 FLEXIBLE RISER TO FLEXIBLE SEWER MAIN – 21” AND LARGER SHALLOW SEWERS
- 10.10 TRACER WIRE EXAMPLE DETAIL

MINOR STREET
TYPICAL ROAD SECTION

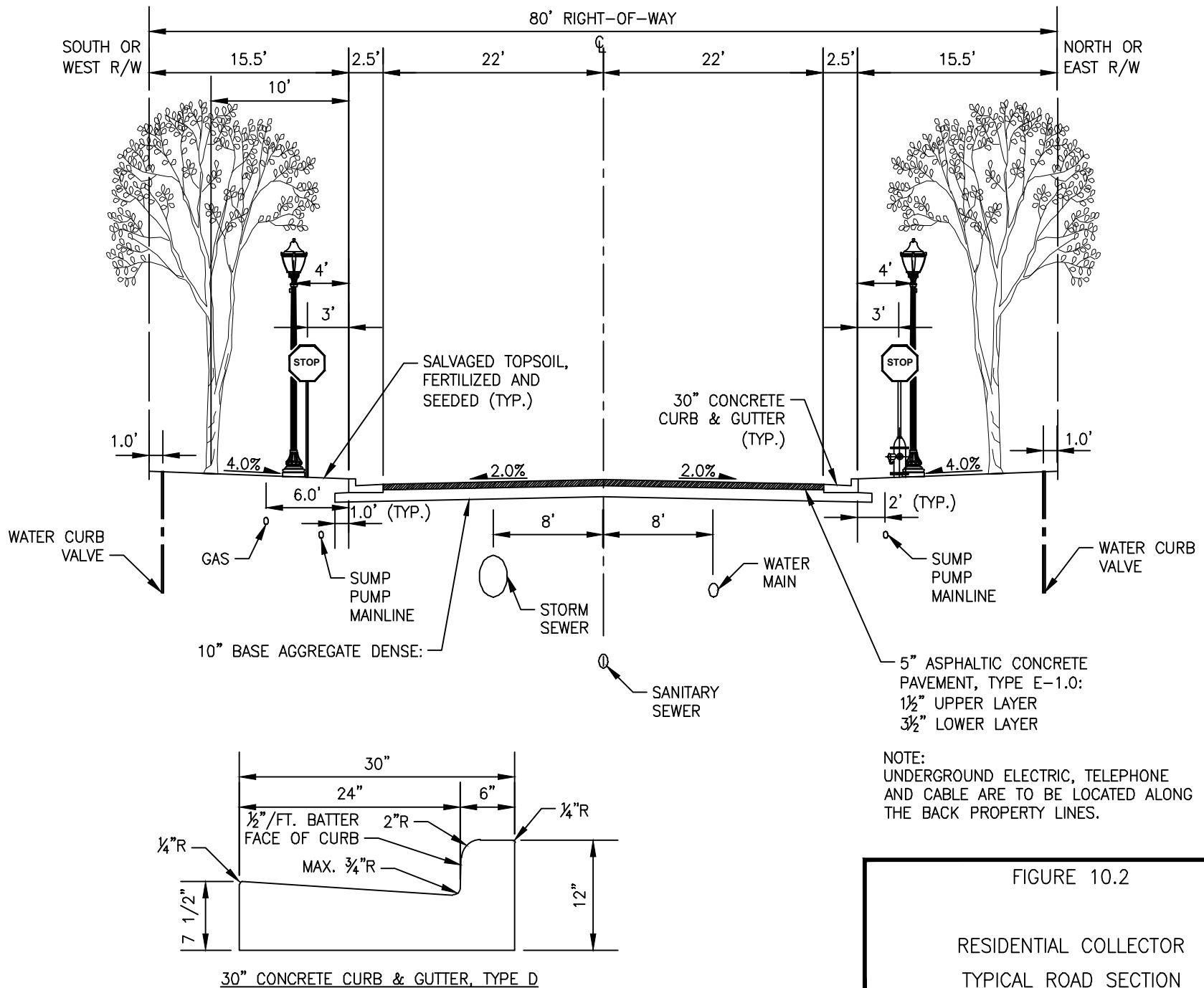


FIGURE 10.2

RESIDENTIAL COLLECTOR
 TYPICAL ROAD SECTION

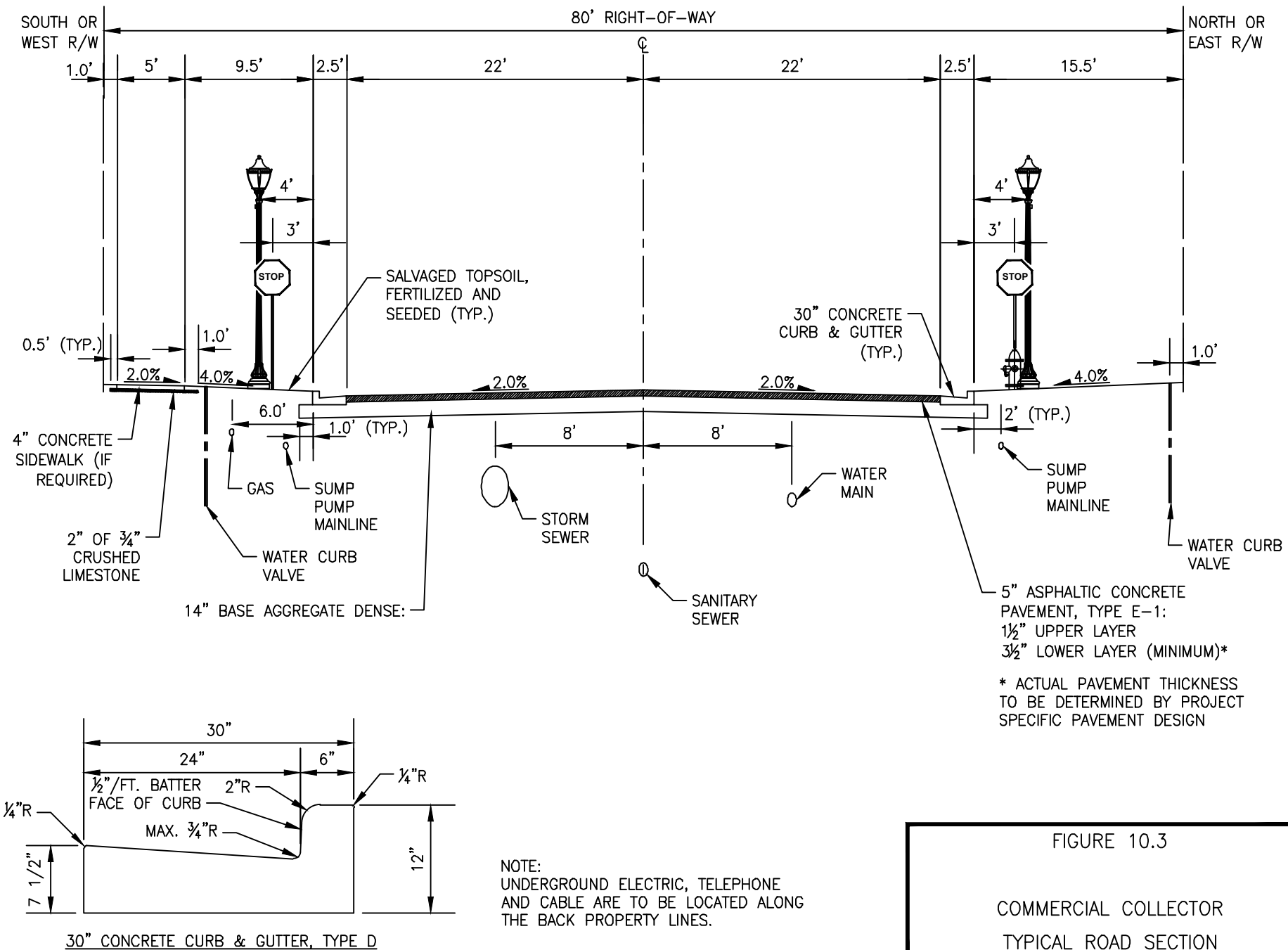
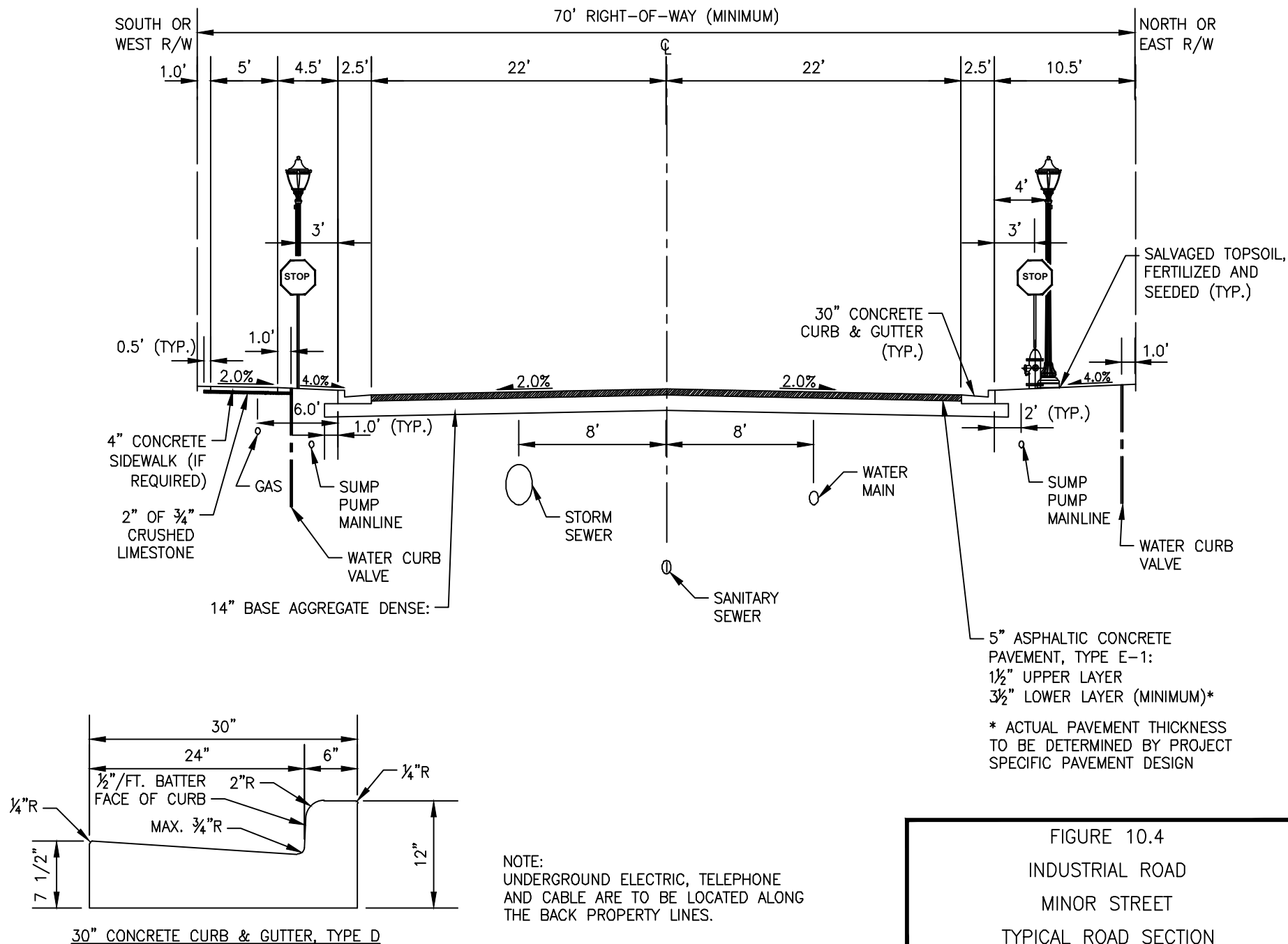


FIGURE 10.3

COMMERCIAL COLLECTOR
 TYPICAL ROAD SECTION



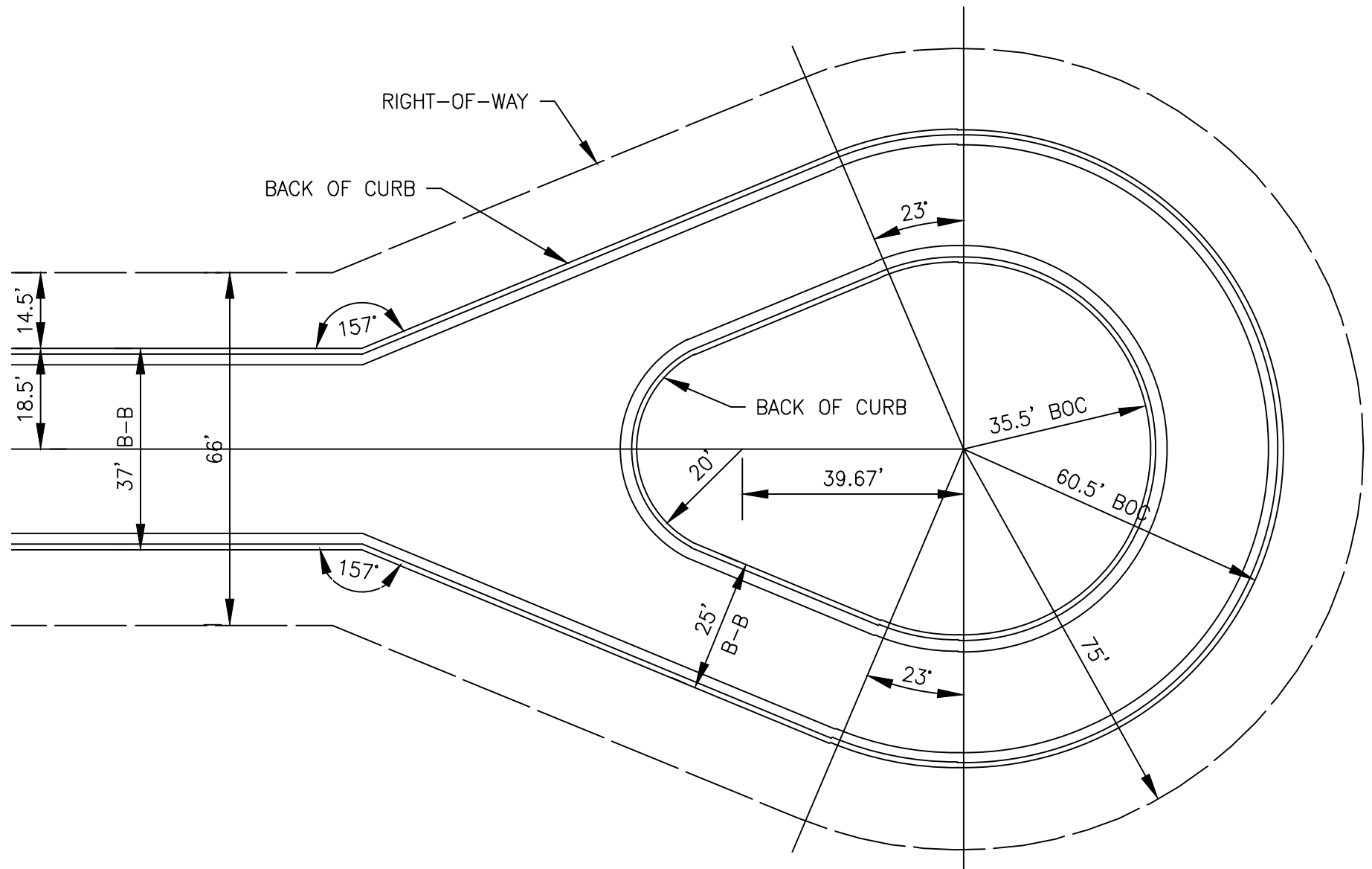
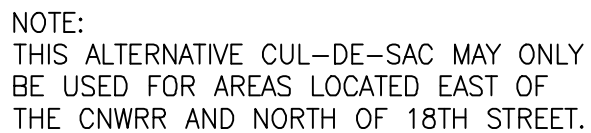


FIGURE 10.5

STANDARD CUL-DE-SAC



ALTERNATIVE CUL-DE-SAC

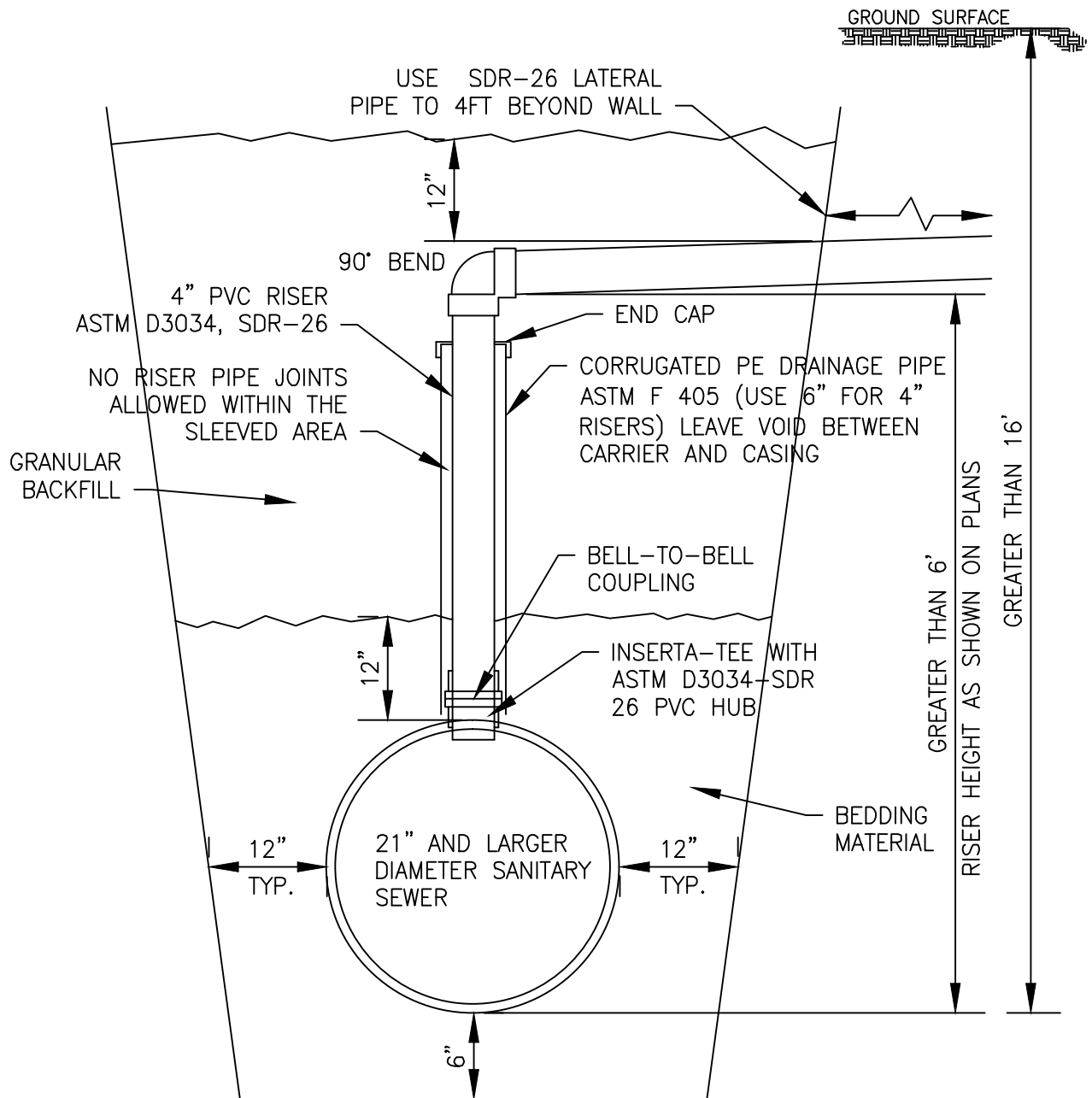


FIGURE 10.7
 FLEXIBLE RISER TO FLEXIBLE SEWER MAIN
 21" AND LARGER DEEP SEWERS

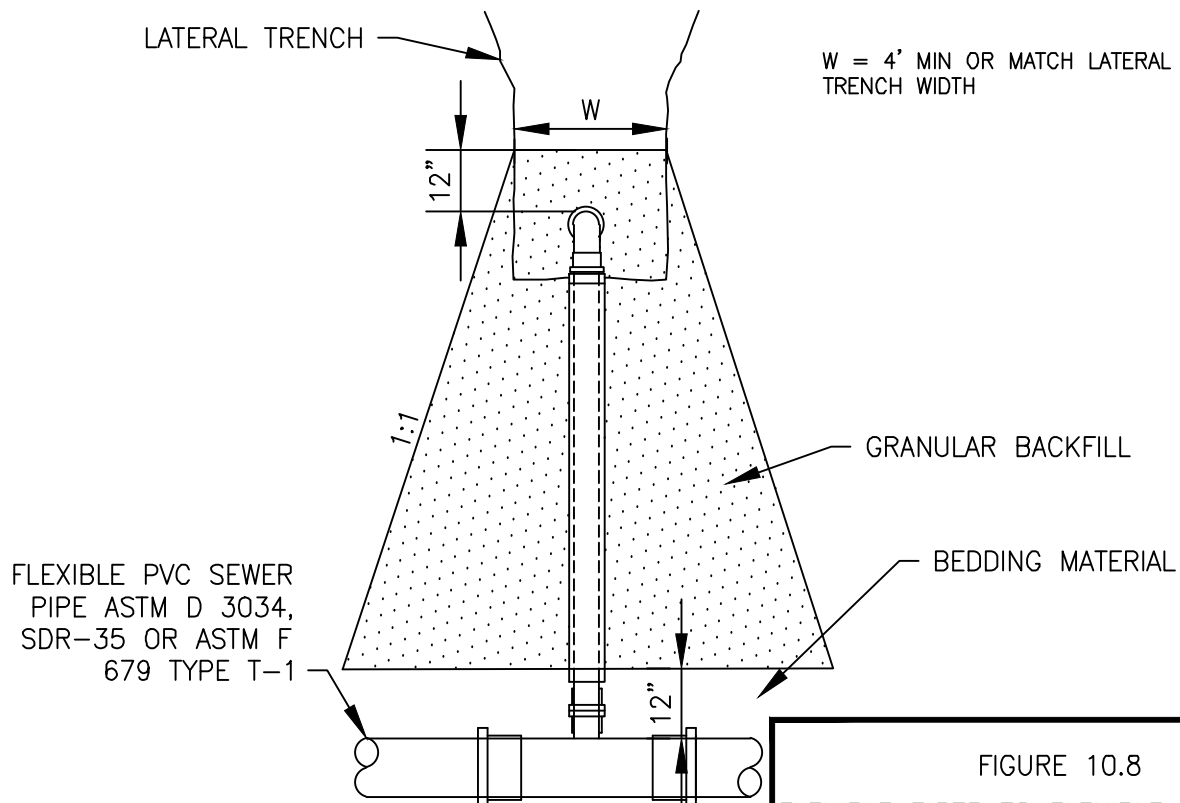
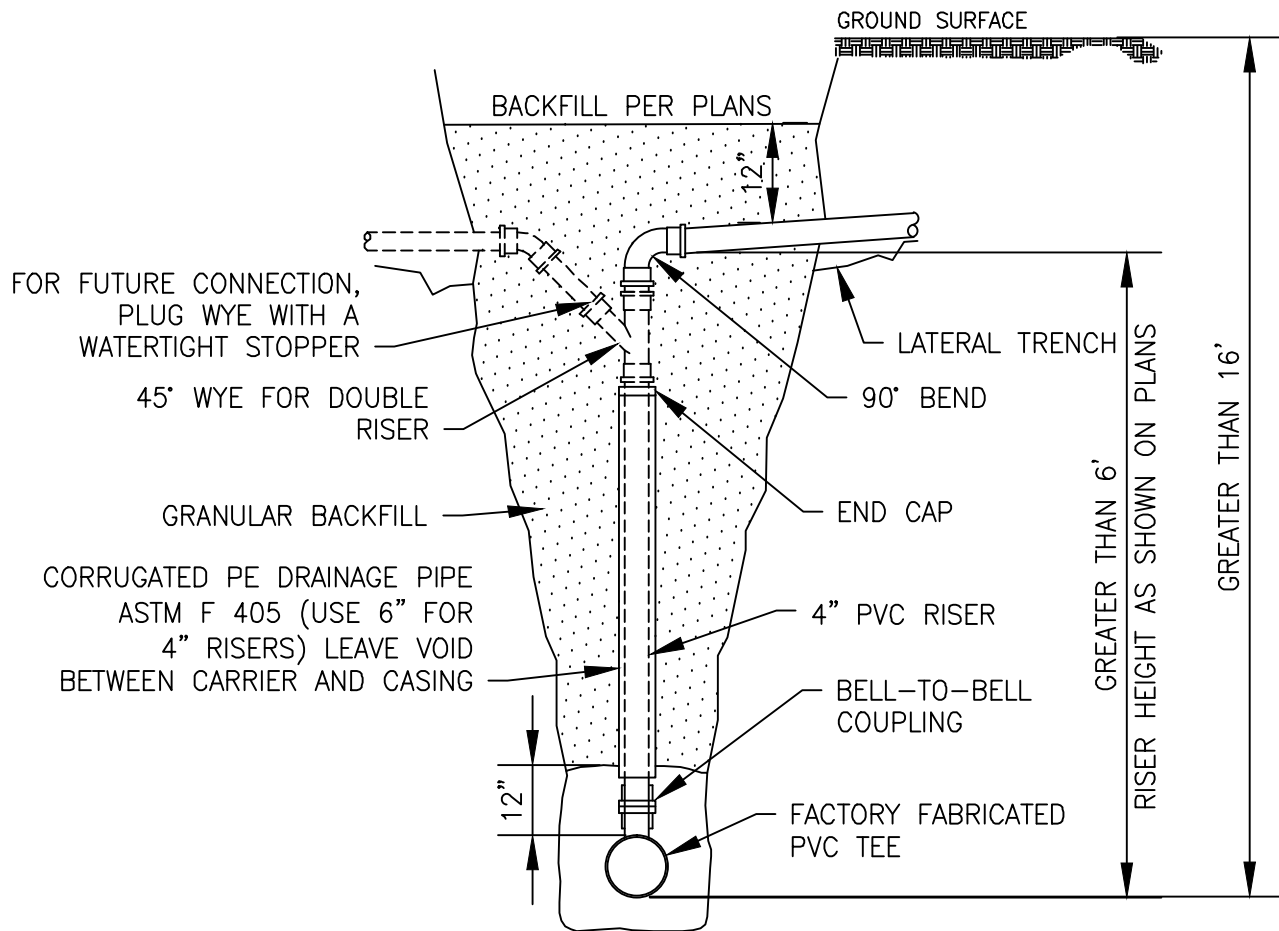


FIGURE 10.8
 FLEXIBLE RISER TO FLEXIBLE SEWER MAIN
 8" THROUGH 18" DEEP SEWERS

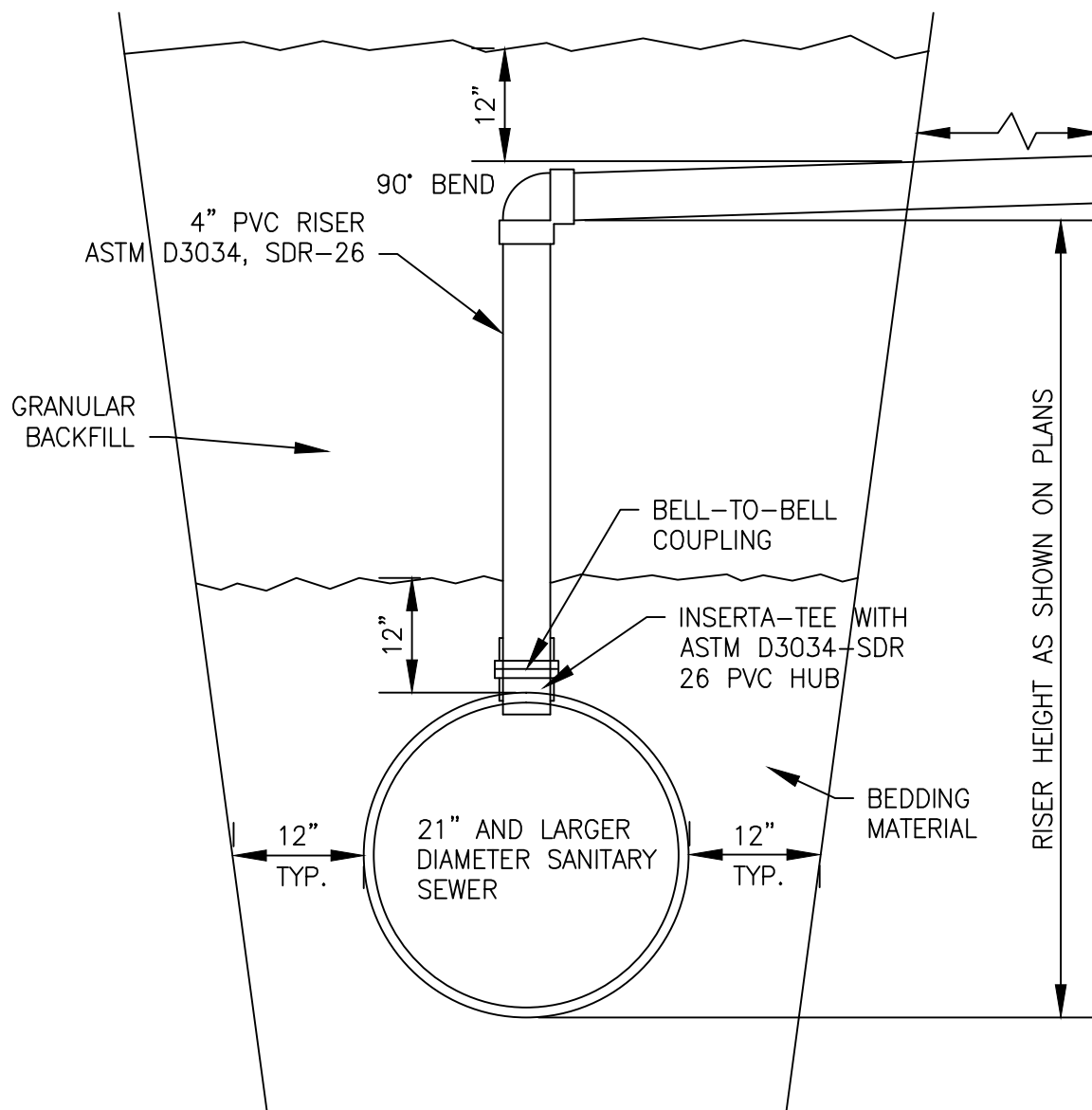


FIGURE 10.9
FLEXIBLE RISER TO FLEXIBLE SEWER MAIN
21" AND LARGER SHALLOW SEWERS

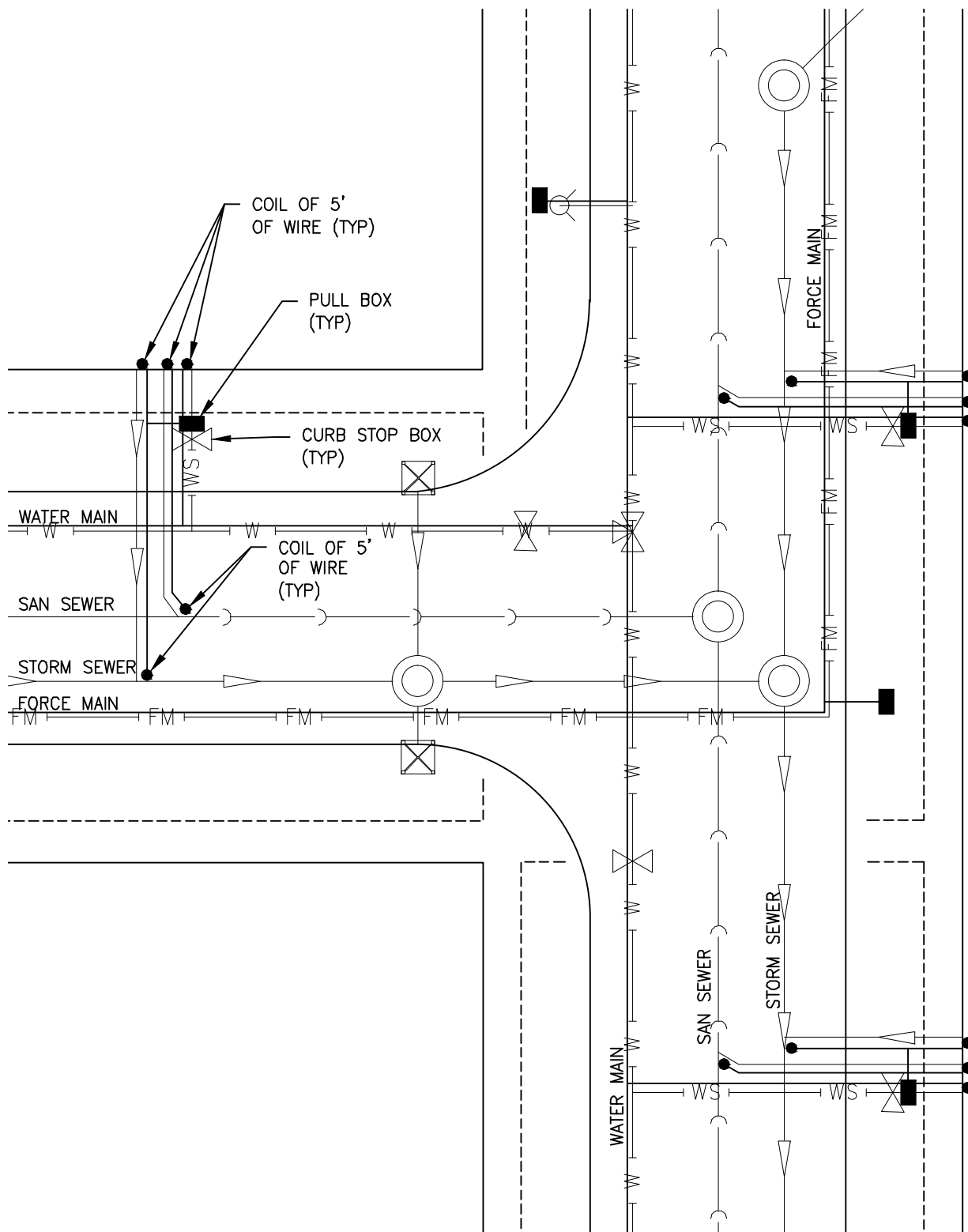


FIGURE 10.10

TRACER WIRE EXAMPLE DETAIL