

VILLAGE OF BEECHER, ILLINOIS

SUBDIVISION ORDINANCE

FINAL

March 2007



**VILLAGE OF BEECHER, ILLINOIS
ENGINEERING TECHNICAL STANDARDS**

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ORDINANCE NO. _____

VILLAGE OF BEECHER, ILLINOIS

SUBDIVISION ORDINANCE AND DEVELOPMENT STANDARDS

PART ONE - SUBDIVISION ORDINANCE

BE IT ORDAINED by the President and Board of Trustees of the Village of Beecher, Will County, Illinois, that the Subdivision Regulations adopted November 8, 1976 and comprehensively amended on April 28, 1996 by the President and Board of Trustees of the Village of Beecher, Illinois, is hereby comprehensively amended to read as follows:

ARTICLE 1 —
GENERAL PROVISIONS

Section 1.0 - Title

This ordinance shall be known and may be cited or referred to as the "*Subdivision Ordinance and Development Standards of the Village of Beecher, Illinois.*" The Subdivision Ordinance, Part One (Page 1-36), Articles 1 through 5, has been adopted, by ordinance by the Village Board of Trustees. The Development Standards, Part Two (Page 37-end), Article 6, has been adopted by resolution by the Village Board of Trustees. Part three, Technical Specifications has also been adopted by resolution by the Village Board of Trustees.

Section 2.0 - Purpose

Subdivision and/or development of land is a privilege conferred upon the developer by the laws of the State of Illinois and by this ordinance. It is the responsibility of the Village of Beecher to regulate the development of lands in and around the Village for the following purposes:

1. To protect and promote the health, safety, and general welfare of the people of the Village, the people of the surrounding area, and of the people visiting or passing through the Village.
2. To leave for future generations a strategically-planned and well-constructed infrastructure so that the focus of citizen concern is not past error but future growth.
3. To promote the orderly development of property so that such development enhances and complements existing Village features.
4. To ensure that development proceeds in a timely manner.
5. To protection the quality and quantity of the Village's land, air, water, natural resources, and environment through development appropriate to local conditions and to take advantage of, and to avoid conflict with, natural topography and resources. To use, to the extent practicable, the natural landscape and naturalized drainage and detention features to filter and infiltrate stormwater runoff on site.

6. To encourage clustered dwelling and commercial units, the benefits of which include:
 - a. decreased impervious surface;
 - b. decreased pollutant loads;
 - c. protection of cultural resources and natural features;
 - d. habitat protection;
 - e. improved aesthetics;
 - f. creation of passive recreation opportunities; and
 - g. reduced costs for development and maintenance.

Section 3.0 - Jurisdiction .

This development ordinance shall apply to improvements constructed on all lands within the Village of Beecher and to improvements constructed on all unincorporated land within 1½ miles of the corporate limits of the Village.

Section 4.0 - Scope

The following persons, corporations, firms, etc., shall be required to comply with this development ordinance, except as otherwise determined by the Board of Trustees of the Village of Beecher:

1. Anyone contemplating the subdivision or resubdivision of land or a planned unit development.
2. Anyone contemplating the development of property as noted above pursuant to an annexation.
3. Any project designated by the Board of Trustees of the Village of Beecher.
4. Any building permit application for a non-residential development over one acre.

Section 5.0 - Effect of Existing Building Permits and Zoning Certificates

Nothing in the Ordinance shall be deemed to require any change in the plans, construction or designated use of any land or structure in the event that:

1. Final plat or plan approval for such subdivision or development was lawfully issued prior to the effective date of the Ordinance or the effective date of any amendment thereof; and
2. Such approval has not by its own terms expired prior to such effective date; and
3. Such approval was issued on the basis of an application showing complete plans for proposed construction; and
4. There has been a substantial expenditure or incurrence of substantial obligations by the applicant in reliance on such approval; and
5. Such expenditure or incurrence of substantial obligations were made prior to published or actual notice of the Ordinance; and
6. Construction pursuant to such approval is complete prior to the expiration of such approval.

Section 6.0 - Definitions

The following terms shall have the following respective meanings as used in this development ordinance, the meaning of all other words shall conform to *Webster's Ninth New Collegiate Dictionary* or later edition:

Agent. A person and/or corporation, etc., acting for and/or in the stead of another person.

Alley. The public right-of-way which affords secondary means of access to properties abutting upon a street.

Applicant. The person, corporation, firm, etc., seeking to develop a property under this development ordinance.

Area, Gross. The gross area of a parcel or development is the total area (in acres) in fee ownership, which excludes right-of-way already dedicated but includes non-residential land uses and private streets.

Area, Net. The net area of a parcel or development is the area (in acres) of the actual tract of land upon which the dwelling units are proposed to be located. This area shall include the site for all principal and accessory building(s) and associated parking area, but does not include common open space or recreational facilities, or the vehicular circulation system, either private or public.

Bench. The concrete formed into the bottom of a structure such as a manhole to conduct - sewage or other liquids across the structure so that the flow is as little disturbed as possible.

Benchmark. A permanent or semi-permanent physical mark of known elevation referenced to a recognized datum.

Berm. A mound of dirt used for screening or landscaping purposes which is planted with low-lying shrubs or ground cover so as to prevent erosion.

Block. A block is a tract of land bounded by street rights-of-way, or by a combination of street rights-of-way and public parks, cemeteries, railroad and utility rights-of-way, bulkhead lines or shore lines of waterways, or corporate boundary lines.

Buffer. A visual screen constructed of wood, concrete block, or landscape material in such a manner that the view of adjacent property will be completely or partially obscured from the use contemplated, so noise, solid waste, or other objectionable influences will be avoided.

Building. A building is an enclosed structure, constructed partially or wholly above ground, with a permanent roof, separated on all sides from adjacent open space by exterior or party walls, which is permanently affixed to the ground.

Building setback line. A line indicating the minimum horizontal distance between any property line and a building on the property.

Comprehensive Plan. The "Village of Beecher, Illinois Comprehensive Plan Amendment April 26, 2005, or subsequent amendments thereto.

Concept Plan. A drawing or any other accompanying information which shows existing and proposed development conditions as proposed in this Ordinance.

Construction cost. Estimated cost of construction excluding engineering costs and - excluding required Village fees based on construction cost.

County. Pertaining to the County of Will, Illinois.

Crosswalk. A public right-of-way located across a block to provide pedestrian access to adjacent streets or alleys.

Cul-de-sac. A street permanently terminated by a vehicle turnaround. The maximum length of a cul-de-sac shall not exceed 500 ft.

Datum Plane. A reference level from which ground elevations are based. The datum plane is at mean sea level as established by the United States Geological Survey (USGS) NAVD88.

Detention basin. A covered or uncovered reservoir designed to hold an accumulation of stormwater runoff so as to reduce peak flow in a stormwater drainage system.

Developer. A person, group of persons, organization, or other entity who petitions the Village according to this development ordinance for the purpose of improving or subdividing land; may also be referred to as "owner" or "applicant" depending on the context.

Development. Any subdivision or change to improved or unimproved real property including single lots and shall not be limited to buildings or other structures, mining, LJ dredging, filling, grading, paving, excavation or drilling operations located within the planning jurisdiction of the Village.

Development standards. This subdivision ordinance and development standards, hereafter referred to as ordinance and/or standards.

Development plan. The documentation, both written and diagrammatic, which sets forth the improvements proposed for any given lot or tract.

Drainage swale. A drainage ditch of shallow depth with small side slopes.

Dwelling unit. One or more rooms which, taken together, are intended as living quarters for a single family or for a group of people living together as a family.

Easement. A grant by a property owner for the use of a portion of said owner's property by another person or other legal entity or the general public for a specified purpose or purposes.

Elevation. The vertical distance of an existing point from a stated datum plane.

Engineer. An Illinois-licensed professional engineer.

Engineer, Village. The engineer or engineering firm designated by the Village to administer the engineering activities of the Village.

Fill. Any act by which earth, sand, gravel, rock, or other material is deposited, placed, replaced, pushed, dumped, pulled, transported or moved to a new location and shall include the conditions resulting therefrom.

Final Plat. The plan or plat of subdivision intended for recording, and any other accompanying material as described herein.

Flood Fringe. That area in the flood plain either side of the floodway where flow velocities are low or zero.

Flood Plain. Those areas along rivers and streams subject to periodic flooding. The floodplain is defined by the Flood Boundary and Floodway Map prepared by the Federal Emergency and Management Agency.

Flood Route. The overland route that flood waters would naturally flow.

Flood Way. The channel of the watercourse and those portions of the adjoining floodplain which are reasonably required to carry and discharge the regional flood.

Frontage. That portion of a property abutting a right-of-way along what would be considered the front yard.

Grade. The slope of land, road, street, or other public way expressed in percent.

Gradient. Change in vertical distance per change in horizontal distance; usually expressed as a percentage (e.g., "0.40%" where rise equals 0.40 percent of run).

Gross Land Area. The entire area of a development including lots, streets and alleys, measured to the centerline of any bounding streets.

Ground Cover. Low-growing plants planted in such a manner as to form a continuous cover over the ground.

Improvements. Improvements include, but are not limited to grading, street surfacing, curbs, gutters, sidewalks, water mains, fire hydrants, sanitary sewers, storm sewers, culverts, trees, bushes, landscaping and other additions to the natural state of land

which increase its value, utility or habitability in accordance with the provisions of these Development Standards.

- A. Private Improvement - Any installed or constructed facilities for which are commonly accessible and the responsibility of maintenance and ownership will be retained by the owner or a homeowners association.
- B. Private Common Improvements Any installed or constructed facility for which the responsibility of maintenance and ownership will be retained by the homeowner or an association. This includes amenities such as, swimming pools, tennis courts, parks, etc.
- C. Public Improvement Any facility for which the Village or other units of government may ultimately assume the responsibility for maintenance and operation or which is constructed for general public use or benefit.

Inspection. Activity of the state, Village, owner, or developer, or their agents to verify the compliance of construction of publicly financed improvements with State or Village rules, regulations, ordinances, agreements, etc., and with the plans and specifications; implies no detailed control of work or workers, not to be confused with "supervision."

Inspector. An agent of the State, County, Village or developer or owner whose sole duty it is to verify, not ensure, the compliance of construction of publicly financed improvements with the State or Village rules, regulations, ordinances, agreements, etc., and with these plans and specifications; not to be confused with "supervisor."

Landscape Development. Trees, shrubs, ground cover, vines, grasses, or earthen berms installed in planting areas for the purpose of fulfilling the requirements of this Ordinance, but shall not include rock or artificial plant materials.

Lot. A parcel of land comprising one unit of the several that are created in the recorded division, subdivision, or resubdivision of land.

Lot, corner. A lot situated at the intersection of two (2) or more streets, where the interior angle of such intersection coterminous with the right-of-way lines of such streets does not exceed one hundred thirty-five (135) degrees.

Lot, through. A lot having frontage on two (2) parallel or approximately parallel streets, and which is not a corner lot. On a through lot, both street lines shall be deemed front lines.

Morton Arboretum. A privately endowed educational foundation for practical, scientific research work in horticulture and agriculture, particularly in the growth and culture of trees, shrubs, and vines by means of a great outdoor museum arranged for convenient study of every species, variety, and hybrid of the woody plants of the world able to support the climate of Illinois

Official map. The map showing the streets, highways and parks theretofore laid out, adopted and established by law and any amendments or additions thereto resulting from the Village Board action or the approval of subdivision plats.

Outlot. A lot that shall not be developed but is reserved for a specific purpose or purposes.

Ordinance. See Subdivision Ordinance.

Owner. Any individual, firm, association, partnership, corporation, trust, or any other legal entity having sufficient proprietary interest in the land sought to be subdivided or developed to commence and maintain proceedings to subdivide the same under the Subdivision Ordinance and Development Standards.

Parcel. A continuous area or acreage of land which can be described as provided for in the Plats Act of the Illinois Compiled Statutes.

Parkway. The part of the public street right-of-way not occupied by the street pavement and located between the back of the curb and the sidewalk as well as the dividing strip of a roadway.

Pavement. The portion of a street or access easement intended to bear vehicular traffic, not including curbs.

Pedestrian Walkway or Crosswalk. A right-of-way across or within a block, for use by pedestrians whether designated as a pedestrian walkway or crosswalk or however designated; and may include utilities where necessary.

Planning and Zoning Commission. The words "Planning and Zoning Commission" as used herein, refer to the Planning and Zoning Commission of the Village of Beecher, Illinois.

Planting Area. Any area designed for landscape planting having a minimum of twenty-five square feet of actual plantable area.

Planned Unit Development (PUD). A parcel of and or contiguous parcels of land meeting the minimum size requirements of the zoning ordinance and sufficient in size to create its own character controlled by a single landowner or by a group of landowners in common agreement as to control, to be developed as a single entity; the character of which is compatible with adjacent parcels, and the intent of the zoning district or districts in which it is located; the developers may be granted relief from specific land use regulations and design standards, and may be granted a variation(s) in return for assurances of an overall quality of development, including any specific features which will be of exceptional benefit to the community as a whole and which would not otherwise be required by the Zoning Ordinance. The area of a Planned Development shall remain under one ownership or unified control unless safeguards are provided that, in the opinion of the Planning and Zoning Commission, will provide for

the continuation of the original Planned Development concept and as modified from time to time by the Planning and Zoning Commission and approved by the Village Board. Also known as a ***Planned Development***. (See Section 12.13 of the Village of Beecher Zoning Ordinance)

Plans. Bound set of prints typically prepared by an engineer and/or architect or similar professional depicting the work to be done to fully construct the improvements proposed for a development.

Plat. A map or drawing generally depicting existing survey, topographical, or subdivision data.

Plat, final. A plat showing Village-approved surveyor subdivision containing the date of the Village approval action.

Plat, preliminary. A plat showing proposed surveyor subdivision data subject to Village approval.

Protective covenants. Protective covenants are contracts entered into between private parties and constitute a restriction on the use of all private property within a subdivision for the benefit of property owners; and to provide mutual protection against undesirable aspects of development which would tend to impair stability of values. Also known as Covenants, Conditions and Restrictions (CCR).

Reconstruction. Rehabilitation or replacement of a structure or structures on property which either have been damaged, altered, or removed.

Resubdivision. The rearrangement of a portion of land previously subdivided, subject to the same constraints that apply to subdivision.

Right-of-way. A general term denoting land, property, or interest therein, acquired for or used as a roadway, pedestrian way, bike path, railroad route, utility route, or other public or quasi-public use.

Road or roadway. Pavement and shoulders or curbs; not to be confused with "street."

Sewerage. A system constructed to carry away storm or waste water and all appurtenances to that system.

Shrub. A woody plant that usually remains low (minimum two feet in height) and produces shoots or trunks from the base. It is not usually tree-like or single stemmed.

Site. A lot or parcel of land or a contiguous combination thereof, where grading work is performed as a single unified operation.

Sidewalk. That portion of a right-of-way intended for pedestrian use.

Slope. A gradient expressed as a ratio (e.g., "4:1").

Street. A publicly owned right-of-way which affords primary means of access by pedestrians and vehicles to abutting properties, whether designated as a street, avenue, highway, road, boulevard, lane or however otherwise designated.

Street, arterial. Streets and highways servicing major activity centers, the highest traffic volume corridors, the longest trip desires, and a high proportion of total urban area travel on a minimum of street mileage. Service to abutting land is subordinate to the provisions of travel service to major traffic movements. This system carries the major portion of trips entering and leaving the Village of Beecher as well as the majority of through movements desiring to bypass the Village. The minimum required right-of-way width for arterial street shall be one hundred (100) feet.

Street, collector. Streets intended to collect and convey traffic from minor streets in the - neighborhood and channel it into the arterial systems. The minimum required right-of-way width for a major collector street shall be eighty (80) feet. Minor collector streets may be sixty-six (66) feet wide.

Street, intersection. The area common to two intersecting rights-of-way.

Street, frontage access. A minor street which is parallel and adjacent to arterial streets and which provides access to abutting properties and protection to local traffic from fast, through moving traffic on arterial streets.

Street, local. Streets not classified in a higher system, providing direct access to abutting land and access to the higher systems. They offer the lowest level of mobility and have limited continuity to discourage through-traffic. The minimum required right-of-way width for local streets shall be sixty-six (66) feet.

Street, private. An undedicated street, generally within a Planned Development which is privately owned or maintained or an easement of access benefiting a dominant tenant.

Street, public. Any arterial, collector, or minor street which is shown on the subdivision plat and is or is to be dedicated to public use.

Subdivider. The person or persons responsible for preparing and recoding the plats of the subdivision and for carrying out all appropriate requirements Including responsibility for public improvements installation relating thereto as outlined in the Development Standards.

Subdivision. For the purposes of these Development Standards, a subdivision is the division of land into two (2) or more lots or parcels, any of which is less than ten (10) acres, for the purpose, whether immediate or future, of transfer of ownership or building development, including all public streets, ways for public service facilities, parks, playgrounds, school grounds, or other public grounds, and all the tracts, parcels,

lots or blocks, and numbering of all such lots, blocks or parcels by progressive numbers, giving their precise dimensions. The term subdivision includes resubdivision, and, where it is appropriate to the context, relates to the process of subdivision or to the land subdivided, provided however, the following shall not be considered a subdivision but shall be in conformance with the requirements of this Subdivision Ordinance and Development Standards, where applicable.

- A. The division or subdivision of land into parcels or tracts of ten (10) acres or more in size which does not involve any new streets or easements of access;
- B. The division of lots or blocks of less than one (1) acre in any recorded subdivision which does not involve any new streets or easements of access;
- C. The sale or exchange of parcels of land between owners of adjoining and contiguous land;
- D. The conveyance of parcels of land or interest therein for use as a right-of-way for railroads or other public utility facilities and other pipe lines which does not involve any new streets or easements of access;
- E. The conveyance of land owned by a railroad or other public utility which does not involve any new streets or easements of access;
- F. The conveyance of land for highway or other public purposes or grants or conveyances relating to the dedication of land for public use or instruments relating to the vacating of land impressed with a public use;
- G. Conveyance made to correct descriptions in prior conveyances;
- H. The sale or exchange of parcels or tracts of land following the division into no more than two (2) parts of a particular parcel or tract of land existing on April 2, 1962 and not involving any new streets or easements of access; and
- I. The sale of a single lot of less than five (5) acres from a larger tract when a survey is made by a registered surveyor; provided, that this exemption shall not apply to the sale of any subsequent lots from the same larger tract of land, as determined by the dimensions and configuration of the larger tract on April 2, 1962 and provided also that this exemption does not invalidate any local requirements applicable to the subdivision of land. (See Plat Act, Illinois Compiled Statutes).

Superintendent of Public Works. The person designated by the Board of Trustees and Village Administrator to administrate the water, sewer and street construction and maintenance activities of the Village.

Tree. Any self-supporting woody plant which usually produces one main trunk and which normally grows to a minimum of fifteen feet in height.

- 1. Overstory/Canopy Tree – Deciduous tree with a normal growth over 30 feet.
- 2. Understory/Ornamental Tree – Deciduous tree with a normal growth 30 feet or less.
- 3. Coniferous Tree – Evergreen tree

Utilities. Services provided by public or quasi-public agencies including but not limited to telephone communication, electrical power, heating gas, cable television signals, steam, telegraph signals, transportation, etc.

Village. The Village of Beecher, Will County, Illinois.

Village Administrator. The person designated by the Board of Trustees as to administer overall activities of the Village and its subordinate departments, as designated by the Board of Trustees

Village Attorney. The person or firm designated by the Board of Trustees to provide legal service as specified or required under this Ordinance.

Village Board. The President and Board of Trustees of the Village of Beecher, Will County, Illinois.

Village Engineer. The person or organization designated by the Village to administer the engineering activities of the Village.

Village Planner. The person or organization designated by the Village to administer the planning activities of the Village.

Vines. Any of a group of woody or herbaceous plants which may climb by twining, by means or aerial rootlets or by means of tendrils or which may simply sprawl over the ground of other plants.

Wetland. Wetlands are land that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, under normal conditions a prevalence of vegetation adapted for life in saturated soil conditions (known as hydrophytic vegetation). A wetland is identified based upon the three attributes: 1) hydrology, 2) soils, and 3) vegetation as mandated by the current Federal wetland determination methodology.

Zoning Ordinance. The Zoning Ordinance of the Village of Beecher as last amended.

Section 7.0 - Interpretations and Exceptions

Section 7.1 – Interpretation

Any dispute arising from the interpretation of this development ordinance shall be resolved in favor of the Village interpretation. The Village Administrator shall be authorized to interpret this ordinance. The Village Administrator's interpretation may be overruled by the President and Village Board of Trustees.

Section 7.2 - Changes and/or Alternative Methods

A. The Village staff and Village consultants will review and possibly permit changes and/or alternative methods to specific engineering requirements of this ordinance, as long as such revisions are approved by the Village Administrator and are justified by a unique hardship on the part of the subdivider or development property. The understanding is that the intent of these regulations, standards, and specifications shall not be compromised. The Village Board may

overrule any changes and/or alternative methods granted or denied by the Village staff or consultants.

B. The Village Board shall review and decide proposed changes and/or alternative methods deemed by the Village Administrator, by the Planning and Zoning Commission, or by the Village Engineer to be significant.

C. The developer shall request Village review and Village Engineer review of significant changes and/or alternative methods in writing.

D. The Village Board may conduct public meetings for significant changes and/or alternative methods.

Section 7.3 - Vested Rights

Nothing contained in this development ordinance shall be interpreted to be a consent, license, or permit to use any property; to locate any building, structure, or facility; or to conduct any trade, industry, occupation, or activity.

Section 7.4 - Minimum Requirements

In their interpretation and application, the provisions of this Ordinance shall be held to be the minimum requirements for the promotion of the public health, safety, comfort, morals and general welfare as set forth in the provisions hereof. When the provisions of this Ordinance impose greater restrictions than those of any statute, other ordinance or regulation, the provisions of this Ordinance shall be controlling. Where the provisions of any statute, other ordinance or regulation impose greater restrictions than this Ordinance, the provisions of such statute, other ordinance or regulation shall be controlling.

Section 7.5 - Cumulative Impact of Limitations

The provisions of this Ordinance shall be interpreted to be cumulative of, and to impose limitations in addition to, all other codes, laws and ordinances in existence or which may be passed governing any subject matter of this Ordinance. The several provisions of this Ordinance shall also be interpreted to be cumulative of each other. To the greatest extent possible, the provisions of this Ordinance shall be construed to be consistent with, and not in conflict with, the provisions of such other codes, laws and ordinances and each other, to the end that all such provisions may be given their fullest application.

Section 7.6 - Separability

It is hereby declared to be the intention of the Village of Beecher that the several provisions of this Ordinance are separable in accordance with the following:

A. If any court of competent jurisdiction shall adjudge any provision of this Ordinance to be invalid, such judgment shall not affect any other provisions not specifically included in said judgment.

B. If any court of competent jurisdiction shall adjudge invalid the application of any provision of this Ordinance to a particular property, building, structure or other improvement such judgment shall not affect the application of said provision to any property, building, structure or other improvement not specifically included in said judgment.

Section 7.7 - Use of Words, Tense, and Gender

- A. Words used or defined in one tense or form shall include other tenses and derivative forms.
- B. Words in the singular number shall include the plural number, and words in the plural number shall include the singular number.
- C. The masculine gender shall include the feminine and neuter. The feminine gender shall include the masculine and neuter. The neuter gender shall include the masculine and feminine.
- D. The word "shall" is mandatory. The word "may" is permissive.
- E. The word "person" includes individuals, firms, partnerships, joint ventures, trusts, trustees, estates, corporations, associations and any other similar entities.
- F. In case of any difference of meaning or implication between the text of this Ordinance and any caption, illustration or table, the text shall control.

Section 7.8 – Enforcement

- A. The Village Administrator, Superintendent of Public Works and the Village Engineer shall be responsible to alert the owner or developer to any violation of this ordinance. The Superintendent of Public Works and the Village Engineer shall have the power to make such decisions, order, requirements, or determinations in conformity with this ordinance as are necessary to enforce this ordinance, subject to the approval of the Village Administrator.
- B. The Village may take any lawful action it deems necessary to ensure the enforcement of this ordinance.
- C. A decision, order, or requirement of the Superintendent of Public Works or Village Engineer may be appealed to the Village Administrator. Any further appeals shall be considered by the Village Board. The Village Board shall be the final arbiter.

Section 7.9 - Violations and Penalties

- A. Any person, firm, company, or corporation who does not proceed in compliance with the provisions of this development ordinance shall be guilty of an offense hereunder, and shall upon conviction be subject to a fine not less than \$25.00 not to exceed \$750.00 with each and every day that the violation is allowed to exist constituting a distinct and separate offense under the terms of this ordinance. In addition, the Village of Beecher may take whatever action it deems appropriate to enforce the terms of this Ordinance, including action for injunction and a cease and desist or stop work order. All attorneys' fees and costs incurred by the Village of Beecher in enforcing this Ordinance shall be paid by the violator.
- B. Should any improvement be implemented in violation of this ordinance, the Village may take appropriate legal steps to remove such improvement, to correct noncomplying aspects of

such improvement, or to prevent the use of such improvement. The violator shall be responsible for the cost of any such enforcing action of the Village.

C. The Superintendent of Public Works, Village Engineer, Village Administrator, or a sworn officer of the Police Department may halt any or all construction activity at a development site if any construction activity is or would lead to a violation under this ordinance.

Section 7.10 - Variances and Modifications of Standards

Upon finding that severe hardship, caused by conditions uniquely attributable to the land under consideration, would be imposed upon an applicant by compliance with these regulations and upon a finding that there are alternate feasible means of fulfilling the purpose and spirit of the regulations to protect the public health, safety and welfare, the Village Engineer may recommend and the Village Board may approve variances to and modifications from the regulations of the Development Standards.

Section 7.11 – Professional Fee Agreement

Any developer, person, entity, corporation, association or group filing an application with the Planning and Zoning Commission or with the Village of Beecher for any development, zoning, subdivision and the like shall at the time of execution of the petition or application execute a Professional Fee Agreement in accordance with the Village's Professional Fee Ordinance as amended from time to time.

Section 7.12 - Appendices; Incorporated by Reference

Any appendices referred to in this development ordinance are to be considered a part of this development ordinance.

ARTICLE 2 –

APPLICATION AND APPROVAL PROCEDURES

Section 1.0 - Intent

Before subdividing any tract or parcel of land within the corporate limits of the Village of Beecher or the unincorporated areas within one and one-half (1½) miles beyond the Village limits, an owner or subdivider shall submit a preliminary plat to be acted upon by the Village in accordance with the procedures and requirements of this Ordinance, in addition to any application and review fees as prescribed by the terms of this and any other Village ordinance.

Section 2.0 - Application and Review Fee

Prior to Village review of an application, subdivision pre-application or a final plat of subdivision, the developer shall have remitted any and all required fees and review expenses to the Village Clerk. A schedule of fees shall be adopted by resolution and attached hereto.

Section 3.0 - Pre Application Conference (Concept Plan)

Prior to the filing of an application for approval of the preliminary plat, it is recommended that the owner or subdivider consult with the Village Administrator, Village Engineer and Village Planner to secure information relative to the land use and zoning requirements, development regulations and standards, and other applicable regulations and standards. The purpose of the Pre-Application Conference is to afford the subdivider the opportunity to obtain the advice and assistance of Village Officials, staff and other advisors and to discuss the proposed development informally prior to the preparation of the preliminary plat in order to process approvals in a cost effective and time efficient manner.

Before the meeting, it is suggested that the subdivider prepare a Concept Plan of the proposed development on a topographic survey of the area showing the proposed layout of streets, arrangement of lots, and other features in relation to the existing conditions in accordance to the provisions of Article 5, Section 2. Upon receipt of any request for a pre-application conference or the payment of any applicable fees by the Village Clerk, the Village Administrator shall schedule a conference meeting with the developer and Village representatives as deemed necessary by the Village Administrator and Village Board.

If requested by the developer, the Concept Plan shall be forwarded to the Village Board for their review and comment; however concept plan shall be referred to the Planning and Zoning Commission.

Section 4.0 - Procedure for Preliminary Plat Approval and Project Phasing

A. The subdivider shall cause to be prepared by a Registered Professional Engineer in the State of Illinois, a preliminary plan, together with improvements plans and other supplementary material as specified in Article 5, Section 2. The plan shall include all of the property owned or controlled by the applicant which is adjacent to or considered to be contiguous to the proposed subdivision.

B. Five (5) copies of the preliminary plan and supplementary material specified shall be

submitted to the Village Clerk with a completed General Land Development Application and appropriate application and review fees.

C. The Village Clerk shall transmit copies of the preliminary plan and supplementary material for review and comment to the Village's planner, engineer, administrator and other Village and non-Village departments and officials as determined by the Village Administrator. Comments and recommendations shall be returned to the Village Administrator within thirty (30) days. The Village Administrator shall promptly consolidate all comments and recommendations and forward them to the Planning and Zoning Commission. The Planning and Zoning Commission shall promptly review all the plans and documentation required for preliminary plat approval in accordance with the procedures in this section.

D. The Planning and Zoning Commission shall approve or disapprove the application for preliminary plat approval within ninety (90) days from the date of filing the application or the filing by the applicant of the last item of required supporting documents, whichever date is later, unless such time is extended by mutual consent in writing. Approval of a preliminary plat by the Planning and Zoning Commission is strictly tentative, involving only the general acceptability of the layout and proposals as submitted.

E. The owner or subdivider shall indicate on the Preliminary Plat the phases of the project and schedule for development of each phase, if any, and whether the developer will postpone final plat approval for one or more of the phases to a later date. The Village may at its discretion, grant preliminary approval and/or final approval to one or more phases of the proposed development and request the developer to submit other phases of the development for final approval at a later date.

F. Following action by the Planning and Zoning Commission, the preliminary plat and the recommendation of the Planning and Zoning Commission shall be referred to the Village Board of Trustees. If the Planning and Zoning Commission approved the plat, it shall be so noted on the plat; if it disapproves such plat, it shall furnish the Board of Trustees and the applicant a written statement setting forth the reasons for disapproval. The Board of Trustees shall accept or reject said plat within thirty (30) days after its regular stated meeting following the action of the Planning and Zoning Commission.

G. Approval of the preliminary plat shall be effective for a maximum period of one (1) year, unless upon application of the developer, the Village Board of Trustees may grant an extension for an additional one year. The application for said extension shall not require an additional filing fee, or the submittal of additional copies of the plan of subdivision.

Section 5.0 - Procedure for Final Plat Approval

A. The owner or subdivider shall file an application for approval of the final plat with the Village Clerk within one year after approval of the preliminary plat. The final plat shall conform substantially to the preliminary plat as approved and, if desired by the subdivider, it may constitute only that portion of the approved preliminary plat which he proposes to record and develop at that time, provided however, that such portion conforms to all requirements of these regulations.

B. The final plat shall contain all engineering design specifications for the subdivision and approved by the Village Engineer, Village staff, Planning and Zoning Commission or other review body, as of the date of the submittal by the subdivider.

C. The application for a final plat approval shall include one transparency print and three copies of all supporting maps, plans, and other drawings, and all other required documents as determined by the Village Administrator. The application shall be submitted in writing and shall be accompanied by the fee required in these regulations. When the Village Administrator determines that the final plat submittal is complete it shall be submitted to the Planning and Zoning Commission for recommendation to the Village Board for approval or disapproval.

D. Upon receipt of these final plans, the Planning and Zoning Commission shall refer copies of said plan and all supporting documents to the Village's planner, engineer, attorney and any agency providing required facilities that should be consulted prior to approval. All comments and recommendations shall be returned to the Planning and Zoning Commission within sixty (60) days.

E. The Planning and Zoning Commission and Village Board shall approve or disapprove the application for final plat approval within sixty (60) days from the date of filing the application or the filing by the applicant of the last item of required supporting documents, whichever date is later, unless such time is extended by mutual consent, in writing. If the Planning and Zoning Commission approves, it shall fix upon the plat the certifying signatures of its Chairman, if it disapproves, it shall set forth its reasons in its own records and provide the applicant a copy.

F. After approval of the final plat by the Planning and Zoning Commission, it shall be submitted to the Village Board of Trustees for approval. The Village Board must take action on the final plat within sixty (60) days, unless this time period is extended by mutual consent of the applicant and the Board of Trustees, in writing.

G. Upon approval by the Village Board of Trustees, the Developer shall, within thirty (30) days thereafter, record (or verify the recording of) the final plat of subdivision with the County Recorder. The Developer shall provide verification of the recording of the final plat of subdivision to the Village Clerk within seven (7) days of recording of final plat. The developer shall furnish the Village Clerk with four (4) additional copies, one to be retained by the Village Clerk and the others to be distributed to the Village Administrator, Building Inspector and Village Engineer. One copy of the Final Plat shall be submitted to the Village in an electronic format acceptable to the Village.

ARTICLE 3 –

CONSTRUCTION, INSPECTION, AND UTILITY ACCEPTANCE PROCEDURE

Section 1.0 – General Considerations

A. The subdivider shall be represented by the subdivision design engineer to interpret the plans and specifications, make design changes and prepare record drawings.

B. The Village Engineer shall perform the duties of resident project representative and conduct periodic observations of the public improvements, witness the tests of the public improvements, review and recommend action relative to construction guarantee, advise the Village of potential problems, conduct semifinal and final inspections of the improvements. Upon completion of the public improvements and receipt of the record drawings the Village Engineer shall update the Village atlas maps. The subdivider shall reimburse the Village for all services and costs of the Engineer for the Village incurred by the Village.

Section 2.0 - Pre-Construction Meeting

After a general contractor has been engaged but before construction shall begin, the developer shall convene a pre-construction meeting. Representatives of the general contractor and the Village must attend. Representatives of other public or quasi-public agencies shall be invited by the Village Engineer and may attend at their option. The objective of the meeting is to review the scope of the project, establish review/inspection points, to coordinate schedules and identify "key" concerns.

Section 3.0 - Insurance Certificates

The developer shall, prior to commencing construction work, file with both the Village and the Village Engineer, certificates of insurance showing coverage of all insurance required, signed by the insurance companies or their authorized agents. The Certificate of insurance shall cover their employees, the Village of Beecher and the Village Engineer, and including their respective officers, directors, employees, agents and other consultants, with rated companies, in amounts as noted below. Insurance covering the Village and the Village Engineer, as "additionally insured" parties shall not be modified by riders that reduce the protection provided the Village and the Village Engineers to less than that afforded the applicant and his/her employees.

The developer shall provide and maintain Comprehensive General Liability Insurance which will protect the Village of Beecher, the Village Engineer and each of their officers, employees, agents and consultants from claims which may arise out of or result from the performance of work by anyone directly or indirectly employed by the contractor or subcontractor, or by anyone for whose acts the contractor may be liable. Comprehensive General Liability Insurance and automobile shall provide coverage in the amount of \$1,000,000 per accident for property damage and \$1,000,000 per person and \$3,000,000 umbrella liability aggregate, per accident for bodily injury, sickness of disease, or death of any person and provide Workmans

Compensation insurance at a minimum of \$100,000.

The policies of insurance so required by this paragraph to be purchased and maintained shall be furnished by insurers with A.M. Best Company rating of at least A-(Excellent), and a financial category of VIII or greater.

With respect to comprehensive general liability insurance, the insurance shall remain in effect at least until final acceptance and at all times thereafter when the developer may be correcting, removing or replacing defective work in accordance with this Ordinance. Thirty day written notice to each other additional insured is required prior to cancellation of policy.

Section 4.0 - Contractor's Insurance and Village License Required

The general contractor shall furnish evidence of insurance conforming to that described in Article 3, Section 2 and shall provide evidence of a Village of Beecher Contractor's License issued in accordance with the Village Code.

Section 5.0 - Notice of Commencement

The developer shall not commence work until the notice of commencement is provided, pursuant to this section and not until the certificates of insurance showing coverage of all insurance required, signed by the insurance companies or their authorized agents has been filed with both the Village and the Village Engineers, a letter of credit of 110% of the approved engineers opinion of probable cost and final plat approved and recorded. Each certificate shall provide that coverage and shall not be terminated or reduced without 30 days advance written notice to the Village Clerk and the Village Engineer.

The developer or the contractor shall notify the Village Engineer at least 48 hours before construction is to begin. This provision shall apply also to the resumption of construction after a break of three or more working days and to the temporary halting of construction; except for holidays. Significant changes in the construction schedule shall be reported to the Superintendent of Public Works and Village Engineer.

Section 6.0 - Periodic Progress Meetings

Additional progress meetings may be convened by the Village as deemed necessary. Periodic progress meetings shall be scheduled as part of the preconstruction meeting.

Section 7.0 - Inspection, Compliance, and Correction Notice Procedures

Village inspection of the sanitary sewer, storm drainage and water systems shall conform with the provisions of the Engineering Technical Standards. Final Inspection of all other applicable portions of the project shall be conducted by the Village pursuant to this Article, Section 11.0.

Upon notification of non-compliance, the developer shall immediately suspend work on that portion of the development identified by the Village inspector as not in conforming to the terms of this ordinance or the approved plans and specifications and correct all non-conformity within forty-eight (48) hours, or other time period as agreed upon, in writing, by the inspector and/or Village Engineer.

Section 8.0 - Term for Completion of Improvements

All subdivision improvements shall be completed within two years of final plat/plan approval by the Village Board or within an alternative timetable approved, in writing, by the Village Board, but not until a 75% build out of the subdivision lots has been achieved.

Section 9.0 - Performance Guarantee

A fully executed performance guarantee in the amount of one hundred ten percent (110%) of the total estimated construction costs as determined by the Village Engineer for all work to be done shall be accepted by the Village prior to commencement of construction. Such guarantee will be subject to the condition that the improvements will be completed within two (2) years after approval of the final plat and is subject to the approval of the Village Attorney and shall be in one of the following forms:

- (a) Irrevocable letter of credit from a FDIC insured financial institution for the benefit of the Village. Said letter of credit shall not expire unless thirty (30) day written notice, via certified mail, is provided to the Village. Renewal shall be at a minimum of one (1) year.
- (b) Cash escrow agreement or other financial assurance acceptable to the Village Attorney and the Village Board of Trustees.

Section 10.0 - Performance Guarantee Reduction

All requests for reduction in amounts of performance guarantees shall be in writing and shall be filed with the Village Engineer with a copy to the Village Administrator. Such requests shall include an itemized list of the work fully completed to date and an itemized list of the work yet to be completed. The Village Engineer shall approve any and all reductions to the amount of a performance guarantee in writing to the developer with a copy submitted to the originator of the developer's performance guarantee and the Village Administrator. Reductions shall be calculated on the value of work completed, based on the original Engineers opinion of probable cost used to establish the letter of credit. The retained amount shall not fall below the value of the remaining amount plus the 10% contingency. The contingency will remain at not less than \$25,000 or 10%, which ever is greater.

Section 11.0 - Final Inspection

The Village Engineer and Superintendent of Public Works, shall then make a final inspection of the improvements and shall compile a final "punch list" letter to the developer of all items requiring attention and/or correction upon receipt of "as built" drawings.

Section 12.0 - Maintenance of Required Utilities Prior to Village Acceptance

Prior to Village acceptance all utilities including, but not limited to sanitary and storm sewers, water mains and appurtenances, streets and street lights, shall be maintained in good repair and working order so that they function safely and effectively without threat to health and safety.

Section 13.0 - Transmittal of Notice of Acceptance

Once all items of the final punch list letter have been attended to or corrected to the satisfaction of the Village Engineer and other Village officials, the Village Engineer shall submit an

approval letter to the Village Board which may then accept the project improvements by motion. Upon action by the Board of Trustees, the Village Administrator shall transmit notice of acceptance to the developer.

Section 14.0 - Maintenance Warranty and Warranty Period

The developer shall maintain public improvements for a one (1) year warranty period which shall begin upon completion of all improvements and all public improvements are accepted by the Village. Upon acceptance and the start of the warranty period the Village shall release of all but the remaining ten (10%) percent of the performance guarantee which shall be retained until the end of the warranty period. At the discretion of the Village Administrator a maintenance bond may be substituted for the remaining ten percent (10%) performance guarantee.

With respect to operations insurance, such insurance shall remain in effect for the warranty period. The developer shall furnish the Village, Village Engineer and any other additional insured that such insurance is in effect for the duration of the warrantee period.

Section 15.0 - Provision for Extension of Warranty Period

The Village Board of Trustees may require that an extended warranty be provided because of factors arising during construction or because of ordinance exceptions granted. In granting an extension, the developer shall continue, in full force, the performance guarantee for any uncompleted improvements and appropriate guarantees necessary for fulfillment of the warranty obligations and determined by the Village Engineer and approved, in writing, by the Village Board of Trustees.

Section 16.0 - Repair and/or Replacement of Utilities Upon Resubdivision

Prior to approval for resubdivision, the developer shall arrange with the Superintendent of Public Works and/or Village Engineer for an inspection of all existing utilities including, but not limited to sanitary and storm sewers, water mains and all related appurtenances, and street lights and shall include any required fees for such inspections.

These utilities shall meet or exceed the standards as stated in these Development Standards for the existing and/or proposed extension of utility needs on site as well as off site.

Any repairs shall be made by and at the expense of the owner of the property. The Village may, in case of an emergency, repair any defect that is not addressed by the developer within six (6) hours of notification. If this is done the cost of such repair work shall be repaid to the Village by the developer or owner of the property. Any performance guarantee imposed on the project shall be strictly interpreted to include costs for maintenance of any improvements until expiration of the warrantee period.

Section 17.0 – Record Drawings

A. During construction an accurate record of all construction work performed shall be kept by the Contractors. Upon completion and prior to acceptance by the Village of the completed public improvements, the Developer shall prepare and submit to the Village “Record Drawings” showing complete “as constructed” information for all improvements. The ends of all water, sanitary sewer and sump pump service lines shall be accurately located so they can

be located in the future. The final elevation and storage volume for storm water storage facilities shall be shown.

B. The record drawings shall be prepared and sealed by a Registered Professional Engineer and shall contain thereon a certification that all improvements have been constructed in accordance with the approved Final Engineering plans or with approved changes thereon.

C. The record drawings furnished to the Village by the Developer shall consist of two (2) sets of prints or copies and in an electronic format approved by the Village. Record drawings shall be received prior to the issuance of any building permits or release of the construction guarantees.

D. The Developer shall reimburse the Village for the cost to survey structures using GPS equipment for incorporation into the Will County GIS base map.

ARTICLE 4

BUILDING AND OCCUPANCY PERMITS

Section 1.0 - Building Permits Not To Be Issued Prior To Final Approved Plat

No building permit shall be issued for the construction of any building, structure or improvement on any parcel if the parcel is not a properly created lot of record, nor until a final subdivision plan and/or development plan, made necessary by the Development Standards of the Ordinance, shall have been approved and recorded in the office of the Recorder of Deeds of the County.

No construction above the foundation can occur until a suitable access road is in place able to carry fire department vehicles and emergency vehicles and the water system serving the subdivision has obtained an operating permit from the I.E.P.A. and the Village.

Section 2.0 - Issuance of Building Permits by the Village

No building permit shall be issued for the construction of any building, structure, or improvement to land or any lot within a subdivision, as defined herein, which has been approved for platting until all requirements of this subdivision ordinance and development standards have been fully complied, or stipulated by agreement between the Village Board of Trustees and the developer.

Section 3.0 - Issuance of Occupancy Permits by the Village

No structure or building shall be occupied or used unless and until an occupancy permit shall be issued therefor by the Building Inspector. No occupancy permit shall be issued for any structure within a subdivision approved for platting or re-platting until all utility facilities, including but not limited to water, sewer, gas, electric and telephone (if required), have been installed and made ready to service the structure, until said structure or building is in compliance with all applicable laws and ordinances, and until all public improvements intended to serve said structure or building are installed as provided in this ordinance or stipulated by agreement between the Village Board of Trustees and the developer.

Section 4.0 - Specifications for Issuance of a Certificate of Occupancy

The Building Inspector shall not issue a Certificate of Occupancy for any building or structure until the following specifications have been met:

1. No final certificate of occupancy shall be granted for the use of any building or structure on a lot subject to the Development Standards until:
 - a. Required sanitary sewer and water service has been installed and made ready for servicing the parcel, by having obtained proper I.E.P.A. permits to operate and have passed mandrel, air pressure, chlorination and all required testing by the Village Engineer, and
 - b. Sidewalks, trees, and sod or seeding are completed or an escrow provided to the Village by municipal ordinance for the parcel by the developer or cash escrow equal

to 110% of required improvements is deposited with the Village; and, if a subdivision;

- c. Lots in a subdivision rough graded (within four (4) inches of approved grade); and
- d. Stormwater runoff provided for; and
- e. Roadways and/or fire lanes providing access to the lot and subdivision have been proof rolled and paved with the binder course of asphalt, as set out herein, and
- f. Gas, electric and telephone service (if required) by Village, provided to the structure.

2. No certificate of occupancy shall be issued for any structure or building unless the Building Inspector and/or Village Engineer certify that the public and private improvements required by the Development Standards for the parcel have been installed in conformity with approved plans and specifications. Upon approval by the President and Board of Trustees of the Village, a cash escrow payment, equal to one hundred ten (110%) percent of the amount of all incomplete public and private improvements shall be filed with the Village to ensure that improvements will be completed within thirty (30) days of the onset of the next building season. The filing of this cash escrow and written guarantee shall allow for the issuance of a temporary certificate of occupancy, and in no other instance unless otherwise approved by the Village Board.

- a. The Developer shall submit a proposed grading plan for each lot for review by the Village Engineer. Proposed lot grading plans shall comply with the approved subdivision plans and signed by a Professional Engineer or Professional Land Surveyor licensed in the State of Illinois.
- b. The Developer shall reimburse the Village for the cost of the lot grading review.
- c. Final lot grades shall be submitted to the Village and certified by a Professional Engineer and/or Professional Land Surveyor licensed in the State of Illinois for conformance with the approved lot grading plan.

ARTICLE 5 –

PROJECT DOCUMENTS

Section 1.0 - Intent

It is the intent of the following standards to provide for the thorough, relatively uniform presentation of pertinent development information by developers or others wishing to alter the present condition of real property. It is the intent of these standards to provide clear documentary evidence of what currently exists, what is proposed, what is constructed, and what all parties agree to. It is the intent of these standards to provide for the control of physical aspects of documentary material so that such material may be conveniently archived by the Village.

Section 2.0 - Applicability

These standards and specifications shall apply to the documentation for all subdivision and development activities within the Village and within the one and one-half (1½) mile jurisdictional area surrounding the Village with the exception of architectural drawings having to do specifically with proposed buildings or like structures.

Section 3.0 - Document Specifications and Standards

Documents shall conform to the following standards:

- A. Documents that are primarily written, forms, correspondence, etc., shall be 8½ by 11 inches except certain legal documents may be 8½ by 14 inches.
- B. Plats and plans shall be standard D-size sheets (approximately 24 by 36 inches), unless otherwise approved by the Village Engineer, Village Planner and/or Village Administrator.
- C. Documents, plats, and plans that consist of more than one sheet shall be bound at the top or left side. Bound sheets shall have a margin of 1 ½ to two inches on the bound side.
- D. Certain incidental documentation such as letters of transmittal, receipts, etc., may vary from the above standards and specifications. Some of the sketches or other early drawing items required in the conceptual stage of a project may also vary from the above standards and specifications except that no conceptual stage documentation shall be smaller than 8½ by 11 inches.
- E. Documents that are 11 by 17 inches shall be folded to 8 ½ by 11 inches.
- F. Information conveyed by radio or telephone or otherwise verbally shall not be considered binding unless documentation is also provided. The intent of this provision is to encourage the conveyance of important information by documentation so each transaction is as clear and unambiguous as possible.
- G. Documents conveyed through the use of facsimile transceivers or electronic mail are to be considered as less binding than conveyance of original signature documents by mail or by hand delivery. Legal documents involving the Village shall all be original signature documents.

Section 4.0 - Pre Application Conference and Documents

Section 4.1 - Purpose and Objective

The purpose of conceptual documentation is to establish where the proposed project is located, whether the applicant owns or is allowed to develop the property in question, the type and scope of the project, and any potential problems with construction in the area of the project. This information will determine whether or not the proposed project is feasible, what level of planning will be necessary, the logistics related to planning and constructing the proposed project, possible problems to be addressed, and the level of Village involvement that will be required. Most of this information will be provided by the applicant submitting a completed General Land Development Application as furnished by the Village.

Section 4.2 - Required Documents

Five (5) copies of the following shall be submitted to the Village Administrator at least five (5) working days preceding the day of concept review meeting:

1. Evidence of Ownership

The applicant shall provide evidence of ownership or evidence of approval of the owner to develop the proposed project site. If the ownership is in a trust, the applicant shall provide a certified copy of the trust agreement which shall include, but not be limited to, the name of the trustee(s), the name of the trust beneficiary(ies), and the trust number. The applicant must also state the interest the applicant has in the property, i.e. Attorney/client privilege, an option to purchase, direct ownership, etc. This information shall remain confidential.

2. Location Map

The applicant shall provide a map showing the location of the proposed project site as well as nearby transportation routes and other significant features. The location map shall include a north arrow, title, scale, and date.

3. Topographical Plat

The applicant shall provide a topographical plat of the proposed project site showing all existing zoning, land use, land characteristics, woods, mature trees, wetlands, floodplains, other water resources, pertinent nearby municipal improvements, public utilities, easements, buildings, etc., in and within 250 feet of the site. The topographical plat shall include a north arrow, title, scale and date. The scale (1 inch = 20 feet, 1 inch = 40 feet, 1 inch = 50 feet, 1 inch = 100 feet, or 1 inch = 200 feet) of the plat shall be appropriate to the size of the site. Contours shall be at no more than one-foot intervals and shall be based on benchmark elevations using the USGS datum. Portions of this provision may be waived at the option of the Village Engineer, Village Planner and/or Village Administrator based on the scope of the proposed project.

The Village may require additional topographical data of said property and adjacent property, particularly if there appear to be problems with drainage.

4. Site Plan

The applicant shall provide a series of drawings or sketches made on copies of the topographical plat showing the proposed layout of streets, lots, and site improvements in relation to the existing features, showing the following:

- a. Boundary lines of the site with dimensions.
- b. Proposed lots, building setback lines, building locations and separations, and pedestrian considerations, with the approximate size of each lot shown in square feet and in acres.
- c. Proposed street layout, off-street parking, loading spaces, fire lanes, and exterior street improvements such as turning lanes.
- d. Proposed open spaces, school sites, park sites, and private recreation facilities.
- e. Proposed drainage and storm water detention/retention locations, and areas of best management practices for stormwater infiltration and management such as bioswales, rain gardens, and naturalized detention basins.
- f. Alternate designs or layouts with only enough detail to make the alternatives understandable.

5. Land Use Schedule

The following information shall be provided on the plan maps or other documents submitted:

- a. Total acreage of site.
- b. Proposed land use by acreage and percent of total.
- c. Proposed gross and net residential density for residential portions of the proposed project.
- d. Minimum lot size and median lot size for the residential sections of the proposed project.
- e. Proposed floor area ratio and land coverage in percent for nonresidential portions of the proposed project.
- f. Legal description of the property and P.I.N. (property identification number)

Section 5.0 - Preliminary Plat, Plan and Documents

Section 5.1 - Purpose and Objective

The purpose of preliminary stage documentation is to establish planning and design solutions to the problems posed by the project as conceived. In this stage, other agencies will be

provided the opportunity to comment on the project from their own perspective. The Village will finalize its requirements related to the project and will review the proposed planning and design solutions.

Section 5.2 - Required Documents

The applicant shall deliver to the Village Clerk five (5) copies of each of the following documents as applicable. The Village Engineer, Village Planner and/or the Village Administrator shall decide which documents are applicable.

1. Plat of Survey

The plat of survey shall be prepared and certified by a surveyor licensed to practice in the State of Illinois. The plat of survey shall include the entire area to be subdivided or re-subdivided. The plat of survey shall include or shall be accompanied by a precise legal description of the property in its entirety.

2. Traffic Study

A traffic study shall be prepared by a qualified independent professional or professional firm, for all proposed commercial and industrial development and any residential development when requested by the Village Engineer, Village Planner and/or Village Administrator, or adjacent jurisdictional agency.

3. Preliminary Plat

The preliminary plat of subdivision shall conform to the following requirements, however, minor variations in layout of the drawings may be allowed based on the nature of the drafting involved:

- a. The preliminary plat shall be drawn on film trimmed to 24 by 36 inches or as otherwise approved by the Village based on the requirements of the County Recorder.
- b. The margin on the side of the sheet to be bound, if any, shall be 1 1/2 to two inches. The margins on the other sides shall be at least one-half inch.
- c. If more than one sheet is required, each sheet shall show the sheet number relative to the total number of sheets (SHEET 1 OF 3, SHEET 2 OF 3, etc.).
- d. The current revision date shall be shown on each sheet near the sheet number.
- e. If more than one sheet is required, the sheets shall be firmly fastened together.
- f. Each sheet shall have the title of the plat, boldly lettered.
- g. The lot, site, or phase number shall be placed below the title on each sheet. If the project has a secondary name, it shall be placed parenthetically after the lot, site, or phase number. No more than one such title modifier is permitted per plat.
- h. The location of the project shall be described by legal description, quarter-quarter section, township, range, municipality, county, and state. Only the section(s)

actually shown on the plat shall be cited.

- i. The word "PRELIMINARY" shall be boldly lettered on each sheet. The word "FINAL" shall appear nowhere on the plat relative to the title of the plat.
- j. A location map showing the view depicted on the sheet in relation to adjacent sites and showing roads, streets, railroads, drainage ditches, watercourses, etc., within 250 feet of the view depicted on the sheet shall be placed near the word description of the location. The location map shall be oriented to match the main drawing.
- k. A properly oriented north arrow to serve the entire sheet shall be placed near the above maps.
- l. The scale of the main drawing shall be placed near the north arrow. The scale shall be selected from the following: 1:100, 1:50, 1:40, 1:30, 1:20, or 1:10 (inches: feet). The scale shall also be shown graphically.
- m. The full name, address, and telephone number of the owner and the person or firm preparing the plat shall appear on the plat.
- n. If a section line crosses the area shown on a particular sheet, it shall be properly shown on that particular sheet.
- o. Easements shall be shown on the main drawing as dashed lines. Each easement shall be clearly dimensioned and labeled as to purpose.
- p. Parcels that are not formal lots shall be clearly labeled as to their intended use.
- q. The names of public or private streets shall be shown wherever the streets appear on the plat. The Village reserves the right to review street names after advising the applicant of the change and the reason for the change.
- r. The names and document numbers of adjacent subdivisions shall be shown on the main drawing.
- s. The exterior boundaries of the subdivision shall be shown as the heaviest lines on the main drawing. At least two widely separated exterior boundary corners shall be tied to government subdivision lines and/or corners.
- t. Street center lines shall be shown.
- u. Street right-of-way limits shall be shown as relatively heavy lines.
- v. The exact length and bearing of each straight line shall be shown near each straight line. The exact length and radius of each curved line shall be shown near each curved line.

- w. Blocks shall be consecutively numbered or lettered in alphabetical order. Blocks that are additions to those in an existing subdivision shall be so labeled beginning after the last block in the existing subdivision.
- x. All lots in each block shall be consecutively numbered.
- y. All surveyed meander lines shall be shown and fully described by length and bearing. The points where meander lines intersect other surveyed lines shall be shown and described with appropriate dimensions.
- z. Curve tables shall be provided to show for each curve: number, radius, central angle, tangent length, main chord length, and main chord bearing.
- aa. Floodplain limits and wetland areas shall be shown on the preliminary plat
- ab. Ties between boundary corners and significant existing topographical features such as pavements, ditch center lines, etc., shall be shown.
- ac. If a boundary street or a boundary line appears on a sheet, details such as intersecting streets, lot corners, blocks, etc., of the property on the other side of the street or line shall be shown.

4. Preliminary Plans

At the time of submission of a preliminary plat, plans of public improvements shall also be submitted. These preliminary plans shall include at least the following items:

- a. Preliminary layout of grading and drainage showing the approximate method of lot drainage and street drainage throughout the subdivision. Preliminary layout of storm sewers, showing locations, sizes, gradients, and depths of all storm sewers will be included if storm sewers are used in design. Preliminary detention and drainage calculations, including inverts, must be included. Existing grading on adjacent properties in relation to the proposed grading is also required. Plans must also include all stormwater discharge points, regulatory floodplains, wetland boundaries, and buffer areas, upon subject property and adjacent properties.
- b. Preliminary water quality and quantity control plan that identifies the type and location of measures used to reduce the flow of pollutants and volume of water to water resources. To show pollutant management, include areas of best management practices for stormwater infiltration and management such as bioswales, rain gardens, and naturalized detention basins, water resource buffers, floodplain and floodway, any and all water resources and features, topography and general drainage direction. To show volume reduction, include drainage and detention features that infiltrate stormwater runoff on site.
- c. Preliminary layout of sanitary sewerage facilities showing approximate sizes and lengths of sanitary sewers, location of treatment facilities, depths and gradients of sewers, and other pertinent information concerning the sanitary sewer system.

- d. Preliminary layout of water mains, showing sizes and locations of mains, valves, fire hydrants and other appurtenances.
- e. Preliminary layout of streets, showing cross section and grades and gradients of all streets proposed within the subdivision.
- f. A street lighting plan in conformance with Section 6 of this Ordinance.
- g. A statement concerning the materials to be used in the construction of the above.
- h. Preferably, all preliminary plans shall be submitted on twenty four inch by thirty six inch (24" x 36") size drawings and shall bear the name and address of the Illinois registered professional engineer under whose direction they were prepared.

5. Preliminary Landscaping Plans

The preliminary landscaping plans shall include:

- a. Location, size, type, common and botanical names of all trees and other vegetation; which will be planted on the site as part of the development.
- b. A landscaping plan meeting the specifications of Article 6, Section 14.0 of this ordinance.
- c. All berming, screening, and fencing.
- d. Entrance treatment; including signage, lighting, plantings, etc.

6. Preliminary Improvements Cost Estimate

The applicant shall provide a detailed preliminary estimate of the total cost of construction excluding design fees and any other fees which will be eventually be determined on the estimated total cost of construction.

7. Reports

The applicant shall provide the following documents as determined to be applicable by the Village Planner, Village Engineer and/or Village Administrator:

- a. Will-South Cook County Soil and Water Conservation District natural resource opinion. The report shall be an integral part of the planning process.
- b. Will County Highway Department report concerning permits for access to County roads.
- c. Illinois Department of Transportation report concerning permits for proposed work in federal or state rights-of-way.
- d. Illinois Department of Natural Resources, Division of Water Resources for any floodplain interpretation.

- e. School district reports/agreements concerning donation of land or cash contribution for increased load on the school system, including contributions for updated demographic studies.
- f. Report concerning donation of land or cash contribution for increased impact on the park and recreation system facilities.
- g. Soil boring report on proposed road surfaces and interpretation including location map by professional soil testing firm. One boring is required for each four hundred (400) foot interval of road surface.
- h. Fire district report concerning fire protection and access points for the proposed development and requirement for cash-in-lieu of land.
- i. Library District contributions
- j. Wildlife and Endangered Species Consultation Report by Illinois Department of Natural Resources if applicable.
- k. Report concerning presence and status of wetlands on site prepared by wetlands specialist or U.S. Army Corps of Engineers, if applicable.
- l. Archaeology report by suitable professional or professional firm, if applicable.
- m. Any other report requested by a board, commission, or staff as authorized by the Building Commissioner and/or Village Administrator.
- n. Project location in relation to F.P.A. If the project is not located within the F.P.A., a cash escrow shall be provided equal to the cost for the F.P.A. expansion, to be completed by the Village Engineer.

8. Other Documents

The following narrative documentation shall be submitted by the developer:

- a. Detailed fact sheet showing breakdown of land use type by acres, type and number of dwelling units with bedroom mix breakdown, number of buildings, gross and net residential density, building coverage (nonresidential), floor area ratio (nonresidential), percent of green area, percent of paved area, and estimated total population (residential) or estimated number of employees (nonresidential).
- b. Schedule showing number of required parking spaces, including guest parking, actual number of parking spaces provided for, and parking space ratios compared to zoning ordinance requirements.
- c. Breakdown of open space by acreage including environmentally sensitive areas and including a list of recreational facilities and who will own and/or be responsible for their maintenance.

- d. Preliminary long-term maintenance and management plan for the preservation and management of onsite wetlands, conservation areas, wildlife habitats, all common open space areas, landscape, stormwater areas (including best management practice areas such as detention basins, swales, and infiltration areas), etc.
- e. Proposed Home Owners Association (HOA), organization and operational documents, if required for ownership or operation of common owned land and/or facilities or to fund levels of service requested of the Village beyond current service levels established throughout the Village. Each HOA shall be backed by a default Special Service Area should the HOA fail to fulfill its responsibilities for maintenance and upkeep as determined by the Village.
- f. A tax impact statement, indicating property and per capita sales taxes along with income tax allotments anticipated to be paid as a result of the project.

Section 6.0 - Final Plat, Plans and Documents

Section 6.1 - Purpose and Objective

The purpose of final planning stage documentation is to fix agreed-upon planning and design solutions, to record the necessary documents, and to ensure that the Village, its employees, staff, and consultants are protected in the event the applicant fails to perform the work of the project properly.

Section 6.2 - Required Documents

The applicant shall deliver the original documents to be recorded and five (5) copies of the following documents to the Village Clerk, according to the following specifications:

1. Final Plans

After the approval of the preliminary plat by the President and Village Board of Trustees, and prior to the filing of an application for the approval of the final plat, the subdivider shall submit to the Village Clerk three (3) copies of well-detailed engineering plans, based on careful fieldwork and detailed surveys, prepared by and bearing the seal of a Professional Engineer licensed in Illinois, for the construction of the subdivision and the construction of the following and all other subdivision improvements:

- a. Streets
- b. Curb and gutter
- c. Sanitary sewerage system
- d. Storm drainage, including sewers and detention/retention ponds
- e. Water supply and distribution system
- f. Street lights
- g. Sidewalks
- h. Street signs, guard rails, landscaping, etc.
- i. Public utility locations
- j. Landscaping
- k. Such other improvements that may be required by this ordinance, annexation

agreements or by the Village Board as a condition of the tentative approval of the preliminary plat.

The subdivider shall file with all applicable utilities which have been granted an easement a copy of the final plat and any "as built" drawings upon completion of the construction of any and all improvements.

2. Final Plat of Subdivision

The final plat of subdivision, is the legal document for the subdivision, to be recorded by the developer with the Will County Recorder, containing all information shown on the preliminary plat, and the following items:

- a. A properly worded surveyor's certificate shall be placed either to the side of the main drawing or above the owner's certificate. The surveyor shall certify the relationship of the property to any floodplain and that the surveyor has set and described all subdivision monuments as required by the Plat Act.
- b. The owner's certificate shall include a notary public's certificate if the owner is a corporation. The owner's certificate shall include an attestation if the owner is not a corporation.
- c. Certificates shall be provided for the Village Engineer, the Planning and Zoning Commission, the Village Board of Trustees, the Village Clerk and the County Collector, in that order. These latter certificates shall be placed together.
- d. Certificates, including restrictive covenants, applicable for state and county agencies including state and county departments shall be listed on the plat and subject to approval by the Village.
- e. Grants of easements shall be provided for electrical, telephone, cable television, gas, and water, sewer, and drainage provisions – including all rights of ingress and egress to all detention facilities.
- f. Boundary monuments and other important monumented points shall be labeled as to material. In subdivisions of more than ten lots, the lot corner monuments do not have to be shown but their material may be noted elsewhere on the plat.
- g. The word "FINAL" shall be boldly lettered on each sheet.
- h. All certificates except for those of Village personnel shall be fully executed.
- i. The final plat of subdivision shall be signed and sealed by a surveyor or a surveying firm licensed to practice in the State of Illinois.

3. Specifications and Special Provisions

The following narrative documentation shall be submitted by the developer:

- a. The specifications and special provisions shall address every improvement planned in the development in a manner satisfactory to the Village Engineer.
- b. The specifications and special provisions shall include a detailed engineer's estimate of the cost of construction.

4. Other Documents

The applicant shall provide the following additional documents, if applicable, at this time.

- a. Will County Highway Department permit(s).
- b. IDOT permit(s) and bond(s). (Division of Highways)
- c. IDNR permit(s). (Division of Water Resources)
- d. IEPA permit(s).
- e. Other permits as required by other agencies.
- f. A properly executed sworn statement and development agreement listing the improvements the applicant intends to construct at his/her own cost, the time of completion of the project, and the method of payment for the improvements, to include:
 - (i) A signature and attest line for the Village Board approval of this document.
 - (ii) A provision guaranteeing that the improvements will be constructed according the Village-approved plans and specifications and to the Village ordinances.
 - (iii) A provision affirming that all bonds, guarantees, deposits, etc., required under this development ordinance have been furnished to the Village.
 - (iv) A provision to the effect that the applicant shall be responsible to pay all costs, including but not limited to, attorney's fees and engineer's fees incurred in the event the Village must enforce the provisions of this development ordinance during the life of the project.
 - (v) A clause relieving the Village, its officers, employees, and consultants of any liability arising from the design of construction of the project - the Village Attorney must fully approve the wording of this clause.
 - (vi) Verification of payment of final plat fees including the Beecher Fire Protection District, Beecher Library District, and the Beecher Post Office.
- g. A long-term management and maintenance plan ensuring that all common open space, landscape, and stormwater areas (including best management practice areas such as detention basins, swales, and infiltration areas) that are the responsibility of a

homeowner's association are kept in a healthy growing condition and/or good working order in accordance with commonly accepted performance standards.

Section 7.0 - Construction Plans and Documents

Section 7.1 - Purpose and Objective

The purpose of construction stage documentation is to monitor and record construction progress and to address problems that arise during the course of construction.

Section 7.2 - Contract Documents

A certified copy of all signed contract documents related to the improvements to be transferred to the Village including itemized contract amounts shall be furnished to the Village Administrator and to the Village Engineer. Likewise, if bids are taken to choose a contractor, an itemized bid tabulation sheet shall be furnished.

Section 7.3 - Revised Plans

Revised plans reflect changes to the final plans that arise because of difficulties encountered during construction or because errors are discovered, and shall be prepared in accordance with the following specifications:

- a. The revision date shall be clearly shown near the date of the final plans and clearly stamped as the final "AS BUILT" drawings on the front page of the prints.
- b. The revised plans shall be accompanied by support documentation consisting of the applicant's request for a change in the final plans, the reasons for the requested change, the change in estimated cost of construction, and the written comments of the Village Engineer or other Village personnel or officials who may have become involved.

Section 7.4 - Record Drawings

The developer shall provide a reproducible set of plans, including an electronic copy in a format acceptable to the Village, revised to accurately show the planned improvements as they were actually constructed, to include overflow storm runoff routes and elevations, including contours, as remeasured.

ARTICLE 6

REQUIRED IMPROVEMENTS AND DESIGN STANDARDS – CONVENTIONAL DEVELOPMENT

Section 1.0 General Provision:.

A. Conformance to Applicable Rules and Regulations:

The design of subdivisions and improvements shall conform to the Official Village Plan, the Official Village Map, Village Ordinances (including but not limited to zoning, flood plain, subdivision control, storm water, sewer, water, public ways and properties, and annexation ordinances), Fire Protection District Ordinances, planning and development policies, and all applicable rules, regulations, specifications and standards of the Village of Beecher, Will County and the State of Illinois and other duly constituted agencies. No deviation from the approved plans and specifications will be made without prior approval of the Village of Beecher.

B. Character of Land:

Land which the Planning and Zoning Commission finds to be unsuitable for subdivision or development due to flooding, improper drainage, steep slopes, rock formations, adverse earth formations or topography, utility easements, or other features which will reasonably be harmful to the safety, health, and general welfare of the present or future inhabitants of the subdivision and/or its surrounding areas, shall not be subdivided or developed unless adequate methods are formulated by the Developer and approved by the Planning and Zoning Commission, upon recommendation of the Village Engineer, or upon recommendation of other governmental authority to solve the problems created by the unsuitable land conditions. Such land shall be set aside for uses as shall not involve such a danger.

Development should be planned to minimize clearing, grading, and modification of the existing land form, topography, and drainage of the site. Proposed development should be laid out to be compatible with existing topography and features and conditions.

C. Oversized Design:

Where required in the overall planning as evidenced by the Village's Utility Master Plan for water, sewer or streets, or the Land use map, the subdivision improvements shall be designed and constructed in accordance with the community's anticipated needs. An agreement between the subdivider and the Village may be made allowing the subdivider to recapture added construction costs resulting from an increased design capacity beyond that necessary for the immediate subdivision. This recapture provision shall apply to all utilities but not be limited to: collector sewers, lift stations, disposal facilities, wells, pumping facilities, water mains, storage tanks, culverts, storm sewers, and streets. Such recapture provisions shall be authorized by the Board of Trustees by ordinance and shall not exceed twenty (20) years.

D. Preservation and Restoration of Natural Features:

GENERAL: Due regard shall be given to the preservation of natural features within a proposed development, such as large trees, water courses, historical and similar community assets,

which, if preserved, will add attractiveness and value to the property. The Developer shall take every precaution required to preserve said natural features in the planning and construction of said development.

Any area designated as naturalized open space shall be planted and maintained with appropriate native vegetation, if possible, where existing natural vegetation does not exist or cannot be preserved.

1. **PRESERVATION OF EXISTING TREES:** When parcels proposed for development include trees measuring six (6) inches in caliper or larger, a tree preservation and protection plan shall be prepared and submitted to the Village for review and approval, and shall include the following:
 - a. Show the location, size, condition and species of all existing trees within the construction zone and within thirty (30) feet of proposed construction, which are six (6) inches in caliper or larger.
 - b. Identify all existing trees, six (6) inches in caliper or larger, proposed to be removed.
 - c. Means and methods to be used to protect and preserve trees designated to be saved.
2. **EVALUATION OF EXISTING TREES:**
 - a. The ability to save existing trees on the site shall be evaluated by the Developer and the Village to determine which trees shall be saved, and which trees may be removed for one or more of the following reasons:
 1. To provide essential grade changes.
 2. To provide for surface water drainage and utility installations.
 3. To locate proposed structure(s) without causing unreasonable economic hardship.
 4. To observe good forestry practices, i.e., the number of healthy trees that the parcel will support.
 5. That pose a safety hazard to pedestrian or vehicular traffic, or threaten to cause disruption of public services.
 6. That pose a safety hazard to buildings, both existing and proposed.
 7. That are diseased or weakened by age, storm, fire or other injury.
 8. That are willows, silver maples, or other fast-growing softwood trees determined by the Village to be short lived or of poor quality.
 - b. All existing trees determined to be saved shall be identified on the preservation and protection plan and shall be preserved and protected during the development.
3. **TREE REPLACEMENT:** In the event that a tree identified for preservation is destroyed or damaged during construction, such tree shall be replaced with a tree that is at least the same size caliper as the tree removed, or be replaced with smaller trees,

each with a minimum caliper of two and one-half (2½) inches, as measured six (6) inches above grade, which add up to the caliper of the original tree.

4. OTHER TREE PRESERVATION REQUIREMENTS:

- a. Approval of a development plan shall be withheld until all of the information required by this section of the Ordinance has been submitted, and the evaluation of existing trees on the subject property has been completed by the Village.
- b. The Village shall, at its discretion, have the right to retain a professional tree consultant/ forester to review tree preservation plans and to submit a written report to the Village. All expenses incurred by the Village for the use of the tree consultant shall be reimbursed by the Developer.
- c. The Village shall have the right to inspect the subject property at any time during the construction process, in order to verify that the Developer and contractor have protected trees in accordance with the approved tree preservation plan.
- d. Any person, private or public company failing to adhere to the provisions of the approved tree preservation plan shall be subject to a fine of seven hundred fifty dollars (\$750) per tree which has been cut down, and/or termination of all construction activity, until such time as all provisions of this ordinance have met to the satisfaction of the Village.

D. Parking:

Any off-street parking improvements required to be constructed as part of the proposed subdivision improvements shall be in accordance with the requirements of the Zoning Ordinance of the Village of Beecher. Depth and width of all lots shall be adequate to provide off-street parking and loading spaces as required by the Zoning Ordinance.

E. Boundary, Lot, and Right-of-Way line monumentation:

Permanent monuments shall be placed at the corners or changes in bearing of the exterior boundary; at the points of curvature or points of tangency of streets; at a minimum of two (2) points, preferably along the rear lot line, of all blocks; and at such other points as shall be required to enable ready establishment of lines within the subdivision; and as provided by 765 ILCS 205.

Permanent monuments shall be of concrete having a six (6) inch minimum diameter with one (1) number 4 vertical bar in its center, and be at least thirty-six (36) inches in length. Monuments shall be set flush with adjacent ground.

Iron pipe markers not less than ¾ inch in diameter and 24 inches in length shall be set at all lot corners and all other required points not marked by permanent monuments. The iron pipes shall be set flush with the finished ground elevation.

After construction of all improvements and before final acceptance by the Village, the subdivider shall replace or verify the existence of all monuments and markers.

Section 2.0 Required Improvements:

The following improvements shall be provided as part of the development of a proposed subdivision:

A. Street pavement structure improvements shall be bituminous concrete flexible type pavement or a Portland cement concrete rigid type pavement consisting of the following:

1. Concrete curb and gutters
2. Stable and compacted subgrade.
3. Base and sub-base course, as required.
4. Bituminous concrete binder and surface courses for flexible type pavement.
5. Portland cement concrete surfaces courses for rigid type pavements.
6. Portland cement concrete sidewalks;
7. Street and parking lot lighting; center island or median lighting;
8. Landscaping and trees;
9. Street signs and pavement markings;
10. Any traffic safety installation such as guard railing, etc;

B. Other required improvements:

1. Public utilities for telephone, electric, cable, television, and natural gas;
2. Site and lot grading;
3. Storm Sewer, Swale, or Channel Systems and Sump Pump Drainage System;
4. Storm Water Storage and Management;
5. Erosion Control;
6. Wastewater Facilities;
7. Water Facilities;
8. Water and Sanitary Sewer Service Lines;
9. Flood Protection;
10. Warning Sirens.

Section 3.0 Minimum Standards and Specifications:

All construction of improvements covered by this chapter shall be in accordance with, and materials used shall be in compliance with, the methods and materials required in the appropriate sections of the latest editions, amendments or revisions of the following:

All applicable Village Ordinances, Standards, and Specifications as adopted.

A. **“Standard Specifications for Road and Bridge Construction”, Illinois Department of Transportation (IDOT);**

B. **“Standard Specifications for Water and Sewer Main Construction in Illinois”, Illinois Society of Professional Engineers et al;**

C. **“Illinois Design Standards for Sewage Works”, I.E.P.A., Division of Water Pollution Control;**

- D. “Technical Policy Statements”, I.E.P.A., Division of Public Water Supply;**
 - E. “Recommended Standards for Water Works”, Great Lakes Upper Mississippi River Board of State Sanitary Engineers (“10 States Standards”.);**
 - F. “Illinois Urban Manual”, National Resources Conservation Services;**
 - G. “U.S. Soil Conservation Service Field Engineering Handbook”;**
 - H. Illinois Department of Transportation Design Manual;**
 - I. American National Standard Practice for Roadway Lighting (ANSI/IES RP-8 latest edition);**
 - J. Illuminating Engineering Society of America Lighting for Parking Facilities (IESNA RP-20 latest edition);**
 - K. The National Electric Code (NEC, NFPA 70, latest edition).**
- Where standards are not specifically set forth, improvements shall comply with standards established by the Village Board.

Section 4.0 Block Standards:

A. Determination of Block Dimensions:

The length, widths, and shapes of blocks shall be determined with due regard to:

1. Provision of adequate building sites suitable to the special needs of the type of use contemplated;
2. Zoning requirements as to lot sizes and dimensions within the corporate limit of the Village of Beecher;
3. Needs for convenient access, circulation, control and safety of pedestrian and street traffic; and
4. Limitations and opportunities of soil conditions and topography.

B. Block Dimension Restrictions: The length, width, and shape of blocks shall be such as are appropriate for the locality and the type of development contemplated, but block length in residential areas shall not be less than 400 feet nor exceed one thousand two hundred (1,200) feet (except E of this Section below), nor have less than sufficient width to provide two (2) tiers of lots of appropriate depth between street lines, except for blocks with one tier of lots which meet the double frontage requirements of this ordinance.

C. Pedestrian Crosswalks: Pedestrian crosswalk rights-of-way not less than twelve (12) feet wide shall be required at centers of blocks having a length in excess of eight hundred (800) feet and where deemed necessary by the Planning and Zoning Commission to provide for pedestrian circulation or access to schools, playgrounds, shopping centers, transportation and other community facilities.

D. Blocks Located in Industrial/ Commercial Areas: Blocks or portions thereof intended for commercial or industrial use shall be designated as such and the plans shall show adequate off-street areas to provide for parking, loading docks, and other such facilities, as provided in the Village Zoning Ordinance.

E. Blocks Intersecting Arterials: The number of intersecting streets along arterial streets and highways shall be kept to a minimum. Wherever practicable, blocks along such traffic ways shall be not less than twelve hundred (1200) feet in length.

Section 5.0 Lot Standards:

A. Lot Arrangement: The lot arrangement shall be such that there will be no foreseeable difficulties, for reasons of topography, soils, flooding or other conditions, in securing permits to build on all lots in compliance with the zoning ordinance, the flood plain ordinance, and wastewater treatment and disposal system rules and regulations. Subdivisions shall contain no left-over pieces, corners, or remnants of land.

B. Lot Size Requirements: Lot dimensions and areas within the Village corporate limits and the 1½ mile jurisdictional boundary shall conform to the requirements of the Village Zoning Ordinance. If the Will County Zoning Ordinance is more restrictive with regard to a lot in the 1½ mile jurisdictional boundary, then the County Zoning Ordinance shall apply. No lot shall be created for residential or non-residential uses which does not comply with the minimum lot area and width of the zoning district in which it is located, unless otherwise granted as part of a planned development or special use.

Depth and width of all lots shall be adequate to provide space for off-street parking and loading spaces as required by the Zoning Ordinance. Excessive depth in relation to width shall be avoided. A proportion of two and one-half (2½) to one (1) shall normally be considered a desirable maximum.

C. Lots Affected by Surface Water: Lots abutting a stormwater retention/detention pond, water course, drainage way, channel or stream shall have a minimum width or depth as required to provide an adequate building site and to afford the minimum usable area required in this ordinance or the Beecher Zoning Ordinance for front, side and rear yards.

Watercourses, stream channels, floodways and water storage areas shall not be included in the computation of required lot areas where it is proposed that such watercourses are to traverse the lot interiors. The Planning and Zoning Commission, whenever possible, shall require that lot lines center on said watercourses. Natural vegetation buffer strips shall be required along streams, lakes, ponds and wetlands per the Village's Stream and Wetland Protection Ordinance, Section 3.20.

D. Lot Drainage: Lots shall be laid out so as to provide positive drainage away from all building sites and individual lot drainage shall be coordinated with the general storm drainage pattern for the area.

E. Proximity to Dedicated Street: All lots, tracts and parcels shall front on a publicly dedicated street as required by the Village Zoning Ordinance.

F. Double and Reverse Frontage: Double frontage lots are forbidden except where lots back upon a arterial or major collector street; and in such instance, vehicular access between the lots and the primary street is prohibited.

G. Side Lot Line: Side lot lines shall be approximately at right angles or radial to the front lot line and/or at right angles to the back lot line.

H. Corner Lots: Corner lots shall be sized to accommodate the building setbacks as set forth in the Zoning Ordinance. A corner lot shall be deemed to have two (2) front yards. The classification of the remaining two (2) yards shall be determined by the classification of yard abutting it. If a yard abuts a side yard, it shall be deemed a side yard. If a yard abuts a rear yard, it shall be deemed a rear yard.

Corner lots for residential use shall be ten (10) feet wider along both abutting streets than that required by the underlying zoning district in which the lot is located, to assure that the lot is large enough to provide privacy, and protect the lot owner from potential nuisances associated with the sight and sounds of vehicular traffic on abutting streets.

I. Flag Lots: Lots which meet the minimum area and dimension provisions of the Zoning Ordinance except that the buildable portion of the lot is accessible to a street right-of-way by means of a narrow strip of land shall be prohibited unless otherwise approved by the Village of Beecher.

Section 6.0 Easements:

A. Utility Easements: Easements for the installation, operation and maintenance of utilities shall be provided as follows:

1. Along all boundary lines of the subdivision having a width of not less than ten (10) feet.
2. Along all back lot lines having a width of not less than ten (10) feet.
3. Along side and front lot lines where required, Easements for water, sanitary sewer, and storm sewer lines shall have a minimum width of twenty (20) feet or ten (10) feet on each lot when the easement straddles two (2) lots. Separate and exclusive easements for water, sanitary sewer and storm sewer are required. Easements for electrical, street lighting, telephone, cable television and gas shall have a minimum width of ten (10) feet or five (5) feet on each lot when the easement straddles two (2) lots.
4. On abutting lots, back of lot lines and side lot lines easements shall be provided on each side of the lot line at the minimum width specified above.
5. Utility easements shall be laid out so as provide continuity from block to block.
6. On wooded sites, utility easements shall be located and be of sufficient width so as to minimize environmental damage.
7. Utility easements and any easement provisions to be incorporated into the final plat or in the deed documents shall be reviewed and approval by the utility companies

responsible to furnish the proposed services. Also, the wording of the utility easement certificate on the final plat shall be approved by the Village Engineer.

B. Drainage and Stormwater Management Easements:

1. Drainage easements shall be provided at the side and rear of all lots to accommodate drainage from each lot. The width of drainage easements shall be not less than ten (10) feet wide along each rear lot line (totaling 20 feet) and five (5) feet along each side lot line totaling ten (10) feet.
2. Where a subdivision is traversed by a watercourse, drainage-way, channel or stream, or other body of water, appropriate dedications or easements, with adequate width to accommodate observed computed or anticipated stormwater drainage through and from the subdivision, shall be made. The width of the easement or dedication shall be dependent on the area of land drained by the watercourse and shall allow access for construction and maintenance equipment. In general the easement shall conform substantially with the lines of the watercourse and shall include the flood plain, where applicable, plus an additional area not less than twenty (20) feet wide adjoining both edges of the flood plain or an additional area not less than 60 feet wide landward from the OHWM of the watercourse, whichever is more protective. Buffer requirements for developments along streams, lakes, ponds and wetlands are per the Village's Stream and Wetland Protection Ordinance, Section 3.20.
3. All permanent stormwater management facilities for a subdivision shall be protected by easements or dedications for drainage and shall permit ingress and egress for maintenance. All side lot lines shall have a minimum ten (10) foot easement on each lot. All lot line adjacent to non-subdivided lands shall have a twenty (20) foot easement for drainage.
4. No construction of structure, dams, embankments or channels (except as indicated on the improvement plans) and no planting of trees, shrubbery or other vegetation, which hinder the flow of water or otherwise inhibit the intended purposes, shall be allowed within any drainage or stormwater management facility easement. In the event the area within such easements is obstructed, reshaped, regraded or restricted for uses other than as intended or as shown on the improvement plans, the Village will cause to have any alterations corrected at the expense of the party or parties causing said obstruction, restriction, regrading or alteration.
5. Where possible drainage easements shall be separate and distinct from utility easements.
6. Drainage and stormwater management easements shall be adequately maintained so as to provide for removal of accumulation of vegetation, silt, debris or other material that may interfere with the flow characteristics of drainage-ways or the essential features of retention or detention facilities.

C. Landscaping and Conservation Easements:

1. A screen planting easement may be required between residential and commercial or industrial lots, or along lot lines to discourage the undesirable development of residential lots fronting on traffic arteries. If such easement is to be used for public

- utilities, the easement shall be of sufficient width to accommodate appropriate screen planting without interfering with utility service or maintenance.
2. Easements shall be required to protect areas designated for the restoration of site flora as referenced in the Village Zoning Ordinance requirements for greenbelt and open space protection.
 3. Said easements shall be conveyed to a homeowner association for future maintenance responsibility or, at discretion of Village, a special service area created to maintain said easements. If the homeowners association fails to maintain this area, the Village shall have the right to conduct maintenance activities and draw on the identified revenue source to fund those activities, or take over management of this area. A dormant special service area overlay shall be recorded with all final plats for private common property.
 4. A long-term management and maintenance plan must be prepared to ensure that all common open space, landscape, and stormwater areas (including best management practice areas such as detention basins, swales, and infiltration areas) that are the responsibility of a homeowner's association are kept in a healthy growing condition and/or good working order in accordance with commonly accepted performance standards.
 5. A qualified consultant will periodically visit the property to monitor the health of the plants, naturalized open space areas, and preserved or re-created wetland areas.
 6. Areas containing vegetation shall undergo periodic burns after the second growing season or as fuel allows. These burns help to reduce undesirable weedy species and encourage native species. These burns should only be performed by a qualified burn contractor. See Title 6, Chapter 5, "Burning", of the Village's ordinances for further requirements.

D. Temporary Turnaround Easements: Temporary easements shall be provided for construction of temporary turnarounds on streets which are designed to have temporary terminus and are to be extended in the future. When the street is extended, said temporary easements shall be considered voided and released for other uses and purposes.

E. Pedestrian Way Easements: Easements or dedications shall be provided for pedestrian ways where deemed appropriate by the Village Planning and Zoning Commission. Pedestrian way easements shall be maintained to permit their continued use.

F. Line of Sight Easements at Intersections: At all intersections, line of sight easements shall be granted to the Village to protect clear sight distance not to exceed two feet above centerline grade within the triangular area formed at the intersection of any street right-of-way lines by a straight line drawn between said right-of-way lines at a distance along each line of twenty-five (25) feet from their point of intersection. No obstructions will be permitted within said easement which exceeds two feet above centerline.

Section 7.0 Streets:

A. The subdivision of land, including the arrangement, character, extent, width, grade and location of all streets, alleys, or other land to be dedicated for public use, shall conform to the

standards of this Ordinance and those included in Section 1 of the Engineering Technical Standards “Streets and Alleys”.

B. In the event that it is determined by the Beecher Planning and Zoning Commission during the course of a review procedure initiated pursuant to the Beecher Subdivision Control Ordinance that a subdivision sought to be approved will, if so approved, necessarily utilize existing streets, either during or upon completion of construction, off-site streets extending to the nearest off-site intersection shall be repaved if required by the Board of Trustees.

Street alignment should respect the natural features of the site; should avoid excessive cuts or fills; and should preserve wooded area, large trees, and wetlands wherever possible.

A public street or streets shall be provided to afford convenient access to all lots within the subdivision, and shall front all lots, tracts and parcels.

On primary and collector streets where traffic volume and safety considerations warrant or where required by other government authority having jurisdiction, paved acceleration, deceleration, passing and turning lanes shall be provided.

No street names may be used which will duplicate or be confused with the names of existing streets. Street names shall consist of one word only. Names of new streets shall be approved by the Planning and Zoning Commission and the Village Board. Proposed streets which are obviously in alignment with or continuations of existing streets already named shall bear the name of such existing streets provided the continuation is in the same general direction.

A minimum distance may be required by the Planning and Zoning Commission where deemed necessary between points of ingress and egress where all property to be subdivided is under one ownership on the effective date of this Ordinance.

No permanent building or structure shall be erected or constructed within a street right-of-way, extended street lines, or planned street right-of-way.

C. Rural type streets, streets having no concrete curb and gutter and having roadway ditches for drainage, will not be permitted unless a variance is granted by the Village Board under special conditions.

D. Abutting Planned or Existing Highway or Railroad:

1. Where a subdivision borders on or contains an existing or proposed primary street or railroad, the Village Board, upon recommendation of the Planning and Zoning Commission, may require a frontage or reversed frontage road with screen planting contained in a non-access reservation, which shall have a minimum width of ten (10) feet. Actual width may increase if determined by recommendation of the Planning and Zoning Commission and approved by the Village Board in order to provide adequate separation and screening from the primary street or railroad.
2. Should a proposed subdivision border on or contain a railroad, expressway or other limited access right-of-way; the Village may require the location of a street approximately parallel to and on each side of such right-of-way at a distance suitable

for the development of appropriate use of the intervening land, such as a park proposed in residential districts, or for commercial or industrial purposes in appropriate districts. Such distances shall be determined with due consideration of the minimum distance required for approach grades to future grade separations.

E. Frontage Road Requirements

1. The complete design of frontage roads including specifications and designation of traffic-ways, driving lanes, pavement, widths, thickness, materials, etc., shall be submitted to the Village for review and approval.
2. When a frontage road is to be dedicated to public use, the specifications shall be in accordance with the design requirements for streets within the district it is located.
3. Where more than one owner or lessee are to use the same private frontage road, a covenant, whereby the owners of the property serviced thereby are jointly and severally liable for the maintenance thereof, shall be recorded before approval of the proposed development as defined herein.
4. Where such frontage road is a private road there shall be a dormant special service area recorded in the event that the responsible property owners do not properly maintain the road.

Section 8.0 Curbs and Gutters

A concrete curb and gutter section shall be constructed along the outside lines of all street pavements, and parking lots unless waived by the Village Board.

Section 9.0 Sidewalks and Pedestrian Ways Requirements

Sidewalks or pedestrian ways shall be provided as follows:

1. Residential Subdivision: Sidewalks are required on both sides of all streets.
2. Commercial Districts: Sidewalks are required on both sides of all streets.
3. Industrial Districts: Sidewalks in industrial districts shall be provided as directed by the Village Board.
4. Pedestrian ways or sidewalks may be required by the Village through the center of blocks more than eight hundred (800) feet long, where deemed essential to provide circulation of access to schools, playgrounds, shopping centers, transportation, and other community facilities. Said pedestrian ways or sidewalks shall be located within a right-of-way or easement at least twelve (12) feet in width.
5. Sidewalks will be required along major roadways such as state or county routes which are within or abutting the proposed development. Bike paths may be permitted at the discretion of the Board of Trustees in lieu of sidewalks.

Section 10.0 Street Lighting

All developments shall include the design and construction of a street lighting system for the illumination of all streets and roadways which lie in or border the development. The street lighting system shall be in conformance with the standard requirements in the Village of

Beecher Ordinance No. 971, Adopted August 25, 2004, Section 6, of the Engineering and Technical Standards, "Street Lighting."

Section 11.0 Parkway Restoration

- A. All parkways and cul-de-sac islands within the street's right-of-way which are to have a finished earth surface shall be graded with topsoil and sodded. All parkways between the sidewalk and curb shall be graded so as to have a minimum cross-drainage slope of two (2%) percent to the curb line.
- B. Unsuitable soil, boulders, and other debris, including broken or excess concrete shall be removed from the parkway so as to provide an acceptable subgrade. Stumps shall be removed to a minimum of 12-inches below the proposed finished grade.
- C. After the parkway subgrade has been prepared, acceptable topsoil material shall be placed to a minimum depth of six-inches (6") and graded to proposed finish surface.
- D. All parkway common areas and unbuildable lots earth surfaces shall be sodded.

Section 12.0 Site Grading and Drainage

A. General Requirements:

The excavation of, or any combination thereof of any lot or parcel within any subdivision shall be in accordance with an approved grading plan submitted as part of engineering plans for said subdivision.

B. Drainage Overlay:

A reproducible mylar drainage overlay drawing and/or drawing in an electronic format acceptable to the Village, with certificate, as required by the Illinois Plat Act, shall be submitted to the Village for approval with the final engineering plan. The drainage overlay drawing shall be at the same scale as the final subdivision plat.

C. Contents of the Grading Plan: The grading plan shall include the following:

- 1. Benchmark locations and other control elevations based on USGS Datum.
- 2. Existing and finished ground control lines at a minimum of one foot (1') contour intervals.
- 3. Site and any affected adjoining properties drainage showing existing and proposed channels, swales, lakes, ponds, and structures with control elevations, slopes and cross-sections.
- 4. Top of foundation elevations and any opening elevations below top of the foundation for any existing or proposed buildings.
- 5. Finished ground surface elevations at foundation corners, lot corners, top of curbs at property lines extended, drainage inlet structures, and at other ground control points.
- 6. The parcel drainage shall be designed to flow away from the top of the foundation. Storm water being directed to the side yard of the parcel shall be directed into a formed drainage swale, having a minimum slope of one percent (1%) and a maximum slope of twenty percent (20%). In the event that conditions dictate that some parts of the lot be

higher than the structure foundation, the grading plan must show specific drainage configurations for the parcel specifying that all drainage is to be directed to flow away from the foundation in an acceptable manner.

7. Back lot line swales shall be graded to a positive outlet or inlet structure at a minimum flowline slope of one and one-half percent (1½%) and shall have side slopes of 6:1 or less.
8. Construction and work such as walkways, driveways, landscaping or any structure shall be installed so that the construction of same will not interfere with drainage. All sidewalks, driveways, patios and other flat work shall be at an elevation relative to the foundation wall so that water will drain away from the structure on all sides and off the lot in a manner which will provide reasonable freedom from erosion and permanently pocketed surface water.
9. The flow from off-site tributary areas that are tributary to an intermittent stream or overflow route that must pass through the parcel must be identified on the grading plan and must be designed in such a way to adequately convey the flow of all surface water for a 100-year storm frequency without damage to adjoining structures.
10. All overflow routes for the 100-year storm and for accumulated storm water runoff from several lots or from off-site catchment areas must be clearly designated on the grading plan with the total width of the flow route contained within an easement for drainage purposes.

These shall be in conformance with Village of Beecher Ordinance No. 1002 approved November 22, 2004 or any subsequent ordinance.

D. Grading Classification of Lots:

In a subdivision or a planned unit development, all rough grading within a given block (or area) must be completed prior to the issuance of any building permits. The Developer shall certify in writing that all rough grading is completed within a given block, watershed or other area in strict conformity with the grading plan as prepared and approved by the Village. Grading must be left within three inches of the approved final grading plan prior to the issuance of any building permits. Engineer shall verify grading is complete as required and so notify the Village before building can proceed. All proposed drainage ways, swales, detention facilities, lot and block grading shall be complete to insure minimum affect and disturbance upon properties adjoining said development or other portions within the development.

1. All parcels within said development shall have a “building spot survey” performed immediately after the foundation has been poured and backfilled to insure compliance with building setback requirements to insure that rough grading has been completed so that all drainage flows away from the building to the side yard, front yard or rear yard in conformance with the grading plan and to insure that elevations of any openings in the foundation are in conformance with the approved grading plan requirements of high water restrictions as they relate to the grading plan or storm water management plan. At the same time, the Developer and/or owner of the property will insure that the drainage pattern on a particular parcel has not been altered during the course of the foundation construction and backfilling so as to adversely affect the overall drainage plan. Any improper grading deemed by the Building Inspector or Village Engineer to

be a potential hazard to any property shall be corrected immediately upon his direction or shall be cause for suspension of work on the parcel.

After the structure on a parcel is substantially completed and final grading is completed, the Developer shall furnish an occupancy survey to certify that the final ground elevations are in strict compliance with the elevations indicated on the approved grading plan.

The Developer shall be responsible for the grading of each lot or parcel through all stages of construction to insure that drainage from tributary areas is not blocked or hindered and that servient property is protected from damage by providing proper grading to a storm drainage facility in accordance with the approved grading plan.

2. Exceptions: In those cases where conditions, in the opinion of the Village Engineer, do not permit compliance with the approved grading plan, a revised grading plan must be submitted to the Village in the same detail as the original submission requires. In the case of those parcels that need additional detail, the same shall be provided as required by the Village Engineer at the expense of the applicant.

Section 13.0 Public Utilities

All utility lines for telephone, electric service, gas and cable television shall be placed underground entirely throughout a subdivided area within described easements. Said conduits or cables shall be placed within easements or dedicated public ways, in a manner which will not conflict with other underground services. Further, all transformer boxes and other appurtenances shall be located in rear yard easements at an elevation of plus or minus three (3) inches from approved final grade so as not to be unsightly or hazardous to the public. The utility lines shall be parallel to and buried at least eighteen (18) inches below final grade not less than eighteen (18) inches from the property lines. Corner property markers shall not be disturbed by the installation of utility lines.

Section 14.0 Storm Sewers and Sump Pump Drains

Village of Beecher Ordinance No. 1002, approved November 22, 2004, or as subsequently amended.

Section 15.0 Erosion and Sediment Control Plan

Article 8 Section 2 Village of Beecher Ordinance No. 1002, adopted November 22, 2004, or as subsequently amended.

Section 16.0 Flood Plain Regulations

All foundation elevations, proposed grading, storm water management facilities and structures shall be designed and constructed in conformance with the Village of Beecher Flood Plain Ordinance No. 1002, Chapter 151 of the Beecher Village Code as amended November 22, 2004 or any subsequent ordinance or amendment.

Section 17.0 Sanitary Sewer System

Sanitary sewer systems shall be provided in accordance with the provisions of Section 4 on the Engineering and Technical Standards, "Sanitary Sewer System."

Section 18.0 Water Distribution System

When located within the service area of a public water supply system, water mains as specified in the Engineering Technical Standards, Section 3 "Water Distribution System" shall be constructed throughout the entire subdivision in such manner as to serve adequately all lots and tracts with connections to such public systems, together with shutoff valves, fire hydrants and all equipment installed in the manner prescribed in the Technical Standards.

Section 19.0 Landscaping and Trees

A landscape plan, prepared by a qualified landscape architect, shall be submitted with all applications for site plan review in accordance with the Engineer Technical Specifications, Section 8, "Landscape Requirements."

Section 20.0 Opening in Streets

1. All public utility companies desiring to install any public utility under any street in the Village shall auger under the Village streets for installation of the public utility. Cutting of a public street by a public utility is prohibited unless written authorization by the Superintendent of Public Works of the Village is obtained.

The public utility must notify the Village Department of Public Works prior to the auguring of the installation of the utility and all open holes made as a result of such auguring must be properly barricaded and warning lights installed prior to the workmen leaving the area.

2. Open trench cutting of existing Village streets shall be allowed for connecting a private sewer and water line to the existing Village Sewer and water system but only under the following terms and conditions:
 - a. The Superintendent of Public works must be contacted for approval prior to the trench cut and shall inspect all cuts, backfilling and surface patching.
 - b. The trench cut into the Village street (asphalt or concrete) shall be saw cut prior to excavating.
 - c. The owner or contractor shall deposit \$1000 cash per cut (or certified check) with the Village Clerk , who will hold the funds in an escrow account for a period of five (5) years from the date of any excavation, for future maintenance of the area of trenching to insure the area remains in the same condition as the adjacent roadway. The escrow funds or any portion of them may be used by the Village if maintenance of the area of trenching is required in the discretion of the Village. After the five (5) year period any remaining funds will be returned to the depositor. No interest will be paid to the depositor.

- d. All openings made in streets and sidewalks shall be protected at all times in the following manner: Open holes or trenches that must exist overnight, must be backfilled and sufficiently barricaded with snow fence and with signal or warning lights prior to the work crew leaving the area for the day.

ARTICLE 7

REQUIRED IMPROVEMENTS AND DESIGN STANDARDS - CONSERVATION DESIGN DEVELOPMENT

Section 1.0 – Purpose and Intent

Conservation Design Developments are intended to provide for more flexible land development techniques in the arrangement and construction of dwelling units, roads, surface drainage, and other improvements than is allowed through the standard zoning and subdivision requirements. Such flexibility is intended to retain or increase for the property owner the development rights (the number of residential dwelling units allowed) that are permitted under the existing conventional zoning for the property while encouraging environmentally responsible development that integrates natural resources, open space, walkability, and biodiversity into residential development.

The objective of a Conservation Design Development is therefore not simply to allow exceptions to otherwise applicable regulations; it is instead to encourage a higher level of design and amenity than is available under the usual land development requirements. It is the intent of the Village to suspend the application of detailed zoning and subdivision standards as provided herein only when such amenity is achieved. In this way the Village may grant the developer a desirable flexibility and at the same time not only protect but enhance the welfare of the residents and other users of a development as well as the rest of the community.

The goal of the ordinance is to maximize protection of the community's natural resources by recognizing the following objectives:

- A. Protect constrained, sensitive, unique, and/or undevelopable lands and features including steep slopes, floodplains, wetlands, meadows, grasslands, tree stands, woodlands, streams, stream corridors, watercourses, groundwater recharge areas, farmland, wildlife corridors and/or habitat, biodiversity, historical buildings and/or sites, archeological sites, and green and/or open space by setting them aside from development.
- B. Reduce the quantity and improve the quality of stormwater runoff from expected development.
- C. Provide greater design flexibility, incentives and design alternatives in the siting of dwelling units, services and infrastructure, including the opportunity to reduce impervious surface area by reducing the length and width of roads, utility runs, and the amount of paving required for residential development and creating development that conforms to existing topography and natural features.
- D. Encourage clustered dwelling and commercial units.
- E. Provide for a diversity of lot sizes and residential product types to accommodate a variety of age and income groups and residential preferences, so that the community's population diversity can be enhanced.
- F. Provide standards accommodating to some extent the varying circumstances and interests of individual landowners and the individual characteristics of their properties.

- G. Encourage interaction in the community and reduce the amount of and need for infrastructure and impervious surfaces by clustering houses and orienting them closer to the street.
- H. Reduce erosion and sedimentation by the retention of existing vegetation and drainage patterns and the minimization of development on steep slopes and other constrained and sensitive lands.
- I. Provide incentives for the creation and connection of greenway systems and open space within the Village for the benefit of present and future residents.
- J. Protect areas of the Village with productive agricultural soils for continued agricultural use by conserving blocks of land large enough to allow for viable farm operations.
- K. Create neighborhoods with direct visual and/or recreational access to constrained, sensitive, and conservation land.
- L. Conserve scenic views and elements of the Village's rural and scenic character and minimize perceived density by minimizing views of new development from existing roads.
- M. Increase future property value.
- N. Create livable and sustainable mixed-use communities.

Section 2.0 – Applicability

When all or a portion of a proposed development is within 500 feet of the ordinary high water mark of a lake, stream, or river, conservation design must be used or a strong argument as to why conservation design is not feasible must be made to and accepted by the Village. When all of a proposed development is 500 feet or more from the ordinary high water mark of a lake, stream, or river, the election to develop property using a Conservation Design is, like a Planned Unit Development provision, voluntary and provided to developers as an alternative to development of property as a conventional subdivision pursuant to other applicable provisions of the Village code.

Conservation Design may be developed within applicable agricultural and residential zones of the Village; commercial and office development may incorporate some of the provisions herein at the discretion of the Village. Conservation Subdivisions shall be developed in accordance with and subject to the development standards, conditions, procedures and regulations of this Article and with other applicable subdivision ordinances and zoning regulations of the Village which are not otherwise in conflict with the provisions of this Article. Conservation Design is most appropriately to be used in areas with significant open space resources to be protected and preserved in perpetuity. These include flood plains, groundwater recharge areas, wetlands, woodlands, streams, important wildlife habitat, steep slopes, and historic, cultural and archeological resources. To further these goals the Conservation Subdivision development concept promotes flexibility and innovation and allows the modification of zoning requirements involving setbacks, lot and yard sizes, and other standards as outlined herein.

Section 3.0 – Approval Process

Applications using Conservation Design shall be submitted and processed in accordance with the requirements and procedures set forth in the Village’s Subdivision Ordinance, including submission and approval of schematic, preliminary and final plans or plats, and any additional procedural requirements set forth in this Article, including, but not limited to, submission of a Site Yield Plan, Natural Features Protection Plan, Schematic or Preliminary Plan showing the conceptual design of the subdivision, and/or Final Plan.

Section 4.0 – Permissible Activities

In general, permissible activities are those that are in accordance with the purposes of the ordinance. These include residential use or mixed use, conservation uses, passive recreational activities, unpaved trails or trails constructed of porous paving materials, preservation of archeological and historic sites, and other low-impact activities. Agricultural, horticultural, silvicultural, and pasture uses are permissible when they do not conflict with residential uses and when all applicable best management practices are used to minimize environmental impacts.

Section 5.0 – Development Activities Prohibited

In order to ensure the preservation and enhancement of existing conditions or certain property within the Village, including, but not limited to, constrained and sensitive lands, natural and cultural resources, wildlife habitat and other unique and sensitive lands, no new development activity shall be permitted on property proposed for development using Conservation Design prior to final plat approval as provided herein. Upon final plat approval, all development activity shall be conducted in accordance with and subject to applicable permit and development approval processes required by Village ordinances, rules and regulations. For purposes of this Section, “development activity” shall include any disturbance or alteration of the property in any way, but shall not include continuation of any currently existing permitted use of the property.

Section 6.0 – Waiver

Subject to the provisions set forth herein, any provision of this Article may be waived by the Village. Such waiver(s) shall be granted only in limited circumstances as deemed appropriate and necessary by the Village. No waiver shall be granted absent a finding of good cause based upon specific special circumstances attached to the property. No waiver should be granted that would be contrary to the public interest or contrary to the underlying intent of this Article. Any waiver of the required minimum conservation land dedication shall require comparable compensation, off-site improvements, amenities or other consideration of comparable size, quality and/or value.

Section 7.0 – Site Yield Plan

All applications for a Conservation Design shall include a Site Yield Plan prepared in accordance with the provision set forth herein. The Site Yield Plan is utilized to determine and

calculate the base number of dwelling units for any given property to be developed as a Conservation Design.

A. Site Yield Plan. Applicants shall prepare a Site Yield Plan for the proposed project showing how the property within the project could be developed under a Conventional Subdivision layout using the dimensional standards set forth in Subsection (C) below. The Site Yield Plan is not intended to propose or permit the actual development of the property in accordance with the dimensional standards set forth herein, but is prepared merely to determine the base number of dwelling units to be used in calculating the permitted number of dwelling units and lot size for the actual Conservation Subdivision.

B. Underlying Zoning. The Conservation Design classification is intended to act as an overlay zone, the sole purpose of which is to permit property to be developed utilizing the Conservation Design residential subdivision provisions as contained herein. Except as otherwise provided, all provisions of the underlying base zone of any property with the Conservation Design designation shall apply.

C. Base Density. The base density for a Conservation Design shall be determined by (a) if incorporated or planned as a County development, dividing the total acreage of the subdivision site by the minimum lot size requirement of the underlying zoning district in which the proposed Conservation design is located; (b) if proposed for annexation, dividing the total acreage of the subdivision by the minimum lot size requirement of the zoning district most consistent with the County or Village comprehensive plan.

D. Realistic Layout. The Site Yield Plan must be drawn to scale and must exhibit and realistic layout reflecting a Conventional Subdivision layout that could reasonably be expected to be implemented in consideration of dimensional standards set forth herein and calculating and addressing the presence of non-buildable or infrastructure areas, including, but not limited to, rights-of-way, public improvement areas, wetlands, floodplains, waterbodies, steep slopes, and existing easements or encumbrances. Where floodplains and wetlands overlap, they shall be counted only once.

E. Dimensional Standards. The Site Yield Plan shall reflect the dimensional standards of the underlying zoning.

F. Approval. The Site Yield Plan must be approved in writing by the Village for compliance with the standards and provisions of this Section prior to the submission of a Schematic Plan for a Conservation Design.

Section 8.0 – Natural Features Inventory and Protection Plan

All applications for a Conservation Design shall include a Natural Features Inventory and Protection Plan prepared in accordance with the provisions set forth herein. The Natural Features Inventory and Protection Plan shall identify all constrained and sensitive lands within the property boundaries and within 400 feet outside of the property boundaries, including, but not limited to, floodplains, wetlands, and steep slopes. The Natural Features Inventory and Protection Plan shall also clearly identify all natural or cultural resources present on the property and within 400 feet outside of the property, including, but not limited to, geographic features, meadows, grasslands, tree stands, streams, stream corridors, watercourses, farmland, rapidly permeable soils, wildlife corridors and/or habitat; historic building and/or sites;

archeological sites; cultural features and green space; and views or viewsheds. Applicants are solely responsible for checking and ensuring the accuracy and designation of constrained and sensitive lands and natural and cultural resources on the Natural Features Inventory and Protection Plan for their particular project and applicable adjacent property. If site analysis, surveying and/or identification of constrained and sensitive lands and natural and cultural resources require entry onto adjacent properties, applicants are solely responsible for obtaining all required permits and/or approvals for such entry and analysis, surveying and/or identification. Natural Features Inventory and Protection Plan should include:

- A. Natural Resources Inventory (NRI), furnished by the County Soil and Water Conservation District. The report shall be an integral part of the planning process and the petitioner shall, at his/her expense, order and furnish the required information to the District and obtain a report to be placed upon the public record.
- B. Natural Features Protection Plan (NFP) shall be drawn to scale and shall describe the plan to buffer, protect, and enhance natural resources.

Section 9.0 – Schematic or Preliminary Site Plan

A. A Schematic Site Plan shall be submitted that shows how the property could be developed as a Conservation design. Site layout shall incorporate existing topography and natural features to the extent possible. The Schematic Plan shall be used for illustrative purposes only for determining whether the proposed rezone is appropriate for the particular property and shall not be considered to constitute an approval of any given layout or development of the property. The schematic plan shall include a drawing or set of drawings at a suitable scale and other materials that include, but are not limited to, the following:

1. A plan of the open space and natural resources present on the site that may merit preservation including:
 - a. Wetland identified by the National Wetlands Inventory maps prepared by the U.S. Fish and Wildlife Service or Advanced Identification of Wetlands (ADID) maps, the County Soil Survey prepared by the United States Department of Agriculture (USDA) Natural Resources Conservation Service, or a certified wetlands delineation using data from the U.S. Army Corps of Engineers and any proposed modifications; including wetland quality if available.
 - b. 100-year floodplains as identified by the Federal Emergency Management Agency (FEMA) and any proposed modifications.
 - c. Water courses including rivers, streams, creeks, and/or existing lakes or ponds.
 - d. Riparian zones equal to any required stream buffers and improvement setbacks.
 - e. Soils map, noting hydric and rapidly permeable soils.
 - f. Woodlands and buffers.
 - g. Location, size and identification of all existing trees, shrubs, and other vegetation on the site, indicating which will remain and which will be removed, and methods of protection of vegetation to remain.

- h. Description and location of adjacent natural resources to within 400 feet of site from readily available materials (aerial photos, existing maps, etc.)
 - i. Existing slopes greater than 10% on average identified as part of a site analysis conducted by a registered engineer, land surveyor or landscape architect and calculated using topographic maps from the Village or from a topographic survey prepared by a licensed land surveyor.
 - j. Farmlands (fields, pastures, meadows).
 - k. Habitat for any species listed as endangered, threatened, or of special concern by the U.S. EPA and/or the IDNR.
 - l. Unique natural elements, such as ravines or unusual rock formations, or geological elements such as glacial deposits.
 - m. One-foot topographic map of the site.
 - n. Site suitability analysis and plan that clearly identifies areas to remain undisturbed and areas for development.
2. The existing land use and zoning surrounding the proposed development and the distance from the subject property line to the nearest structures on all abutting properties within two hundred feet of the perimeter of the site.
 3. Cemeteries (including pioneer cemeteries).
 4. Historic buildings, structures, and landscapes as well as known archeological sites.
 5. View sheds (important views into and from the site to be illustrated by photographs numbered and keyed to the site plan.)
 6. Locations and densities in terms of number of units in proposed residential areas including building lots and arrangement of structures on the site. Given that the intent of this ordinance is to protect and maintain open space and open space resources, the construction of housing in residential clusters and on smaller lots is preferred. Residential cluster should be located to minimize negative impacts on the natural, scenic and cultural resources of the site and conflicts between incompatible uses. Subdivisions proposed for tracts which include land with a ridge with an elevation of 80 feet or more above the adjacent valley floor should be designed in such a manner as to avoid the placement of streets and lots where they would create the need to remove the existing vegetation from the crest of the ridge. Lots should be laid out in such a manner that the building site are not located on the crest of the ridge.
 7. Layout and organization of the transportation and circulation network for all modes of travel including pedestrian, equestrian, and bicycle paths, as well as linkage into the regional and sub regional trail networks.
 8. Stormwater management, including a site drainage plan locating wetland boundaries and buffer areas.
 9. Preliminary architectural information in the form of sample building elevations if the project is to have a unified design theme (a unified design theme is desirable in higher density projects).

B. Engineering documents shall include:

1. Existing wetland inventory and delineation.
2. Wetland mitigation plans.
3. Landscaping plan.

C. Review and adoption shall follow the procedural requirements of other subdivision applications to the Village.

Section 10.0 – Final Plan

A. The Final Plan provides a more detailed review of the development and should be consistent with the provisions included in the preliminary plan and the natural features inventory and protection plan. At this stage of review of the proposed project, specification regarding land use, architecture, building sizes, lots, setbacks, parking, access and, in particular, the size, locations and quality of the proposed open space areas is reviewed. The development plan shall be of a level of detail adequate to resolve concerns regarding the logical extension of services to serve the project site, to determine the physical extent of the project – its buildings(s), parking, open space, and their impact on surrounding properties. Review and adoption shall follow the procedural requirements of other subdivision applications to the Village. The plan shall include that required in Sections 7.0, 8.0 and 9.0 of this Article as well as the following as a minimum:

1. An update of the information in Sections 7.0, 8.0 and 9.0 including a site plan, with proposed topographic contours at one-foot intervals.
2. Proposed building lots and proposed land uses. Land to be subdivided shall be laid out and improved in reasonable conformity with the existing topography in order to minimize runoff, and conserve the natural cover and soil.
3. Proposed building locations, height, and setbacks.
4. The phasing of development where applicable.
5. Architectural information in the form of sample building elevations, as well as a materials board, if the project is to have a unified design theme (a unified design theme is desirable in higher density projects).
6. The circulation system indicating pedestrian, bicycle, equestrian, recreation, and motor vehicle movement systems, including existing and proposed public streets and/or alleys; rights-of-way; easements or other reservation of land on the site; the locations and dimensions of existing and proposed curb cuts, off-street parking and loading spaces (if applicable), sidewalk and other walkways.
7. The location of any trees to be left on site as well as plans for their protection during the construction process.
8. A stormwater management plan meeting the requirements of the Village code for the entire site at full development for approval of the Village. Stormwater drainage facilities shall discharge when possible through vegetated areas and buffers into existing natural drainage.

Section 11.0 – Dimensional Standards

A. Density. The permitted density for development within a Conservation Design shall be that of the underlying or pre-existing zoning. The percentage increases noted as the multiplier in the development Incentive Chart are percentage increases from the base density identified in the approved Subdivision Yield Plan for the proposed development. No minimum or maximum lot sizes have been established for Conservation Designs so that maximum flexibility is available to developers to arrange home sites.

Development Incentive Chart

Open Space Area*	Maximum Density Incentive**
30%	2.5%
35%	5%
40%	7.5%
45%	10%
50%	12.5%
55%	15%
60%	17.5%
60%+	20%

* As percentage of total development area minus unbuildable and constrained areas

** As percentage of base density

B. Minimum Required Open Space. All Conservation Designs shall provide at least the minimum percentage of open space within the Conservation Design as set forth in the Development Incentive Chart in Subsection (a) above. The minimum percentage of required conservation land for any given Conservation Design shall be calculated based upon the total acreage of property within the proposed Design less areas containing constrained and sensitive lands. Required conservation land shall not include parkways, landscape islands, or similar features, nor any constrained or sensitive lands as defined herein. Except as otherwise provided herein, open space shall not be included within any residential lot.

Locations proposed for open space shall be designated on the preliminary and final plan and recorded with the final plat or plats. Activities within designated open space areas shall be restricted in perpetuity through the use of an approved legal instrument. The term “Open Space” means any land or area, the preservation of which in its present use would: (1) conserve and enhance natural or scenic resources; or (2) protect flood plains, streams, or water supply; or (3) promote conservation of soils and wetlands; or (4) preserve wildlife habitat; or (5) protect historic and cultural sites; or (6) enhance recreational opportunities. Open space includes land and water areas retained for use as active or passive recreation areas or for resource protection in an essentially undeveloped state.

C. Lot Area. The lot area and minimum lot size for lots within a Conservation Design shall be determined according to the specific site characteristics, opportunities, and constraints.

D. Lot Width at Building Line. The minimum lot width at the building line for main buildings within a Conservation Design shall be 60 feet.

E. Street Frontage. The minimum street frontages for lots within a Conservation Design shall be determined according to the specific site characteristics, opportunities, and constraints.

F. Yard Regulations. The builder or developer of a Conservation Design is encouraged to consider variations in the principal building position and orientation, but shall observe the following minimum standards for buildings within a Conservation Design. Exceptions to these minimum setback regulations may be approved by the Village, in its sole discretion, during plat approval process when deemed appropriate and desirable under the circumstances.

1. Front Setback. The minimum front yard setback for main buildings in a Conservation Design shall be 20 feet.

2. Rear Setback. The minimum rear yard setback for main buildings within a Conservation Design shall be 30 feet.

3. Side Setback. The minimum side yard setback for main buildings within a Conservation Design shall be 10 feet.

4. Side Corner Setback. The minimum side corner setback for main buildings within a Conservation Design shall be 15 feet from the property line.

G. Incentives

1. Density bonuses for preserved open space shall be granted in accordance with Sections A and B herein.

2. Conservation Designs which provide and incorporate a consistent design theme, including unified design of subdivision elements such as street signage, lighting, fencing, entry treatments and features, landscaping, and other elements, and provide unified architectural building styles, including consistency in building materials and colors of a type and quality not typically provided in a conventional subdivision, may receive up to a four percent density incentive at the discretion of the Village.

3. Conservation Designs providing for the stabilization and enhancement of sensitive areas, including stabilization of drainage ways, the protection of wetlands, enhancements to wildlife habitat areas, improvements to open space areas to facilitate public use, other open space area improvements and amenities, and, within these open spaces, the provision of a publicly accessible and improved trail system and providing appropriate linkages and connections to existing or proposed trails, may receive up to an eight percent density incentive.

Section 12.0 – Design Standards

Conservation developments shall meet the requirements of Articles 1- 6 of this ordinance and the Village's engineering technical standards, except when any of these conflict with the design standards below. If the two conflict, the design standards below will govern.

A. The site's landscape shall be preserved in its natural state, as much as practicable, by minimizing vegetation and soil removal and topographic modification.

B. The design shall preserve and maintain mature woodlands, meadows, and orchards, and create sufficient buffer areas to minimize conflicts between residential and agricultural uses.

C. The design shall maintain existing hedgerows and tree lines between fields or meadows, and minimize impacts on large woodlands (greater than five acres), especially those containing many or mature trees, especially oaks, or significant wildlife habitat. Development on

woodlands of any size of highly erodable soils with slopes greater than 10% is to be avoided. However, non-oak woodlands in poor condition with limited management potential can provide suitable locations for residential development. When any woodland is developed, great care shall be taken to place all disturbed areas (for buildings, roads, yards, septic disposal fields, etc.) in locations where there are no large trees or obvious wildlife areas, to the fullest extent practicable.

D. The design shall protect rare plant communities, high quality habitats, and species listed as endangered, threatened, or of special concern by the U.S. EPA and/or the IDNR.

E. The design shall preserve sites of historic, archeological, or cultural significance, and their surroundings.

F. In the event that the tract or parcels contains a minimal amount or none of the natural features listed above, the Village may require the enhancement of open space through the planting of native vegetation including but not limited to wildflowers, prairie grasses, shrubs, trees and the like such that the open space functions and appears as a natural open spaces with minimal future maintenance. A lack of open space amenities may also be grounds for the Village to recommend that the rezoning be denied.

G. Any area designated as naturalized open space shall be planted and maintained with appropriate native vegetation where existing native vegetation does not exist or cannot be preserved. No invasive plant species shall be allowed to be planted in naturalized open space. When possible, naturalized open space shall be connected with other open space. Passive recreation, farming, sewage treatment, and stormwater facilities may be allowed in these areas where these uses do not impact important natural features and where approved by the Village.

H. Streets shall follow a grid network pattern of layout; cul-de-sacs and dead ends should only be used where a grid street network creates undue hardship.

I. Best management practices should follow the Technical Guidance Manual when applicable, located in Appendix A.

J. Best management practices that are encouraged include:

1. Permeable paving (including interlocking concrete pavers, porous concrete, and porous asphalt) for low volume, local access streets, emergency access routes,, parking areas, sidewalks, and driveways. Permeable paving is not allowed at vehicle service stations, gas stations, and other areas used for transfer or storage of hazardous materials.
2. Shared driveways between adjacent commercial sites to reduce impervious area (a signed agreement between the owners of all properties that will be sharing the driveways is required).
3. Driveway designs with vegetated median strips.
4. Rain barrels and cisterns
5. Green roofs

K. Required best management practices include:

1. Roadside bioswales and other filtration and infiltration technologies
2. Native landscaping in 80% of the development's common areas

3. A modified curb and gutter designs to allow water to sheet off into swales. Options include using ribbon curbs or using curb cuts.

L. Street dimensions shall be designed to accommodate the expected average traffic loads but otherwise pavement surface shall be minimized to reduce the impact of impervious surfaces on natural and water resources. Maximum pavement width for streets in residential and multi-family areas and for alleys in commercial areas is 26 feet back to back of curb.

M. Some parking lot BMP's are required. Possible parking lot BMP's include:

1. Infiltration bioswales
2. Vegetated swales
3. Vegetated filter strips
4. Infiltration basins/trenches
5. Sand filters
6. Continuous, ten foot wide planting strips between each parking bay, which may be used for bioretention
7. A 10 foot wide landscape strip around the perimeter of the parking lot, which may be used for bioretention

N. At the discretion of the Village, shared parking spaces are allowed to satisfy parking requirements between uses with parking needs at different times of the day such as banks, bars, restaurants, and churches. Cumulative parking requirements for mixed use occupancies may be reduced by the Village where it can be determined that the peak requirement of the several occupancies occurs at different times (either daily or seasonally). The Shared Parking report published by the Urban Land Institute may be used as a guideline in the estimation of parking demand for mixed use buildings and sites. Off-street parking facilities for different buildings, structures or uses, or for mixed-uses, may be provided collectively in any zoning district in which separate parking facilities for constituent use would be permitted or required. A signed agreement between the owners of all properties that will be sharing the parking spaces is required.

O. Maximum areas for parking spaces are as follows:

1. Regular: 9'x18' (162 square feet)
2. Handicapped: 8'x18' and 8'x18' aisle (288 square feet) to ADA Standards with two ADA parking spaces accessing each aisle;
3. On Street: 8'x22' (176 square feet)

P. Lay out blocks and lots as appropriate to protect and buffer natural topography and natural features including water courses and bodies. Block and lot layout shall also consider the use of the natural landscape for stormwater management.

Q. The lot sizes specified within the zoning code shall be used to determine site yield. However, actual lot sizes and setbacks may be reduced (by mutual agreement between the Village and the Developer) to meet open space requirements and to provide flexibility to protect unique site areas not designated as unsuitable for development.

- R. Areas planted with native vegetation shall be burned as required to maintain healthy growth, as outlined in the Village's Burning Ordinance (Title 6, Chapter 5 of the Village Code).
- S. Natural and native landscaping is allowed on private property and shall be designed to be aesthetically pleasing and complimentary to the surroundings.
- T. Existing trees and woodlands shall be protected from development and disturbance to the greatest extent possible.
- U. Lot setbacks may be reduced to meet open space requirements and to provide flexibility to protect unique site areas not designated as unsuitable for development.
- V. Yards may be graded to accommodate stormwater flow from structures, driveways, other impervious surfaces, and yards into an onsite, naturally vegetated rain garden or swale to absorb and cleanse stormwater runoff.
- W. The design shall create an open space that is in a reasonably contiguous configuration. Fragmentation of open space should be minimized and conservation lands should not be divided into numerous small parcels located in various parts of the development.
- X. The design shall tie into regional trail and greenway plans wherever applicable.
- Y. The design's pedestrian circulation system shall meet the following standards:
1. Open space networks shall connect any common areas within the development and any adjacent public places/rights-of-way.
 2. Paths located in primary conservation areas should be constructed of pervious materials.
 3. Sidewalks or walkways are required on both sides of street right-of-way, unless there are no adjacent residential lots, in which case sidewalks are only required on one side of the street. Sidewalks must be separated from moving traffic lanes.
 4. Walkways shall be provided to connect residential areas to retail/commercial areas and common open space areas and to provide convenient pedestrian access throughout the conservation development and from the conservation development to other areas of the community.
 5. When the proposed walkway system provides pedestrian access equal to or better than sidewalks along street rights-of-way, sidewalks along public streets are not required.
- Z. Abut Conservation Land. At least half of the lots shall directly abut conservation land or face conservation land across a street.
- AA. Constrained and Sensitive Lands. Restrictions and regulations regarding the preservation, protection, ownership and maintenance of constrained and sensitive lands within a Conservation Design shall be complied with as provided herein.
1. Whenever possible, open space within Conservation Designs should connect with existing or potential open space lands on adjoining parcels and local or regional recreational trails.
 2. Buffers are required around natural areas and sensitive natural features. These buffers shall be restored or maintained in a natural state.

3. Developers shall use native plants for landscaping as allowed in the Village landscaping ordinance.

Section 13.0 – Use Regulations

A. Subdivision. Subject to use and development restrictions of constrained and sensitive lands as set forth herein, land within Conservation Designs may be used for the following purposes:

1. Permitted Uses. Any uses permitted in the relevant zone including:
 - a. Open Space. Open space, subject to the use and development restrictions of conservation land as set forth herein.
 - b. Residential uses including single-family detached homes; single-family clustered dwellings; single-family attached homes including townhouse or row house applications, and duplexes; multi-family housing including apartments, independent, assisted, congregate and other forms of elderly housing (multi-family ownership options such as condominiums shall also be allowed).
 - c. Accessory Uses. Any permitted accessory uses as provided in the relevant zoning regulations, including the following:
 - (i) Private garages, parking spaces and car ports for licensed and operable passenger cars and trucks not to exceed a gross capacity of nine thousand pounds.
 - (ii) Recreational facilities and parking for recreational vehicles and equipment.
 - (iii) Accessory uses in side yards shall be limited to garages and carports only..
 - (iv) Accessory buildings associated with uses described herein are permitted.
 - (v) Noncommercial greenhouses and conservatories.
 - (vi) Swimming pool, tennis courts, and other recreational facilities which are operated for the enjoyment and convenience of the residents of the principal use and their guests.
 - (vii) Tool houses, sheds, and similar buildings for storage of domestic supplies and noncommercial recreational equipment.
 - (viii) Fencing, screening and landscaping as permitted and regulated by other regulations of the Village.
 - (ix) Boat houses, piers and docks.
 - (x) Signs in compliance with other regulations of the Village.
 - (xi) Recreational uses such as golf course, country clubs and riding stables and/or arenas.

B. Open Space. Open space may be used for the following purposes:

1. Permitted uses. The following uses are permitted in open space areas:
 - a. Conservation of open land in its natural state; e.g., meadow, grassland, tree stands, etc.

- b. Agricultural and horticultural uses, and associated buildings that support an active, viable agricultural or horticultural operation, excluding commercial livestock operations involving swine, poultry, and mink.
- c. Pastureland and equestrian facilities for horses.
- d. Underground utility easements for drainage, access, sewer or water lines, or other public purposes.
- e. Above-ground utility and street rights-of-way may traverse conservation land if permitted by the decision of the Village; provided, areas encumbered by such facilities and/or rights-of-way shall not be counted towards the minimum required conservation land for the Subdivision.

2. Conditional Uses. The following uses shall be considered as conditional in conservation land areas:

- a. Agricultural uses, not otherwise permitted, but excluding commercial livestock operations involving swine, poultry and mink.
- b. Wholesale nurseries and associated buildings that are specifically needed to support active, viable horticultural operations.
- c. Silviculture, in keeping with established standards for selective harvesting and sustained-yield forestry.
- d. Neighborhood open space uses such as village greens, commons, picnic areas, community gardens, trails, and similar low-impact passive recreational uses specifically excluding motorized off-road vehicles, rifle ranges, and other uses similar in character and potential impact.
- e. Active non-commercial recreation areas, such as playing fields, playgrounds, courts, and bikeways should be restricted to a small area, preferably no more than 10% of the site.
- f. Golf courses, not including miniature golf.
- g. Water supply and sewage disposal system, and stormwater management areas designed, landscaped, and available for use as an integral part of the conservation land. Individual and communal septic systems should be located to be shared by dwelling units.
- h. Fencing, when deemed necessary and appropriate for the particular use, condition, purpose and/or location of the conservation land.

3. Prohibited Uses. Except as otherwise approved and permitted by the Village as a permitted or conditional use in conjunction with the Conservation Design approval, the following uses shall be considered prohibited in conservation land areas:

- a. Any residential, commercial or industrial activity;
- b. Any development, construction or location of any man-made modifications or improvements such as buildings, structures, roads, parking lots, or other improvements.

- c. Any filling, dredging, excavating, mining, drilling, or exploration for and extraction of oil, gas, minerals or other resources from the property;
 - d. Any dumping or storing of ashes, trash, garbage or junk;
 - e. Burning of any materials, except as necessary for natural area management, agriculture, drainage and fire protection purposes;
 - f. The use of motor vehicles, including snowmobiles, all-terrain vehicles, motorcycles and other recreational vehicles, except as may be necessary to maintain and operate the property and/or utility facilities within the property;
 - g. Hunting or trapping for any purpose other than predatory or problem animal control;
 - j. The change, disturbance, alteration, or impairment of significant natural ecological features and values of the property or destruction of other significant conservation interests on the property;
 - k. The division, subdivision or de facto subdivision of the property;
 - l. Changing the topography of the property by placing on it any soil, dredging spoils, land fill, or other materials, except as necessary to conduct specific permitted purposes; and
 - m. All other uses and practices inconsistent with and detrimental to the stated objectives and purpose of the easement.
4. Constrained and Sensitive Lanes. No development or residential uses shall be permitted within constrained and sensitive lands.

Section 14.0 – Open Space Design Standards

Designated conservation and natural open space land within a Conservation Design shall meet the following standards:

- A. Preserved or restored to its natural state; designed and intended for the passive use and/or enjoyment of residents of the proposed development, or preserved in order to expand and extend the usefulness of existing preserved open space and natural areas.
- B. Significant Areas and Features. Conservation land should include the most unique and sensitive resources and locally significant features of the property within the Subdivision such as meadows, grasslands, tree stands, streams, stream corridors, watercourses, farmlands, wildlife corridors and/or habitat, historic buildings and/or sites, archeological sites, cultural features, green space, scenic views, etc.
- C. Contiguous Land. Conservation lands within a development shall be contiguous to provide for large and integrated open space areas within the Subdivision. Non-contiguous parcels of conservation lands may be approved by the Village during plat approval process upon a finding that such exception is necessary and/or desirable based upon consideration of the size of the project, the size of the conservation parcels, the types of features and resources included with the conservation lands, and other relevant considerations. Long thin strips of conservation land (less than one hundred feet wide) are prohibited, unless approved by the Village during plat approval process upon finding that such configuration of the conservation

land is necessary and/or desirable to connect other significant areas, to protect linear resources such as streams or trails, or to provide a buffer.

D. Open Space Network Connection. Conservation land within a Conservation Design shall be designed and laid out as part of a larger continuous and integrated open space system if possible in general accordance with the Village and County Comprehensive Plan to ensure that an interconnected network of open space will be provided throughout the Village and County.

E. Visibility. Conservation land shall be located and designed within the Conservation Design to add to the visual amenities of neighborhoods and to the surrounding area by maximizing the visibility of internal open space. Such enhanced visibility of conservation land may be accomplished through design and location of such open space as terminals at the edges of street curves, and by maximizing the visibility of external open space as perimeter greenbelt conservation land.

F. Buffering. Conservation land shall be designed to provide buffers and to protect scenic views as seen from existing roadways and from public parks. Where the proposed development abuts a forest preserve or other public park, open space, wildlife sanctuary or preserve, a natural greenway buffer at least fifty feet wide shall be provided within the development along its common boundary with said land, within which no new structures shall be constructed, nor shall any clearing of trees or understory growth be permitted (except as may be necessary for street or trail construction or fire safety). Where this buffer is unwooded, the Village may require vegetative screening to be planted at developer's sole cost and expense and/or that the buffer be managed to encourage natural forest succession through no-mow policies and the periodic removal of invasive alien plant and tree species.

G. Pedestrian Access. Developer shall provide adequate pedestrian access to conservation land which is open to public or resident use.

H. Maintenance Access. Developer shall provide sufficient maintenance access to all conservation land and constrained and sensitive lands within the Conservation Design.

I. Landscaping. All conservation land that is not wooded, farmed, or maintained as conservation meadows, grassland, or other approved open space, shall be landscaped using primarily native plant species and arranged so as to continue existing open space and habitat areas at developer's sole cost and expense in accordance with landscaping requirements provided herein and in the Village code.

Section 15.0 – Permanent Protection of Conservation Lands

A. Conservation Easement. All conservation land shall be permanently restricted from future development by dedication of a conservation easement to a local government or conservation organization or other method of protection and preservation acceptable to the Village. Under no circumstances shall any development be permitted in the conservation land at any time, except for those permitted or conditional uses listed herein and approved in conjunction with the Conservation Design. All conservation easements, or other acceptable method of protection and preservation of the conservation land within a Conservation Design, shall be approved by the Village and recorded prior to or concurrent with the recording of the final plat for the Conservation Design.

B. Terms and Conditions. All conservation easements, or other acceptable method of protection and preservation of the conservation land within a Conservation Design, shall be in substantially the same form as the standard conservation easement form as recommended by the Land Trust Alliance and shall include, at a minimum, the following terms and/or conditions:

1. Legal description of the easement.
2. Description of the current use and condition of the property.
3. Permanent duration of the easement.
4. Permitted and conditional uses.
5. Prohibited development and/or uses.
6. Maintenance responsibilities and duties.
7. Enforcement rights and procedures.
8. Applicable fee to cover bi-annual inspections and perpetual enforcement.

C. Grantee. Unless otherwise approved by the Village, the grantee of a conservation easement shall consist of one of the following acceptable entities which entity shall be qualified to maintain and enforce such conservation easement: land trust, conservation organization or governmental entity. The Village may, but shall not be required to, accept, as grantee, a Conservation Easement encumbering conservation lands within a Conservation Design, provided there is no cost of acquisition to the Village of the easement and sufficient access to and maintenance responsibilities regarding the conservation land are provided.

Section 16.0 – Ownership of Conservation Lands

A. Undivided Ownership. Unless otherwise approved by the Village and subject to the provisions set forth in this Article, the underlying fee ownership of the conservation land shall remain in single ownership and may be owned and maintained by one of the following entities; homeowners' association, land trust, conservation organization, governmental entity, or private individual.

B. Property subject to a conservation easement, or other acceptable method of protection and preservation, shall not be subdivided.

C. Different ownership and management options may apply to the permanently protected open space created through the development process. The open space shall remain undivided and may be owned and managed by a homeowners' association, a condominium association, the Village, the developer, or a recognized land trust or conservancy. An easement or the dedication of land may be required by the Village to facilitate trail connections and/or active and passive greenway paths as a condition of approval of a final plat. A narrative describing ownership, use and maintenance responsibilities shall be submitted for all common space and public improvements, utilities, and open spaces. The Village shall be provided with the name and address of an agent or representative of the association or trust for enforcement purposes. This information shall be updated as necessary. Common open space within a development shall be owned, administered, and maintained by any of the following methods either individually or in combination, subject to the approval of the Village:

1. Homeowners' Association. The undivided open space and associated facilities may be held in common ownership by a homeowners association. The association shall be formed and operated under the following provisions:

- a. The developer shall provide a description of the association, including its bylaws and methods for maintaining the open space easement.
- b. The association shall be organized by the developer and shall be operated with a financial subsidy from the developer, before the sale of any lots within the development.
- c. Membership in the association is automatic (mandatory) for all purchasers of homes therein and their successors. The conditions and timing of transferring control of the association from the developer to homeowners shall be identified.
- d. The association shall be responsible for maintenance of insurance and taxes on undivided open space.
- e. The members of the association shall share equitably the costs of maintaining and developing such undivided open space. Shares shall be defined within the association bylaws.
- f. In the event of a proposed transfer, within the methods here permitted of undivided open space land by the homeowners' association, or of the assumption of maintenance of undivided open space land by the Village, notice of such action shall be given to all property owners within the development.
- g. The association may have or hire adequate staff to administer common facilities and properly and continually maintain the undivided open space.
- h. The homeowners' association may lease open space lands to any other qualified person, or corporation, for operation and maintenance of open space lands, but such a lease agreement shall provide:
 - (i) That the residents of the development shall at all times have access to the open space lands contained therein (except croplands during the growing season and/or critical habitat for any species listed as endangered, threatened, or of special concern by the EPA and/or the IDNR – in such case a management plan may govern).
 - (ii) That the undivided open space to be leased shall be maintained for the purposes set forth in this ordinance.
 - (iii) That the operation of open space facilities may be for the benefit of the residents only, or may be open to the residents of the Village at the election of the developer and/or homeowners' association, as the case may be (unless dedicated to the Village).
 - (iv) The lease shall be subject to the approval of the Village and any transfer or assignment of said lease shall be further subject to the approval of the Village. The Village's approval shall not be unreasonably withheld. The Village's review is simply to insure that the lease is consistent with the purposes of this Article. Lease agreements so entered upon shall be recorded with the County

Recorder within 30 days of their execution and a copy of the recorded lease shall be filed with the Village.

2. Offer of Dedication. The Village shall have the first and last offer of dedication of undivided open space in the event said land is to be conveyed. Dedication shall take the form of a fee simple ownership. The Village may, but shall not be required, to accept undivided open space provided:

- a. Such land is accessible to the residents of the Village (except croplands during the growing season and/or critical habitat for any species listed as endangered, threatened, or of special concern by the EPA and/or the IDNR, in such cases a management plan may govern).
- b. There is no cost of acquisition other than any costs incidental to the transfer of ownership such as title insurance.
- c. The Village agrees to and has access to maintain such lands.
- d. Where the Village accepts dedication of common open space that contains improvements, the Village may require posting of financial security to ensure structural integrity of said improvements as well as the functioning of said improvements for an approximate time period to be established.

3. Condominiums. The undivided open space and associated facilities may be controlled through the use of condominium agreements, approved by the Village. All undivided open space land shall be held as a “common element.”

4. Dedication of Easements. The Village may, but shall not be required to, accept easements for public use of any portion or portions of undivided open space land, title of which is to remain in ownership by condominium or homeowners association, provided:

- a. Such land is accessible to Village residents.
- b. There is no cost of acquisition other than any costs incidental to the transfer of ownership, such as title insurance.
- c. A satisfactory maintenance agreement is reached between the developer, condominium or homeowners’ association, and the Village.

5. Transfer of Easements to a Private Conservation Organization. With the permission of the Village, an owner may transfer easements to a private nonprofit organization, among whose purposes it is to conserve open space and/or natural resources, provided that:

- a. The organization is acceptable to the Village, and is a bona fide conservation organization with perpetual existence.
- b. The conveyance contains appropriate provisions for proper reverter or retransfer in the event that the organization becomes unwilling or unable to continue carrying out its function.
- c. A maintenance agreement acceptable to the board is entered into by the developer and the organization.

6. The developer may elect to continue to own and maintain the common open space in conjunction with control by a homeowner or condominium association of the balance of the property. Should this option be pursued, legal instruments guaranteeing access to the

residents of the development and/or citizens of the Village (if applicable) and maintenance of the property shall be created. This option is subject to approval by the Village.

Section 17 – Maintenance and Management of Conservation Lands

A. Costs. Unless otherwise agreed to by the Village, the cost and responsibility of maintaining and managing conservation land shall be borne by the owner of the underlying fee of the conservation land. If the Village will manage a common natural area, either by designation or necessity, a funding procedure may be established through the creation of a special service area ordinance to cover the costs of maintenance, which authorizes the levy of taxes to pay the costs of providing the required services. A conservation organization or land trust may be contracted by the Village for 5 or 10 year periods to assume maintenance or management.

B. Plan. The developer shall submit a Maintenance and Management Plan providing for and addressing the means for permanent maintenance and management of the conservation land within the proposed Conservation Design with the Preliminary Plat application for the Subdivision. The Maintenance and Management Plan shall provide the following:

1. The Plan shall define ownership in accordance with Section (F) below.
2. The Plan shall establish necessary regular and periodic operation, maintenance, and management responsibilities for the various kinds of open space (e.g., lawns, playing fields, meadows, pastures, wetlands, stream corridors, hillsides, croplands, woodlands, etc.)
3. The Plan shall estimate staffing needs, insurance requirements, and associated costs, and define the means for funding the maintenance and management of the conservation land and operation of any common facilities on an on-going basis. Such funding plan shall include the means for funding long-term capital improvements as well as regular yearly operating and maintenance costs.
4. At the Village's discretion, the applicant may be required to escrow sufficient funds for the maintenance and operation costs of common facilities for up to one year.

C. Approval. The Maintenance and Management Plan must be approved by the Village prior to or concurrent with Final Plan approval for the Subdivision. The Maintenance Plan shall be recorded against the property and shall include provisions for the Village's corrective action rights as set forth herein. Any changes or amendments to the Maintenance Plan shall be approved by the Village.

D. Failure to Maintain. In the event that the organization established to maintain the conservation land and the common facilities, or any successor organization thereto, fails to maintain all or any portion thereof in reasonable order and condition, the Village may assume responsibility, as a right but not an obligation, for maintenance, in which case any escrow funds may be forfeited and any permits may be revoked or suspended. In the event in failure to maintain conservation the Village may have the right to create and or activate the dormant special service are to recover any cost associated with the maintenance of the conservation land.

E. Corrective Action. The Village may enter the premises and take corrective action, including extended maintenance. The costs of such corrective action may be charged to the property owner and may include administrative costs and penalties. Such costs shall become a

lien on said properties. Notice of such lien shall be filed by the Village in the County Recorder's office. The Maintenance Plan and all other documents creating or establishing any association or conservation organization for the property shall reference the Village's corrective action authority set forth herein and shall be recorded against the property.

F. Maintenance Standards.

1. The ultimate owner of the open space (typically a homeowners' association) shall be responsible for raising all monies required for operations, maintenance, or physical improvements to the open space through annual dues, special assessments, payment of a sum at the time of sale or transfer of a home, etc. The homeowners' association shall be authorized under its bylaws to place liens on the property of the residents who fall delinquent in payment of such dues, assessments, etc.
2. In the event that the association or any successor organization shall, at any time after establishment of a development containing undivided open space, fail to maintain the undivided open space in reasonable order and condition in accordance with the development plan, the Village may serve written notice upon the owner of record, setting forth the manner in which the owner of record has failed to maintain the undivided open space in reasonable condition.
3. Failure to adequately maintain the undivided open space in reasonable order and condition constitutes a violation of this ordinance and shall constitute a Village infraction. The Village is hereby authorized to give notice, by personal service or by United States mail, to the owner or occupant, as the case may be, of any violation, directing the owner to remedy the same within twenty days.

Section 18.0 – Landscaping

A landscape plan for the entire Conservation Design is required for final site plan approval, and at a minimum must include the following:

- A. All ground cover areas disturbed in the construction process shall be seeded or sodded with low-water usage species or site-appropriate native species.
- B. The developer of any dwelling unit shall plant native shade trees. Trees shall be of species as outlined in the Village landscaping ordinance.
- C. Additional landscaping may be required to satisfy buffering requirements, and landscape requirements contained in other Village ordinances.

ARTICLE 8

REQUIRED IMPROVEMENTS AND DESIGN STANDARDS – HYBRID DESIGN DEVELOPMENT

Section 1.0 – Purpose and Intent

Hybrid Design Developments are intended to allow some conservation design elements along with some conventional design elements in a development. They offer density bonus incentives and amenities different than those offered for conventional design alone, yet retain a number of the elements of a conventional design.

Section 2.0 – Applicability

When all of a proposed development is 500 feet or more from the ordinary high water mark of a lake, stream, or river, the election to develop property using a Hybrid Design is, like a Planned Unit Development provision, voluntary and provided to developers as an alternative to development of property as a conventional subdivision pursuant to other applicable provisions of the Village code.

Hybrid Design may be developed within applicable agricultural and residential zones of the Village; commercial and office development may incorporate some of the provisions herein at the discretion of the Village. Hybrid Design Subdivisions shall be developed in accordance with and subject to the development standards, conditions, procedures and regulations of this Article, of Article 7, and with other applicable subdivision ordinances and zoning regulations of the Village which are not otherwise in conflict with the provisions of this Article. Hybrid Design is most appropriately to be used in areas with significant open space resources to be protected and preserved in perpetuity. These include flood plains, groundwater recharge areas, wetlands, woodlands, streams, important wildlife habitat, steep slopes, and historic, cultural and archeological resources. To further these goals the Hybrid Design Subdivision development concept promotes flexibility and innovation and allows the modification of zoning requirements involving setbacks, lot and yard sizes, and other standards as outlined herein and in Article 7.

Section 3.0 – Additional Requirements

The same requirements applicable to a Conservation Design Development, outlined in Article 7, apply to a Hybrid Design Development, except as listed below:

The Development Incentive Chart in Section 11.0 is modified to:

Development Incentive Chart

Open Space Area*	Maximum Density Incentive**
30%	1.25%
35%	2.5%
40%	3.75%
45%	5%
50%	6.25%
55%	7.5%
60%	8.75%
60%+	10%

* As percentage of total development area minus unbuildable and constrained areas

** As percentage of base density

Per Section 11.0(G)(2), conservation designs which provide and incorporate a consistent design theme, including unified design of subdivision elements such as street signage, lighting, fencing, entry treatments and features, landscaping, and other elements, and provide unified architectural building styles, including consistency in building materials and colors of a type and quality not typically provided in a conventional subdivision, may receive up to a two percent density incentive at the discretion of the Village.

Per Section 11.0(G)(3), conservation designs providing for the stabilization and enhancement of sensitive areas, including stabilization of drainage ways, the protection of wetlands, enhancements to wildlife habitat areas, improvements to open space areas to facilitate public use, other open space area improvements and amenities, and, within these open spaces, the provision of a publicly accessible and improved trail system and providing appropriate linkages and connections to existing or proposed trails, may receive up to an eight percent density incentive.

Per Section 12.0(J)(1), roadside bioswales are recommended but not required.

Per Section 12.0(J)(2), native landscaping is required in only 50% of the common areas.

Per Section 12.0(J)(3), modified curb and gutter design is recommended but not required.

ARTICLE 9

OTHER ORDINANCES

Sec. 1.0 Stormwater Drainage and Detention Ordinance.

Section 1.1 - Authority and purpose.

1. *Authority.* This ordinance is enacted pursuant to the police powers granted to Will County, Village of Beecher, by the Illinois Compiled Statutes (chapter 65, Sections 5/11-12-5, 5/11-12-6, 5/11-12-12, 5/11-13-1, 5/11-14-1, 5/11-30-2, 5/11-30-8, 5/11-105-1, 5/11-109-1, 5/11-110-1; and chapter 50, Section 815/1).
2. *Purpose.* The purpose of this ordinance is to diminish threats to public health, safety and welfare caused by runoff of excessive stormwater from new development and redevelopment in the Village. This excessive stormwater could result in the inundation of damageable properties, the erosion and destabilization of downstream channels, and the pollution of valuable stream and lake resources. The cause of increases in stormwater runoff quantity and rate and impairment of quality is the development and improvement of land and as such this ordinance regulates these activities to prevent adverse impacts.
3. *Objectives.* This ordinance is adopted to accomplish the following objectives:
 - a. To insure that new development does not increase the drainage or flood hazards to others, or create unstable conditions susceptible to erosion;
 - b. To protect new buildings and major improvements to buildings from flood damage due to increased stormwater runoff;
 - c. To protect human life and health from the hazards of increased flooding on a watershed basis;
 - d. To lessen the burden on the taxpayer for flood control projects, repairs to flood damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by increased stormwater runoff quantities from new development;
 - e. To protect, conserve, and promote the orderly development of land and water resources;
 - f. To preserve the natural hydrologic and hydraulic functions of watercourses and flood-plains and to protect water quality and aquatic habitats;
 - g. To preserve the natural characteristics of stream corridors in order to moderate flood and stormwater impacts, improve water quality, reduce soil erosion, protect

aquatic and riparian habitat, provide recreational opportunities, provide aesthetic benefits and enhance community and economic development.

Section 1.2 - Definitions.

Adverse impacts. Any deleterious impact on water resources or wetlands affecting their beneficial uses including recreation, aesthetics, aquatic habitat, quality, and quantity.

Applicant. Any person, firm, or governmental agency who executes the necessary forms to procure official approval of a development or permit to carry out construction of a development from the Village.

Base flood elevation. The elevation at all locations delineating the level of flooding resulting from the 100-year frequency flood event.

Best management practice (BMP). A measure used to control adverse stormwater-related effects. BMPs include devices such as swales, filter strips, infiltration trenches, and detention basins designed to remove pollutants, reduce runoff rates and volumes, and protect aquatic habitats.

Bypass flows. Stormwater runoff from upstream properties tributary to a property's drainage system but not under its control.

Channel. Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainageway, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

Channel modification. Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, riprapping (or other armoring), widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the clearing of debris or removal of trash.

Compensatory storage. An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of natural flood storage capacity when fill or structures are placed within the floodplain.

Conduit. Any channel, pipe, sewer or culvert used for the conveyance or movement of water, whether open or closed.

Detention basin. A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a flood or storm.

Detention time. The mean residence time of stormwater in a detention basin.

Development. Any man-made change to real estate, including:

1. Preparation of a plat of subdivision;
2. Construction, reconstruction or placement of a building or any addition to a building;
3. Installation of a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days;
4. Construction of roads, bridges, or similar projects;
5. Redevelopment of a site;
6. Filling, dredging, grading, clearing, excavating, paving, or other non-agricultural alterations of the ground surface;
7. Storage of materials or deposit of solid or liquid waste; and
8. Any other activity that might alter the magnitude, frequency, deviation, direction, or velocity of stormwater flows from a property.

Drainage plan. A plan, including engineering drawings and supporting calculations, which describes the existing stormwater drainage system and environmental features, as well as the drainage system and environmental features which are proposed after development of a property.

Dry basin. A detention basin designated to drain completely after temporary storage of stormwater flows and to normally be dry over the majority of its bottom area.

Erosion. The general process whereby earth is removed by flowing water or wave action.

Excess stormwater run-off. The volume and rate of flow of stormwater discharged from an urbanized drainage area which is or will be in excess of that volume and rate which pertained before urbanization.

Floodplain. The land adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation. The floodplain is also known as the special flood hazard area (SFHA).

Flood fringe. That portion of the floodplain outside of the regulatory floodway.

Floodway. The channel and that portion of the floodplain adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future 100-year frequency flood discharge with no more than a one-tenth (0.1) foot increase in stage due to any loss of flood conveyance or storage and no more than a ten (10) percent increase in velocities.

Hydrograph. A graph showing for a given location on a stream or conduit, the flow rate with respect to time.

Infiltration. The passage or movement of water into the soil surfaces.

Major drainage system. That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.

Minor drainage system. That portion of a drainage system designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels, and swales and, where manmade, is designed to handle a minimum of the 10-year runoff event.

Mitigation. Mitigation includes those measures necessary to minimize the negative effects which stormwater drainage and development activities might have on the public health, safety and welfare. Examples of mitigation include compensatory storage, soil erosion and sedimentation control, and channel restoration.

Natural. Conditions resulting from physical, chemical, and biological processes without intervention by man.

One hundred (100) year event. A rainfall, runoff, or flood event having a one (1) percent change of occurring in any given year.

Positive drainage. Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.

Peak flow. The maximum rate of flow of water at a given point in a channel or conduit.

Property. A parcel of real estate.

Regulatory floodway. The channel, including on-stream lakes, and that portion of the floodplain adjacent to a stream or watercourse as designated by DWR, which is needed to store and convey the existing and anticipated future 100-year frequency flood discharge with no more than a one-tenth (0.1) foot increase in stage due to the loss of flood conveyance or storage, and no more than a ten (10) percent increase in velocities. The regulatory floodways are designated for the Trim Creek Tributary and Trim Creek, on the flood boundary and floodway map prepared by FEMA (or Department of Housing and Urban Development) and dated September 6, 1995. The regulatory floodways for those parts of unincorporated jurisdiction of the Village that may be annexed into the Village are designated for Black Walnut Creek, Exline Slough, Pike Creek, Plum Creek, and South Branch Rock Creek, on the flood boundary and floodway map prepared by FEMA (or department of Housing and Urban Development) and dated September 6, 1995. To locate the regulatory floodway boundary on any site, the regulatory floodway boundary should be scaled off the regulatory floodway map and located on a site plan, using reference marks common to both maps. Where interpretation is needed to determine the exact location of the regulatory floodway boundary, the division should be contacted for the interpretation.

Retention basin. A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.

Sedimentation. The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.

Stormwater drainage system. All means, natural or man-made, used for conducting stormwater to, through or from a drainage area to the point of final outlet from a property. The stormwater drainage system includes but is not limited to any of the following: conduits and appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.

Stormwater runoff. The waters derived from melting snow or rain falling within a tributary drainage basin which are in excess of the infiltration capacity of the soils of that basin, which flow over the surface of the ground or are collected in channels or conduits.

Storm sewer. A closed conduit for conveying collected stormwater.

Time of concentration. The elapsed time for stormwater to flow from the most hydraulically remote point in a drainage basin to a particular point of interest in that watershed.

Tributary watershed. All of the land surface area that contributes runoff to a given point.

Two (2) year event. A runoff, rainfall, or flood event having a 50 percent chance of occurring in any given year.

Wet basin. A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.

Section 1.3 - Stormwater detention.

A combination of storage and controlled release of stormwater runoff shall be required for single-family developments of five (5) acres or more with greater than two single family structures or one or more two-family structures; for multi-family or non-residential structures on more than one (1) acre; for existing multi-family or non-residential sites more than one (1) acre, with more than 25,000 square feet of new development; and for roadway widening of more than two (2) acres.

For properties which are not required to have stormwater release and storage structures per this section, best management practices for pollutant removal and runoff minimization shall be applied.

Section 1.4 - Drainage plan submittal requirements.

Each applicant shall submit the following information, depending on development size, to ensure that the provisions of this ordinance are met. The submittal shall include sufficient

information to evaluate the environmental characteristics of the property, the potential adverse impacts of the development on water resources both on-site and downstream, and the effectiveness of the proposed drainage plan in managing stormwater runoff. The applicant shall certify on the drawings that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with the drainage plan. The following information shall be submitted for both existing and proposed property conditions.

Properties smaller than ten (10) acres shall submit only the basic drainage plan called for in Section 1.4(1). Properties larger than ten (10) acres shall comply with the submittal requirements of both the basic drainage plan and the advanced drainage plan of Section 1.4(2).

1. *Basic drainage plan.*

a. *Topographic map:* A topographic survey of the property at one (1) foot contours under existing and proposed conditions, and areas upstream and downstream, necessary to determine off-site impacts of the proposed drainage plan. The map shall be keyed to a consistent datum specified by the Village.

b. *Drainage system:* Mapping and descriptions, where relevant, of existing and proposed drainage system features of the property and immediate vicinity including:

- i. The banks and centerline of streams and channels;
- ii. Shoreline of lakes, ponds, and detention basins;
- iii. Farm drains and tiles;
- iv. Sub-watershed boundaries within the property;
- v. Watershed soils classifications;
- vi. The property's location within the larger watershed;
- vii. Location, size and slope of stormwater conduits and drainage swales;
- viii. Sanitary sewers;
- ix. Depressional storage areas;
- x. Delineation of upstream and downstream drainage features and watersheds which might be affected by the development;
- xi. Detention facilities;
- xii. Roads and streets and associated stormwater inlets;

- xiii. Base flood elevation, and regulatory floodway where identified for the property; and

- xiv. Basis of design for the final drainage network components.

- c. *Environmental features:* A depiction of environmental features of the property and immediate vicinity including the following:

- i. The limits of wetland areas;

- ii. Any designated natural areas; and

- iii. Any proposed environmental mitigation features.

2. *Advanced drainage plan.* The same information as required in subsection (1) above is required for properties larger than ten (10) acres along with the following additional information for the minor drainage system's design runoff event and the 100-year event of critical duration:

- a. Elevations and maps of 100-year flooding;

- b. Cross-section data for open channel flow paths and designated overland flow paths;

- c. Direction of stormflows;

- d. Flow rates and velocities at representative points in the drainage system; and

- e. A statement by the design engineer of the drainage system's provisions for handling events greater than that 100-year's runoff.

Section 1.5 - Minimization of increases in runoff volumes and rates.

In the selection of a drainage plan for a development, the applicant shall evaluate and implement, where practicable, site design features which minimize the increase in runoff volumes and rates from the site. The applicant's drainage plan submittal shall include evaluations of site design features which are consistent with the following hierarchy:

- 1. Minimize impervious surfaces on the property, consistent with the needs of the project;

- 2. Attenuate flows by use of open vegetated swales and natural depressions so as to reduce runoff rates and volumes, protect aquatic habitats and remove pollutants, and preserve existing natural stream channels;

- 3. Infiltrate runoff on-site;

4. Provide stormwater retention structures;
5. Provide stormwater detention structures; and
6. Construct storm sewers.

Section 1.6 - Water quality and multiple uses.

The drainage system should be designed to minimize adverse water quality impacts downstream and on the property itself. Detention basins shall incorporate design features to capture stormwater runoff pollutants and preference shall be given to wetland systems and wet basins over dry basin designs. Retention and infiltration of stormwater shall be promoted throughout the property's drainage system to reduce the volume of stormwater runoff and to reduce the quantity of runoff pollutants.

The drainage system should incorporate multiple uses where practicable. Uses considered compatible with stormwater management include open space, aesthetics, aquatic habitat, recreation (boating, trails, playing fields), wetlands and water quality mitigation. The applicant should avoid using portions of the property exclusively for stormwater management.

Section 1.7 - Design criteria, standards, and methods.

1. *Release rates.*
 - a. The drainage system for a property shall be designed to control the peak rate of discharge from the property for the 2-year, 24-hour and 100-year, 24-hour events to levels which will not cause an increase in flooding or channel instability downstream when considered in aggregate with other developed properties and downstream drainage capacities. The peak discharge from events less than or equal to the 2-year event shall not be greater than 0.04 cfs per acre of property drained. The peak 100-year discharge shall not be greater than 0.15 cfs per acre of property drained. The peak 100-year discharge shall not be greater than 0.15 cfs per acre of property drained.
2.
 - a. *Detention basin outlet design.* Backwater on the outlet structure from the downstream drainage system shall be evaluated when designing the outlet.
 - b. *Detention basin outlet connections.* Detention basin outlets cannot be connected to farm drains and tiles, except for extended detention discharges.
3. *Detention storage requirements.* The design maximum storage to be provided in a detention basin shall be based on the runoff from the 100-year, 24-hour event and reservoir (also called modified plus or level pool) routing or equal. Runoff hydrograph methods as described in this section must be used for the design of all detention basins. The amount of detention storage constructed must be equal to or greater than 110% of the needed storage computed.

4. *Drainage system design and evaluation.* The following criteria should be used in evaluating and designing the drainage system. The underlying objective is to provide capacity to pass the 10-year peak flow in the minor drainage system and an overload flow path for flows in excess of the design capacity.

a. *Design methodologies:*

i. Major and minor conveyance systems for all tributary areas ten (10) acres or less may be designed using the rational method. The rational method may also be used in sizing the minor drainage system for larger sites. Runoff hydrograph methods as described in this section must be used for major drainage system design for all systems with greater than ten (10) acres of drainage area.

ii. The elapsed duration time used to select the rainfall intensity shall be equal to the time of concentration defined as: the time in minutes for the flow from the most remote point of the drainage area to reach the point under consideration.

iii. The runoff coefficient is the ratio of runoff to rainfall and shall assume saturated conditions. The runoff coefficient shall be a minimum of 0.95 for impervious areas and 0.50 for pervious areas. Runoff coefficients for undeveloped areas outside the limits of the proposed development shall be a minimum of 0.60.

iv. Streams and channels shall be designed to provide design flow capacity based on Manning's formula:

$$Q = \frac{1.486AR^{2/3}S^{1/2}}{n}$$

where Q = Quantity of flow in cubic feet per second
 A = Area of the conduit in square feet
 n = Roughness coefficient of the conduit
 (dimensionless)
 R = Hydraulic radius = area divided by wetted
 perimeter
 S = slope in feet per foot

a. Roughness coefficients used should be:

Concrete pipe	n = 0.013
Channel - sodded	n = 0.020
Streams - clean	n = 0.030
Streams - obstructed	n = 0.150

- b. Design velocities for storm sewers and channels should be:
 - i. Storm sewers: minimum of two (2) feet per second; maximum of ten (10) feet per second.
 - ii. Channels and streams:
 - Lined – minimum of two (2) feet per second, maximum of ten (10) feet per second.
 - Unlined - minimum of two (2) feet per second, maximum of five (5) feet per second.

v. Storm sewer requirements

- a. Storm sewers shall be designed such that the hydraulic gradient shall not be greater than the gutter flow line.
 - b. Minimum storm sewer size shall be ten (10) inches.
 - c. Storm sewers shall be laid straight in both horizontal and vertical planes between structures unless otherwise approved in writing by the Village Engineer.
 - d. Storm sewers of differing diameters shall join at structures only. The invert elevations shall be adjusted to maintain a uniform energy gradient by matching the 0.8 depth points of the differing diameters.
 - e. Inlets shall be provided so that surface water is not carried across or around street intersections. Inlets shall be spaced such that overland flow shall not build up a flow exceeding two (2) cubic feet per second except that curb inlets shall be located **such** that not more than three hundred (300) feet of gutter is tributary to an inlet or as otherwise approved by the Village Engineer. Inlets shall be provided at all low points.
 - f. Manholes shall be provided at (1) changes in direction, horizontal or vertical; (2) changes in shape or size of pipe; (3) junction of pipes. Maximum spacing of manholes is 400 feet for sewers 42 inches in diameter and smaller, and 500 feet for sewers 48 inches in diameter and larger.
 - g. For storm sewer design, the maximum time of concentration to a storm sewer inlet shall be 20 minutes.
- b. *Positive drainage:* Whenever practicable, all areas of the property must be provided an overland flow path that will pass the 100-year flow at a stage at least one (1) foot below the lowest foundation grade in the vicinity of the flow path. Overland flow paths designed to handle flows in excess of the minor drainage

system capacity shall be provided drainage easements. All drainage easements shall prohibit the placing of sandboxes, above grade planters, nonflow-through fences, and other obstructions across these overland flow paths. Street ponding and flow depths shall not exceed curb heights by more than one (1) inch. Streets in flood plain areas shall be designed such that the lowest elevation of minor streets and cul-de-sacs shall be one (1) foot above the base flood elevation and the lowest elevation of all accessory building openings shall be two (2) feet above the base flood elevation.

5. *Methods for generating runoff hydrographs.* Runoff hydrographs shall be developed incorporating the following assumptions of rainfall amounts and antecedent moisture:

a. *Rainfall:* Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on the Illinois State Water Survey's Bulletin 70, specifically those rainfall depths listed in Will County's Technical Guidance Manual, Section T202.6, Table 2. The first quartile point rainfall distribution shall be used for the design and analysis of conveyance systems with critical durations less than or equal to 12 hours. The third quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance system with critical durations greater than 12 and less than or equal to 24 hours. The forth quartile distribution shall be used in the design and analysis of systems with durations greater than 24 hours. The first, third and fourth quartile distributions described by Huff are presented in Table 37 of Bulletin 70. The SCS Type II distribution may be used as an alternate to the Huff distributions.

b. *Antecedent moisture:* Computations of runoff hydrographs which do not rely on a continuous accounting of antecedent moisture conditions shall assume a conservative wet antecedent moisture condition as a minimum.

6. *Wet detention basin design.* Wet detention basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing, and as much as feasible to be available for recreational use.

a. *Wet basin depths:* Wet basins shall be at least three (3) feet deep, excluding near shore banks and safety ledges. If fish habitat is to be provided they shall be at least ten (10) feet deep over 25 percent of the bottom area to prevent winter freeze out.

b. *Wet basin shoreline slopes:* The side slopes of wet basins at the normal pool elevation shall not be steeper than five (5) to one (1) (horizontal and vertical).

c. *Permanent pool volume:* The permanent pool volume in a wet basin at normal depth shall be equal to the runoff volume from its watershed for the 2-year event.

- d. *Inlet and outlet orientation:* To the extent feasible, the distance between detention inlets and outlets shall be maximized. If possible, they should be at opposite ends of the basin and located to avoid short-circuiting.
 - e. All storm water detention facilities other than roof tops, parking lots, and/or underground storage shall be located not less than seventy-five (75) feet from any building or structure to be occupied unless otherwise approved by the Village Engineer.
 - f. The wet basin's shoreline and side slopes shall be planted with native vegetation tolerant of water level fluctuations and water quality conditions associated with stormwater runoff.
 - g. Wet basins shall be designed to serve multiple functions including water quality, passive recreation, habitat, and aesthetics.
 - h. Landscape design around the wet basin shall not include invasive plant species.
7. *Dry detention basin design.* In addition to the other requirements of this ordinance, dry basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing and as much as feasible to be available for multiple uses.
- a. *Dry basin drainage:* Dry basins shall be designed so that they shall have standing water no longer than 72 hours for any runoff event less than the 100-year event. Under drains directed to the outlet may be used to accomplish this requirement.
 - b. *Velocity dissipation:* Velocity dissipation measures shall be incorporated into dry basin designs to minimize erosion at inlets and outlets and to minimize the resuspension of pollutants.
 - c. *Inlet and outlet orientation:* To the extent feasible, the distance between detention inlets and outlets shall be maximized. If possible, they should be at opposite ends of the basin.
 - d. *Minimum detention outlet size:* Where a single pipe outlet or orifice plate is to be used to control discharge, it shall have a minimum diameter of four (4) inches. If this minimum orifice size permits release rates greater than those specified in this section, and regional detention is not a practical alternative, alternative outlet designs shall be utilized which incorporate self cleaning flow restrictors.
 - e. All storm water detention facilities other than roof tops, parking lots, and/or underground storage shall be located not less than seventy-five (75) feet from any building or structure to be occupied unless otherwise approved by the Village Engineer.

8. *Detention in floodplains.* The placement of detention basins within the floodplain is strongly discouraged because of questions about their reliable operation during flood events. However, the stormwater detention requirements of this ordinance may be fulfilled by providing detention storage within flood fringe areas on the project site provided the following provisions are met.

a. *Detention in flood fringe areas:* The placement of a detention basin in a flood fringe area shall require compensatory storage for one and one-half (1.5) times the volume below the base flood elevation occupied by the detention basin including any berms. The release from the detention storage provided shall still be controlled consistent with the requirements of this section. The applicant shall demonstrate its operation for all stream flow and floodplain backwater conditions. Excavations for compensatory storage along watercourses shall be opposite or adjacent to the area occupied by detention. All floodplain storage lost below the 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All compensatory storage excavations shall be constructed to drain freely and openly to the watercourse.

b. *Detention in floodways:* Detention basins shall be placed in the floodway only in accordance with subsection (c) below.

c. *On-stream detention:* On-stream detention basins are discouraged but allowable if they provide regional public benefits and if they meet the other provisions of this ordinance with respect to water quality and control of the 2-year and 100-year, 24-hour events from the property. Further criteria are presented in Section 1.9 of this ordinance. If on-stream detention is used for watersheds larger than one (1) square mile, it is recommended that the applicant use dynamic modeling to demonstrate that the design will not increase stage for any properties upstream or downstream of the property. Also impoundment of the stream as part of on-stream detention:

- i. Shall not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning;
- ii. Shall not cause or contribute to the degradation of water quality or stream aquatic habitat;
- iii. Shall include a design calling for gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin;
- iv. Shall not involve any stream channelization or the filling of wetlands;
- v. Shall require the implementation of an effective nonpoint source management program throughout the upstream watershed;
- vi. Shall not occur downstream of a wastewater discharge; and

- vii. Shall comply with 92 Illinois Administrative Code Parts 702 and 708 and the floodplain ordinance of the Village.

9. *Drainage into wetlands.* Existing wetlands shall be protected from damaging modifications and adverse changes in runoff quality and quantity associated with land developments. In addition to the other requirements of this ordinance, the following requirements shall be met for all developments whose drainage flows into wetlands:

- a. *Detention in wetlands:* Existing wetlands shall not be modified for the purposes of stormwater detention unless it is demonstrated that the existing wetland is low in quality and the proposed modifications will improve its habitat and ability to perform beneficial functions. Existing depressional storage in wetlands shall be maintained and the volume of detention storage provided to meet the requirements of this section shall be in addition to this existing storage.
- b. *Sediment control:* The existing wetland shall be protected during construction by appropriate soil erosion and sediment control measures and shall not be filled.
- c. *Alteration of drainage patterns:* Site drainage patterns shall not be altered to substantially decrease or increase the existing area tributary to the wetland.
- d. *Detention/sedimentation:* All runoff from the development shall be routed through a preliminary detention/sedimentation basin incorporating pollutant removal functions and designed to capture the 2-year, 24-hour event and hold it for at least 24 hours, before being discharged to the wetland. This basin shall be constructed before property grading begins. In addition, the drainage hierarchy defined in Section 1.5 should be followed to minimize runoff volumes and rates being discharged to the wetland.
- e. *Vegetated buffer strip:* A buffer strip of at least 60 feet in width, preferable vegetated with native plant species, shall be maintained or restored around the periphery of the wetland.

10. *Street, parking lot, and culvert damage.*

- a. *Streets:* If streets are to be used as part of the minor or major drainage system, ponding depths shall not exceed curb heights by more than one (1) inch and shall not remain flooded for more than eight (8) hours for any event less than or equal to the 100-year event.
- b. *Parking lots:* The maximum stormwater ponding depth in any parking area shall not exceed six (6) inches for more than four (4) hours.
- c. *Culvert road and driveway crossings:* Sizing of culvert crossing shall consider entrance and exit losses as well as tailwater conditions on the culvert.

11. *Infiltration practices.* To effectively reduce runoff volumes, infiltration practices including basins, trenches, and porous pavement should be located on soils in hydrologic soil groups "A" or "B" as designated by the U.S. Soil Conservation Services. Infiltration basins and trenches designed to recharge groundwater shall not be located within 75 feet of a water supply well or a building foundation. A sediment settling basin shall be provided to remove coarse sediment from stormwater flows before they reach infiltration basins or trenches. Stormwater shall not be allowed to stand more than 72 hours over 80 percent of a dry basin's bottom area for the maximum design event to be ex-filtrated. The bottom of infiltration facilities shall be a minimum of four (4) feet above seasonally high groundwater and bedrock.

Redundant release structures need to be provided for the 2-year, 24-hour, and 100-year, 24-hour events, with release rates per Section 1.7(1)(a). Infiltration rate shall be based on a qualified soils engineer's analysis of the site, and confirmation that the actual conditions at the infiltration surface match those in the analysis. In the case of wet-bottom detention facilities, provisions shall be made to infiltrate water during fluctuating groundwater levels.

12. *Safety considerations.* The drainage system components, especially all detention basins, shall be designed to protect the safety of any children or adults coming in contact with the system during runoff events.

a. *Side slopes:* The side slopes of all detention basins at 100-year capacity shall be a level as practicable to prevent accidental falls into the basin and for stability and ease of maintenance. Side slopes of detention basins and open channels shall not be steeper than three (3) to one (1) (horizontal to vertical).

b. *Safety ledge:* All wet detention basins shall have a level safety ledge at least eight (8) feet in width two and one-half (2 1/2) to three (3) feet below the normal water depth.

c. *Velocity:* Velocities throughout the surface drainage system shall be controlled to safe levels taking into consideration rate and depths of flow.

d. *Overflow structures:* All stormwater detention basins shall be provided with an overflow structure capable of safely passing excess flows at a stage at least one (1) foot below the lowest foundation grade in the vicinity of the detention basin. The design flow rate of the overflow structure shall be equivalent to the 100-year inflow rate.

The existing 100-year peak rate of runoff from the area naturally tributary to the detention pond outfall shall not be exceeded if the restrictor is blocked.

13. *Maintenance considerations.* The stormwater drainage system shall be designed to minimize and facilitate maintenance. Turfed side slopes shall be designed to allow lawn mowing equipment to easily negotiate them. Wet basins shall be provided with alternate outflows which can be used to completely drain the pool for sediment removal. (Pumping

may be considered if drainage by gravity is not feasible.) Pre-sedimentation basins shall be included, where feasible, for localizing sediment deposition and removal. Access for heavy equipment shall be provided.

14. *Extended detention requirement.* The requirements of this section will apply only when an existing agricultural land use is downstream of and adjacent to a site runoff storage facility outlet. The runoff from a three-quarter (0.75) inch rainfall event over the hydraulically connected impervious area of the new development shall be stored below the elevation of the primary gravity outlet (extended detention) of the site runoff storage facility. The facility may be designed to allow for evapotranspiration or infiltration of this volume into a subsurface drainage system and shall not be conveyed through a direct positive connection to downstream areas.

The hydraulically connected impervious area used in the calculation of required extended detention volume may be reduced by the Village Administrator if the soils are prepared to maximize infiltration and deep rooted grasses or other plants selected for their ability to promote infiltration or water absorption are planted in areas appropriately dedicated. The reduction in hydraulically connected impervious area used in the calculation shall be equal to the area of the development meeting the above soils/native planting requirement.

Subsurface drainage systems may be designed as a component of the extended detention portion of the detention basin to assist in infiltration in accordance with the following criteria:

- a. The extended detention volume shall be discharged at a rate no greater than that required to empty the calculated extended detention volume with five (5) days of the storm event.
- b. No subsurface drainage pipe shall be located within ten (10) feet of drainage pipes directly connected to the detention basin.
- c. For purposes of meeting the maximum subsurface drainage discharge requirements, control orifices and weirs may be used.
- d. All design extended detention volume shall be provided above the seasonal high ground water table or the invert elevation of the ground water control system.
- e. Farm field tile shall not be considered a subsurface drainage system.

15. *Detention on sites where depressional storage exists.* For sites where depressional storage exists and the undeveloped release rate for the area tributary to the natural depression is less than the maximum release rate in Section 1.7(1)(a), the developed release rate and corresponding storage volume for that portion of the site tributary to the natural depression shall be based on the existing undeveloped release rate from the natural depression. The runoff from off-site areas tributary to the natural depression shall be calculated using the existing conditions for these off-site areas.

16. *Storage facilities* shall facilitate sedimentation and catchment of floating material. Unless specifically approved by the Village Administrator, concrete-lined low-flow ditches shall not be used in detention basins.

Section 1.8 – Accommodating flows from upstream tributary areas.

Stormwater runoff from areas tributary to the property shall be considered in the design of the property's drainage system. Whenever practicable, flows from upstream areas that are not to be detained should be routed around the basin being provided for the site being developed.

1. Upstream areas not meeting ordinance requirements.

When there are areas not meeting the storage and release rates of this ordinance, tributary to the applicant's property, regionalized detention on the applicant's property shall be explored by the applicant. The following steps shall be followed:

- a. The applicant shall compute the storage volume needed for his property using the release rates of Section 1.7, the applicant's property area, and the procedures described in Section 1.7.
- b. Areas tributary to the applicant's property, not meeting the storage and release rate requirements of this ordinance, shall be identified.
- c. Using the areas determined in 801.b. above plus the applicant's property area, total storage needed for the combined properties shall be computed.

Allowable release rates shall be computed using the combined property areas. Storage shall be computed as described in Section 1.7. If tributary areas are not developed, a reasonable fully developed land cover, based on local zoning, shall be assumed for the purposes of computing storage.

Once the necessary combined storage is computed, the Village may choose to pay for oversizing the applicant's detention basin to accommodate the regional flows. The applicant's responsibility will be limited to the storage for his property as computer in "a" above. If regional storage is selected by the Village, then the design produced in "c" above shall be implemented. If regional storage is rejected by the Village, the applicant shall bypass all tributary area flows around the applicant's basin whenever practicable. If the applicant must route upstream flows through his basin and the upstream areas exceed one square mile in size, the applicant must meet the provisions of Section 1.7(8)(c) for on-stream basins.

2. Upstream areas meeting ordinance requirements. When there are areas which meet the storage and release rate requirements of this ordinance, tributary to the applicant's property, the upstream flows shall be bypassed around the applicant's detention basin if this is the only practicable alternative. Storage needed for the applicant's property shall still be computer as described in Section 1.8(1)(a). However, if the Village decides to route tributary area flows through an applicant's basin, the final design stormwater releases shall be based on the combined total of the applicant's property plus tributary

areas. It must be shown that at no time will the runoff rate from the applicant's property exceed the allowable release rate for his/her property alone.

Section 1.9 - Early completion of detention facilities.

Where detention, retention, or depressional storage areas are to be used as part of the drainage system for a property, they shall be constructed as the first element of the initial earthwork program. Any eroded sediment captured in these facilities shall be removed by the applicant before project completion in order to maintain the design volume of the facilities.

Section 1.10 - Stormwater requirements for agricultural land use including croplands, pasture lands and farmsteads.

Applicability: Regulations under this section apply only to croplands, pasturelands, farmsteads, and outbuildings associated with those agricultural practices. Compliance with the requirements of this section shall be construed as compliance with the stormwater ordinance for the above land uses and no further regulation under the ordinance will apply. Any other land use, including greenhouses, nurseries, container grown plants, equestrian facilities, the sale of agricultural products to the public or where commercial activities involving the new construction of gravel or paved parking facilities or buildings whose aggregate area is 25,000 square feet or more are required to comply with all applicable sections of this ordinance.

1. *Conservation planning and performance standards.* To comply with this section, landowners shall practice conservation planning whose product shall be a management system, which addresses site runoff, soil erosion and sediment control, surface and subsurface drainage. Any acreage with a signed and approved NRCS Conservation Plan is exempt from the requirements of this section and the ordinance.

Applicable approved practices include:

- a. Vegetated grass waterways;
- b. Contour buffer strips;
- c. Critical area planting and cover crops;
- d. Terrace ridges and diversions;
- e. Contour strip cropping;
- f. Contour framing;
- g. Crop rotation;
- h. Conservation tillage and crop residue management; and

- i. Other standard practices for conservation planning in accordance with the NRCS Field Office Technical Guide (current edition) or as otherwise approved by the Will County NRCS District Conservationist or the Will County Agricultural Administrator.

The performance standard for conservation planning shall be a management system which will develop a set of field practices which will reduce the calculated actual soil loss to the "tolerable soil loss" (T) as calculated by the revised universal soil loss equation of the actual site conditions. Cropland tillage and resource management methods shall be **consistent with the** Technical Guide Notice IL-108 and shall be considered evidence of compliance with the "T" performance standard.

2. *Drainage practices, requirements and design criteria.* Drainage for agricultural purposes shall be consistent with those practices identified as appropriate for the "good husbandry" given the soil types, slopes and crops. An agricultural drainage system may consist of both subsurface drainage systems and surface drainage systems. Where active drainage districts maintain drainage systems, they shall be consulted on surface and subsurface drainage within the district boundaries. Requirements applying to subsurface and surface drainage system shall be as follows:

- a. *Subsurface drainage systems.* Drain tile systems shall be maintained and constructed in accordance with subsurface drainage recommendations for the appropriate soil drainage group as specified by The Illinois Drainage Guide, University of Illinois Extension Service Circular No. 1226. Surface inlets into the subsurface drainage system shall be allowed only to maintain good husbandry. Where their use cannot be practicably avoided due to topography, they shall be installed using flow controls such as orifices and perforated risers with gravel filters and / or vegetative filters.
- b. *Surface drainage systems.* Surface drainage systems shall be maintained and constructed in accordance with surface drainage recommendations for the appropriate soil drainage group as specified by the Illinois Drainage Guide, University of Illinois Extension Service No. 1226. Surface drainage systems shall be built with geotechnically stable slopes and the surface when applicable shall be further stabilized utilizing the establishment of cool and warm season grass mixes as identified in Field Office Technical Guide (Illinois 108).
- c. *Buffer strips.* Open channels with a definable bed and banks shall use buffer strips in order to reduce the amount of erosion occurring from the conveyed flows as well as to help filter the runoff from the site into the waterway. Buffer strips shall be a minimum of 15 feet wide from the top of bank except where smaller widths are necessary due to site limitations and when approved by the Village Administrator.
- d. *Agricultural drainage systems* shall also comply with all regulations regarding wetlands as enforced by federal, state, and local agencies.

3. *Sediment control for open channels.* All open channel drainage systems shall maintain practices adjacent to the open outlet channel that will reduce the transportation of sediment off-site. Runoff from agricultural fields must pass through a sediment control system prior to discharge into the open channel conveyance system. Approved sediment control systems may consist of the following:

- a. Vegetated buffer zones planted with permanent grasses appropriate for soil stabilization and filtering;
 - b. Grade control structures for over fall stabilization;
 - c. Sediment traps adjacent to the stream channel;
 - d. Other standard practices for conservation planning in accordance with the NRCS Field Office Technical Guide (current edition) or as otherwise approved by the Will County NRCS District Conservationist or the Village Administrator.
4. *Maintenance and construction of drainage systems.* Agricultural drainage systems shall be maintained so as to convey the expected flows for good drainage practices. The existing agricultural surface drainage systems shall not be enlarged unless such enlargement is consistent with all other sections of this Section 1.10. Maintenance and construction of subsurface drainage systems will not be subject to the requirements of other sections of this ordinance except as they are regulated by other agencies. Maintenance projects by legally functioning drainage districts on existing agricultural drainage systems will not be subject to further permitting requirements under this ordinance except as they relate to the jurisdiction of other agencies.

Section 1.11 - Maintenance responsibility.

Maintenance of stormwater drainage facilities located on private property shall be the responsibility of the owner of that property. Before a construction permit is obtained from the Village, the applicant shall execute a maintenance agreement with the Village guaranteeing that the applicant and all future owners of the property will maintain its stormwater drainage system. The maintenance agreement shall also specifically authorize representatives of the Village to enter on to the property for the purpose of inspections and maintenance of the drainage system. Such agreement shall be recorded with the Record of Deeds of Will County. The maintenance agreement shall include a schedule for regular maintenance of each aspect of the property's stormwater drainage system and shall provide for access to the system for inspection by authorized personnel of the Village. The maintenance agreement shall also stipulate that if the Village attorney notifies the property owner in writing of maintenance problems which require correction, the property owner shall make such corrections within 30 calendar days of such notification. If the corrections are not made within this time period the Village may have the necessary work completed and assess the cost to the property owner.

The Village has the option of requiring a bond to be filed by the property owner for maintenance of the stormwater drainage system.

1. *Long-term maintenance.* Unless maintenance responsibility has been delegated to and accepted by another qualified entity under this section, the owner shall maintain that portion of a stormwater drainage system located upon his land. With the approval of the Village Administrator the stormwater drainage system, or specified portions thereof, may be:

- a. Dedicated or otherwise transferred to and accepted by the permitting community or other public entity;
- b. Conveyed or otherwise transferred to and accepted by a homeowner's association, or similar entity, the members of which are to be the owners of all of the lots or parcels comprising the development; or
- c. Conveyed to one (1) or more persons or in one (1) or more undivided interests to one (1) or more persons.

Except for those portions of a stormwater drainage system to be dedicated or otherwise transferred to the permitting authority or other public entity, included in the application for a stormwater permit shall be a plan for the long-term management, operation and maintenance of the stormwater drainage system and a description of the sources of funding therefore. Amendments to the plan must be approved by the Village Administrator.

2. *Transfer to permitting authority or other public entity.* If any portion of the stormwater drainage system is to be dedicated or otherwise transferred to the permitting authority or other public entity under Section 1.11(1)(a), appropriate easements for ingress and egress to and maintenance of such portions shall be reserved for the benefit of such entity on the final plat.

3. *Transfer to homeowner's or similar association.* If any portion of the stormwater drainage system is to be conveyed or otherwise transferred to a homeowner's or similar association under Section 1.11(1)(b) then:

- a. Appropriate easements for ingress and egress to and maintenance of such portions shall be reserved for the benefit of such association and the permitting authority on the final plat;
- b. The association shall be duly incorporated and a copy of the certificate of incorporation, duly recorded, and bylaws, and any amendment to either of them, shall be delivered to the Village Administrator;
- c. The bylaws of the association shall, at a minimum, contain:
 - i. A provision acknowledging and accepting the association's obligation to maintain certain portions of the stormwater drainage system as required by this ordinance;

- ii. A mechanism for imposing an assessment upon the owners of all of the lots or parcels comprising the development sufficient, at a minimum, to provide for the maintenance of those portions of the stormwater drainage system as required by this ordinance and the payment of all taxes levied thereon;
- iii. A provision adopting the plan of long term maintenance set forth in the application for a stormwater management permit, with approved amendments;
- iv. A provision identifying the officer of the association responsible for carrying out the obligations imposed upon the association under this ordinance, and an obligation to inform the Village Administrator of the name, address and phone number of this officer and any changes thereto;
- v. A provision requiring the consent of the permitting authority to any amendment of the bylaws changing any of the provisions of the bylaws required by this ordinance; and
- vi. A provision requiring the consent of the permitting authority to the dissolution of the association.

d. Any conveyance or other instrument of transfer delivered under Section 1.11(1)(b) shall include a covenant affirmatively imposing upon the association's affirmative acceptance thereof.

4. *Conveyance to one (1) or more persons.* If any portion of the stormwater drainage system is to be conveyed to one (1) or more persons under Section 1.11(1)(c), then:

- a. Appropriate easements for ingress and egress to and maintenance of such portions shall be reserved for the benefit of the permitting authority on the final plat;
- b. The final plat shall contain a legend imposing the maintenance obligations of this section upon the grantee and his successors in interest as a covenant running with the land and incorporating by reference the plan of long term maintenance set forth in the application for a stormwater management permit, with approved amendments;
- c. The final plat shall contain a legend reserving the right of the permitting authority to enter upon the land to perform the maintenance required in this section if the owner does not do so and to place a lien against the land for the cost thereof;
- d. Any conveyance delivered under Section 1.11(1)(c), and any subsequent conveyance, shall include a covenant imposing upon the grantee the obligations,

restrictions and provisions set forth in this section and the grantee's affirmative acceptance thereof.

5. *Incorporation of maintenance obligations in stormwater management permit.* The provisions of this section shall be incorporated by reference in the stormwater management permit and the applicant's acceptance of the permit shall be deemed to be the applicant's acceptance and assumption of the obligations imposed under this section. At the option of the Village Administrator, the stormwater management permit may be recorded.

6. *Funding of long term maintenance of stormwater facilities.* As a condition of approval of any application for a stormwater management permit, unless the maintenance responsibility for the stormwater drainage system to be constructed or installed in connection therewith has been accepted by a public entity, the Village Administrator will require assurance of long-term funding in a form found acceptable to the permitting authority. A corporation with a bond rating of "A" or higher from a major investment firm (i.e. Standard and Poor, Moody or equivalent) will be considered to have met the long-term maintenance funding requirement. Absent some other form of agreement, then the Village Administrator shall require the establishment of a special service area pursuant to 35 ILCS 200/27-5, et seq. either as the primary means of providing for the long term maintenance of the facilities, or as a backup vehicle in the event the entity designated by the applicant as having primary maintenance responsibility fails to adequately carry out its duties.

If the establishment of a special service area is required, the Village Administrator shall make, consider and approve a good faith estimate by the applicant of the tax rate required to produce a tax to be levied upon all taxable property within the area, sufficient for the long term maintenance of the facilities and submit the same to the permitting authority which shall incorporate such rate into its enactment of the ordinances necessary for the establishment of the area. The ordinances to be enacted by the permitting authority shall be substantially in the form set forth in Appendix F.

On or before August 1 of each year thereafter, the Village Administrator shall submit to the permitting authority a good faith estimate of the amount of tax required to be levied upon all taxable property within the area for the next fiscal year for the continued maintenance of the stormwater drainage system.

7. All regulated sites must have post-construction management that meets or exceeds the requirements of Section IV (D)(2)(b) of NPDES permit No. ILR10 including management practices, controls, and other provisions at least as protective as the requirements contained in the Illinois Urban Manual, 2002.

Section 1.12 - Administration.

1. *Inspections.*

a. *Inspections during construction:* General site grading shall not begin until any necessary detention facilities are in place and operational. The Village building official or his representative will also conduct periodic inspections of the work in progress to be certain that the drainage system is being built as designed. If any violations of the provisions or requirements of this ordinance are noted during such inspections, the Village building official shall notify the property owner in writing of the items needing correction. The property owner shall be given ten (10) calendar days to make such corrections unless given a specific extension of time in writing by the Village building official.

Failure to complete such corrections within the specified time period shall constitute a violation of this ordinance.

b. *Final inspection:* Upon notification by the applicant that the drainage system is completed, the Village Engineer or his representative shall conduct a final inspection. If the drainage system is found to contain deficiencies which require correction the Village shall notify the property owner of the necessary corrections. The property owner shall correct such deficiencies within ten (10) calendar days unless given a specific extension of time in writing by the Village. Failure to make necessary corrections within the specified time period shall constitute a violation of this ordinance. Upon finding that the drainage system meets the provisions and requirements of this ordinance the Village Engineer shall issue a written report of drainage system completion to the Village Administrator and Board of Trustees. The Village shall notify the property owner of satisfactory completion.

c. *Routine inspections:* All privately owned drainage systems shall be inspected by representatives of the Village not less often than once per year. A written report shall be filed of the results of any inspection and a copy sent to the property owner detailing any problems which need correction.

2. **Enforcement.** The administration and enforcement of this ordinance shall be the responsibility of the building department of the Village.

3. **Appeals.** All appeals to the Village Engineer's, Village Building Official's or Village Administrator's decisions regarding the interpretation of this ordinance shall be heard by the Village president and Board of Trustees of the Village.

Section 1.13 - Severability.

If any section, clause, provision or portion of this ordinance is judged unconstitutional or invalid by a court of competent jurisdiction, the remainder of this ordinance shall remain in force and not be affected by such judgment.

Section 1.14 - Penalties.

Any person convicted of violating any of the provisions or requirements of this ordinance shall be guilty of an ordinance violation and shall be subject to a fine of not more than one thousand dollars (\$750.00). Each day the violation continues shall be considered a separate offense.

Sec. 2.0 Soil Erosion and Sedimentation Control Ordinance.

Section 2.1. Findings and purpose.

1. *Findings.* The board of trustees of the Village hereby finds that:
 - a. Excessive quantities of soil may erode from areas undergoing development for certain non-agricultural uses including but not limited to the construction of dwelling units, commercial buildings industrial plants, the building of roads and highways, the modification of stream channels and drainageways, and the creation of recreational facilities;
 - b. The washing, blowing, and falling of eroded soil across and upon roadways endangers the health and safety of users thereof, by vision and reducing traction of road vehicles;
 - c. Soil erosion necessitates the costly repairing of gullies, washed-out fills, and embankments;
 - d. Sediment from soil erosion tends to clog sewers and ditches and to pollute and silt rivers, streams, lakes, wetlands, and reservoirs;
 - e. Sediment limits the use of water and waterways for most beneficial purposes, promotes the growth of undesirable aquatic weeds, destroys fish and other desirable aquatic life, and is costly difficult to remove; and
 - f. Sediment reduces the channel capacity of waterways and the storage capacity of floodplains and natural depressions, resulting in increased chances of flooding at risk to public health and safety.
2. *Purpose.* The board of trustees therefore declares that the purpose of this ordinance is to safeguard persons, protect property, prevent damage to the environment, and promote the public welfare by guiding, regulating and controlling the design, construction, use and maintenance of any development or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth on land situated in the Village. It is the intention of this ordinance that the delivery of sediment from sites affected by land disturbing activities be limited, as closely as practicable, to that which would have occurred if the land had been left in its natural undisturbed state.

Section 2.2. Definitions.

For the purposes of this ordinance certain terms used herein are defined as set forth below:

Building permit. A permit issued by the Village for the construction, erection or alteration of a structure or building.

Certify or certification. Formally attesting that the specific inspections and tests where required have been performed, and that such tests comply with the applicable requirements of this ordinance.

Clearing. Any activity which removes vegetative ground cover.

Cubic yards. The amount of material in excavation and/or fill measured by the method of "average end areas".

Excavation. Any act by which organic matter, earth, sand, gravel, rock or any other similar material is cut into, dug, quarried, removed, displaced, relocated or bulldozed and shall include the conditions resulting therefrom.

Existing grade. The vertical location of the existing ground surface prior to excavation or filling.

Fill. Any act by which earth, sand, gravel, rock or any other material is deposited, placed, replaced, pushed, dumped, pulled, transported or moved by man to a new location and shall include the conditions resulting therefrom.

Final grade. The vertical location of the ground or pavement surface after the grading work is completed in accordance with the site development plan.

Grading. Excavation or fill or any combination thereof and shall include the conditions resulting from any excavation or fill.

Natural drainage. Channels formed in the existing surface topography of the earth prior to changes made by unnatural causes.

Parcel. All contiguous land in one (1) ownership.

Permittee. Any person to whom a site development permit is issued.

Person. Any individual, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, and the United States of America, its agencies and instrumentalities, and any agent, servant, officer or employee of any of the foregoing.

Removal. Cutting vegetation to the ground or stumps, complete extraction, or killing by spraying.

Site. A lot or parcel of land, or a contiguous combination thereof, where grading work is performed as a single unified operation.

Site development. Altering terrain and/or vegetation and constructing improvements.

Site development permit. A permit issued by the Village for the construction or alteration of ground improvements and structures for the control of erosion, runoff and grading.

Stream. Any river, creek, brook, branch, flowage, ravine, or natural or man-made drainageway which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

Stripping. Any activity which removes the vegetative surface cover including tree removal, clearing, and storage or removal of top soil.

Vacant. Land on which there are no structures or only structures which are secondary to the use or maintenance of the land itself.

Village. The Village of Beecher, Will County, Illinois.

Wetlands. Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for line if saturated soil conditions.

Section 2.3. General principles.

It is the objective of this ordinance to control soil erosion and sedimentation caused by development activities, including clearing, grading, stripping, excavating, and filling of land in the Village. Measures taken to control soil erosion and offsite sediment runoff should be adequate to assure that sediment is not transported from the site by a storm event of 10-year frequency or less. The erosion and sedimentation control practices discussed in the Illinois Urban Manual and the following principles shall apply to all development activities within the Village and to the preparation of the submissions required under Section 2.4 of this ordinance:

1. Development should be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes where high cuts and fills may be required should be avoided wherever possible, and natural contours should be followed as closely as possible.
2. Natural vegetation should be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, and wetlands should be left undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures.
3. Special precautions should be taken to prevent damages resultant from any necessary development activity within or adjacent to any stream, lake, pond, or wetland. Preventative measures should reflect the sensitivity of these areas to erosion and sedimentation.
4. The smallest practical area of land should be exposed for the shortest practical time during development.

5. Sediment basins or traps, filter barriers, diversions, and any other appropriate sediment or runoff control measures should be installed prior to site clearing and grading and maintained to remove sediment from run-off waters from land undergoing development.
6. The selection of erosion and sedimentation control measures should be based on assessment of the probable frequency of climatic and other events likely to contribute to erosion, and on evaluation of the risks, costs, and benefits involved.
7. In the design of erosion control facilities and practices, aesthetics and the requirements of continuing maintenance should be considered.
8. Provision should be made to accommodate the increased run-off caused by changed soil and surface conditions during and after development. Drainageways should be designed so that their final gradients and the resultant velocities and rates of discharge will no create additional erosion onsite or downstream.
9. Permanent vegetation and structures should be installed and functional as soon as practical during development.
10. Those areas being converted from agricultural purposes to other land uses should be vegetated with an appropriate protective cover prior to development.
11. All waste generated as a result of site development activity should be properly disposed of and should be prevented from being carried off the site by either wind or water.
12. All construction sites should provide measures to prevent sediment from being tracked onto public or private roadways.

Section 2.4. Site development permit.

1. *Permit required.* Except as otherwise provided in this ordinance, no persons shall commence or perform any clearing, grading, stripping, excavating, or filling of land which meets the following provisions without having first obtained a site development permit from the Building Department of the Village.
 - a. Any land distributing activity (i.e., clearing, grading, stripping, excavation, fill, or any combination thereof) that will affect an area in excess of 5,000 square feet;
 - b. Any land disturbing activity that will affect an area in excess of 500 square feet if the activity is within 25 feet of a lake, pond, stream, or wetland; or
 - c. Excavation, fill, or any combination thereof that will exceed 100 cubic yards.

2. *Exceptions.* A permit shall not be required for any of the following provided that the person responsible for any such development shall implement necessary soil erosion and sediment control measures to satisfy the principles set forth in Section 2.3 of this ordinance.

- a. Excavation below final grade for the basement and footings of a single-family residence and appurtenant structures on a site in excess of two (2) acres for which a building permit has been issued by the Village.
- b. Agricultural use of land, including the implementation of conservation measures included in a farm conservation plan approved by the Soil and Water Conservation District and including the construction of agricultural structures;
- c. Installation, renovation, or replacement of a septic system to serve an existing dwelling or structure.

3. *Application for permit.* Application for a site development permit shall be made by the owner of the property or his authorized agent to the Planning Department on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site and of any consulting firm retained by the applicant together with the name of the applicant's principal contact as such firm. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit. All costs incurred by the Village and their associates during the review of this permit application will be paid by the developer.

4. *Submissions.* Each application for a site development permit shall be accompanied by the following information:

- a. A vicinity map in sufficient detail to enable easy location in the field of the site for which the permit is sought, and including the boundary line and approximate acreage of the site, existing zoning, and a legend and scale.
- b. A development plan of the site showing:
 - i. Existing topography of the site and adjacent land within approximately 100 feet of the boundaries, drawn at no greater than two (2) foot contour intervals and clearly portraying the conformation and drainage pattern of the area.
 - ii. The location of existing buildings, structures, utilities, streams, lakes, floodplains, wetlands and depressions, drainage facilities, vegetative cover, paved areas, and other significant natural or man-made features on the site and adjacent land within 100 feet of the boundary.
 - iii. A general description of the predominant soil types on the site, their location, and their limitations for the proposed use.

iv. Proposed use of the site, including present development and plan utilization; areas of clearing, stripping, grading, excavation, and filling; proposed contours, finished grades, and street profiles; provisions for storm drainage, including storm sewers, swales, detention basins and any other measures to control the rate of runoff, within a drainage area map, indications of flow directions, and computations; kinds and locations of utilities; and areas and acreage proposed to be paved, covered, sodded or seeded, vegetatively stabilized, or left undisturbed.

c. An erosion and sediment control plan that meets or exceeds the requirements of Part IV of NPDES Permit Number ILR10, including management practices, controls, and other provisions at least as protective as the requirements contained in the Illinois Urban Manual, 2002. This plan must also show all measures necessary to meet the objectives of this ordinance throughout all phases of construction and permanently after completion of development of the site, including:

i. Location and description, including standard details, of all sediment control measures and design specifics of sediment basins and traps, including outlet details.

ii. Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer application, kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of non-vegetative stabilization measures.

iii. Location and description of all runoff control measures, including diversions, waterways, and outlets.

iv. Location and description of methods to prevent tracking of sediment offsite, including construction entrance details, as appropriate.

v. Description of dust and traffic control measures.

vi. Locations of stockpiles and description of stabilization methods.

vii. Description of off-site fill or borrow volumes, locations, and methods of stabilization.

viii. Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance.

ix. Identification (name, address, and telephone) of the person(s) or entity which will have legal responsibility for maintenance of erosion control structures and measures during development and after development is completed.

d. The proposed phasing of development of the site, including stripping and clearing, rough grading and construction, and final grading and landscaping. Phasing should identify the expected date on which clearing will begin, the estimated duration of exposure of cleared areas, and the sequence of installation of temporary sediment control measures (including perimeter controls), clearing and grading, installation of temporary soil stabilization measures, installation of storm drainage, paving streets and parking areas, final grading and the establishment of permanent vegetative cover, and the removal of temporary measures. It shall be the responsibility of the applicant to notify the Planning Department of any signification changes which occur in the site development schedule after the initial erosion and sediment control plan has been approved.

These submissions shall be prepared in accordance with the requirements of this ordinance and the standards and requirements contained in the "Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement", prepared by the Natural Resources Conservation Service for the Illinois EPA, and the "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" (the Green Book) prepared by the Northeastern Illinois Soil Erosion and Sedimentation Control Steering Committee and adopted by the Will County Soil and Water Conservation District, which standards and requirements are hereby incorporated into this ordinance by reference.

The Village may waive specific requirements for the content of submissions upon finding that the information submitted to show that the work will comply with the objectives and principles of this ordinance.

5. *Bonds.* The applicant is required to file with the Village a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the Village Attorney in an amount deemed sufficient by the Village Engineer and Village Attorney to cover all costs of improvements, landscaping, maintenance of improvements and landscaping, and soil erosion and sediment control measures for such period as specified by the Village, and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site. The bond will in no case be less than 1500 dollars per acre of site construction. This amount shall be included in the engineer's estimate for all site improvements. If a project consists solely of a grading permit or if earth work commences prior to final project approval, a separate cash deposit will be required in the amount specified above or greater.

6. *Review and approval.* Each application for a site development permit shall be reviewed and acted upon according to the following procedures:

- a. The Planning Department will review each application for a site development permit to determine its conformance with the provisions of this ordinance. The Planning Department may also refer any application to the Will County Soil and Water Conservation District and/or any other local government or public agency within whose jurisdiction the site is located for review and comment. Within 30 days after receiving an application, the Planning Department shall in writing:
 - i. Approve the permit application if it is found to be in conformance with the provisions of this ordinance, and issue the permit.
 - ii. Approve the permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this ordinance, and issue the permit subject to these conditions; or
 - iii. Disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission.
 - b. No site development permit shall be issued for an intended development site unless:
 - i. the development, including but not limited to subdivisions and planned unit development, has been approved by the Village where applicable, or
 - ii. such permit is accompanied by or combined with a valid building permit issued by the Village, or
 - iii. the proposed earth moving is coordinated with any overall development program previously approved by the Village for the area in which the site is situated; and
 - iv. all relevant federal and state permits (i.e., for floodplains and wetlands) have been received for the portion of the site subject to soil disturbance.
 - c. Failure of the Village to act on an original or revised application within 30 days of receipt shall authorize the applicant to proceed in accordance with the plans as filed unless such time is extended by agreement between the Village and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the Village.
7. *Expiration of permit.* Every site development permit shall expire and become null and void if the work authorized by such permit has not been commenced within 180 days, or is not completed by a date which shall be specified in the permit; except that the Planning Department may, if the permittee presents satisfactory evidence that unusual difficulties have prevented work being commenced or completed within the specified time limits, grant a reasonable extension of time if written application is made before the

expiration date of the permit. The Planning Department may require modification of the erosion control plan to prevent any increase in erosion control plan to prevent any increase in erosion or offsite sediment runoff resulting from any extension.

8. *Appeals.* The applicant, or any person or agency which received notice of the filing of the application may appeal the decision of the Planning Department as provided in Section 2.4(6), to the Board of Trustees. Upon receipt of an appeal, the Board of Trustees shall schedule and hold a public hearing, after giving 15 days notice thereof. The Board shall render a decision within 30 days after the hearing. Factors to be considered on review shall include, but need not be limited to, the effects of the proposed development activities on the surface water flow to tributary and downstream lands, any comprehensive watershed management plans, or the use of any retention facilities; possible saturation of fill and unsupported cuts by water, both natural and domestic; runoff surface waters that produce erosion and silting of drainageways; nature and type of soil or rock which when disturbed by the proposed development activities may create earth movement and produce slopes that cannot be landscaped and excessive and unnecessary scarring of the natural landscape through grading or removal of vegetation.

9. *Retention of plans.* Plans, specifications, and reports for all site developments shall be retained in original form or on microfilm by the Village.

Section 2.5. Design and operation standards and requirements.

1. *Applicability.* All clearing, grading, stripping, excavating, and filling which is subject to the permit requirements of this ordinance shall be subject to the applicable standards and requirements set forth in this Section 2.5.

2. *Responsibility.* The permittee shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the Village or its officers or agents will not be made liable for such damage, by:

- a. The issuance of a permit under this ordinance,
- b. Compliance with the provisions of that permit or with conditions attached to it by the Planning Department,
- c. Failure of Village officials to observe or recognize hazardous or unsightly conditions,
- d. Failure of Village officials to recommend denial of or to deny a permit, or
- e. Exemptions from the permit requirements of this ordinance.

3. *Site 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.

i. 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 offsite runoff as specified in reference 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.

ii. 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.

iii. 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.

iv. Sediment basins and sediment traps designs shall provide for both detention storage and sediment storage. The detention storage shall be composed of equal volumes of "wet" detention storage and "dry" detention storage and each shall be sized for the 2-year, 24-hour runoff from the site under maximum runoff conditions during construction. The release rate of the basin shall be that rate required to achieve minimum detention times of at least ten (10) hours. The elevation of the outlet structure shall be placed such that it only drains the dry detention storage.

v. The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume of sediment generated in one (1) year. For construction periods exceeding one (1) year, the one (1) year sediment load and a sediment removal schedule may be substituted.

vi. The developer and contractors shall use a water wagon or other acceptable means on the project site to control dust, at a minimum of once each day during dry conditions or more frequently as directed by the Village Engineer.

vii. All streets used by the developer, contractors, or suppliers in or adjacent to the development shall be kept free of debris, dirt, dust, and mud. Streets shall be left in a clean condition at the end of each day's work. Developers and contractors who fail to keep streets clean shall be responsible for street cleaning expenses incurred by the Village.

- b. Stormwater conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed and constructed to withstand the expected flow velocity from the 10-year frequency storm without erosion. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards:
 - i. For grades up to four (4) percent, seeding in combination with mulch, erosion blanket, or an equivalent control measure shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the channel.
 - ii. For grades of four (4) to eight (8) percent, sod or an equivalent control measure shall be applied in the channel.
 - iii. For grades greater than eight (8) percent, rock, riprap, or an equivalent control measure shall be applied, or the grade shall be effectively reduced using drop structures.
- c. Disturbed areas shall be stabilized with temporary or permanent measures within three (3) calendar days following the end of active disturbance, or re-disturbance, consistent with the following criteria:
 - i. Appropriate temporary or permanent stabilization measures shall include seeding (which may include rye), mulching, sodding, and/or non-vegetative measures.
 - ii. Areas having slopes greater than 12 percent shall be stabilized with sod, mat or blanket in combination with seeding, or equivalent.
- d. Land disturbance activities in stream channels shall be avoided, where possible. If disturbance activities are unavoidable, the following requirements shall be met:
 - i. Construction vehicles shall be kept out of the stream channel to the maximum extent practicable. Where construction crossings are necessary, temporary crossings shall be constructed on non-erosive material, such as riprap or gravel.
 - ii. The time and area of disturbance of stream channels shall be kept to a minimum. The stream channel, including bed and banks, shall be restabilized within 48 hours after channel disturbance is completed, interrupted, or stopped.
 - iii. Whenever channel relocation is necessary, the new channel shall be constructed in the dry and fully stabilized before flow is diverted.
- e. Storm sewer inlets and culverts shall be protected by straw bales, sediment traps or filter barriers meeting accepted design standards and specifications. Straw

bales and silt fences shall be inspected weekly and after rainfall events in excess of one-half (1/2) inch to determine required repairs and/or replacement. As a minimum, straw bales are to be replaced every three (3) months or as required by the Village Engineer. If tributary drainage areas are greater than one (1) acre, sediment basins shall be constructed in addition to using straw bales and silt fences.

f. Soil storage piles containing more than ten (10) cubic yards of material shall not be located with a downslope drainage length of less than 35 feet to a roadway, drainage channel, drainage swale, or detention basin and no closer than the required buffer distance plus 10 feet from streams, lakes, or wetlands. Filter barriers, including straw bales, filter fence, or equivalent, shall be installed on the downslope side of the piles. Filter barriers shall be installed a minimum distance of 10 feet from the stockpile edge and shall not be located within the buffer zone of adjacent streams, lakes, or wetlands.

g. If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins or equivalent.

h. Each site shall have graveled (or equivalent) entrance roads, access drives, and parking areas of sufficient length and width to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by shoveling or street cleaning (not flushing) before the end of each workday and transported to a controlled sediment disposal area.

i. All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure effective performance of their intended function.

j. All temporary erosion and sediment control measures shall be disposed of within 30 days after final site stabilization is achieved with permanent soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition of temporary measures should be permanently stabilized to prevent further erosion and sedimentation.

k. The condition of the construction site for the winter shut down period shall address proper sediment and erosion control early in the fall growing season so that slopes and other bare earth areas may be stabilized with temporary and/or permanent vegetative cover. All open areas that are to remain idle throughout the winter shall receive temporary erosion control measure including temporary seeding, mulching and/or erosion control blanketing prior to the end of the fall growing season. The areas to be worked beyond the end of the growing season must incorporate soil stabilization measures that do not rely on vegetative cover such as erosion control blankets and heavy mulching.

1. All waste generated as a result of site development activity should be properly disposed of and should be prevented from being carried off the site by either wind or water.
4. *Handbooks adopted by reference.* The standards and specifications contained in the "Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement", prepared by the Natural Resources Conservation Service for the Illinois EPA, and the "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" (the Green Book) cited in Section 2.4, are hereby incorporated into this Section and made a part hereof by reference for the purpose of delineating procedures and methods of operation under site development and erosion and sedimentation control plans approved under Section 2.4. In the event of conflict between provisions of said manuals and of this ordinance, the ordinance shall govern.
5. *Maintenance and control measures.* All soil erosion and sediment control measures necessary to meet the requirements of this ordinance shall be maintained periodically by the applicant or subsequent land owner during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance. The Developer will identify and provide to the Village the name of the person(s) or entity which will have legal responsibility for maintenance of erosion control structures and measures after development is completed.
6. *Inspection.* The Building Official or his representative shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the site development or erosion and sedimentation control plan as approved. Plans for grading, stripping, excavating, and filling work bearing the stamp of approval of the Building Official or his representative shall be maintained at the site during progress of the work. In order to obtain inspections and to ensure compliance with the approved erosion and sediment control plan, the grading or building permit, and this ordinance, the permittee shall notify the Building Official within two (2) working days of the completion of the construction stages specified below:
 - a. 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;
 - b. After stripping and clearing;
 - c. After rough grading;
 - d. After final grading;
 - e. After seeding and landscaping deadlines; and
 - f. After final stabilization and landscaping, prior to removal of sediment controls.

If stripping, clearing, grading and/or landscaping are to be done in phases or areas, the permittee shall give notice and request inspection at the completion of each of the above work stages in each phase or area. If an inspection is not made and notification of the results given within five (5) working days after notice is received by the Village from the permittee, the permittee may continue work at his/her own risk, without presuming acceptance by the Village. Notification of the results of the inspection shall be given in writing at the site.

At the completion of the any project, storm sewers, gutters, etc. will be inspected by the Village to determine any cleaning or flushing of trapped sediment which may be required due to erosion. The responsibility for that work lies with the site developer.

7. *Special precautions.*

a. If at any stage of the grading of any development site, the Village Engineer or his designee 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 Engineer or his designee may require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as 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, berm, more level exposed slope, construction of additional drainage facilities, berm, terracing, compaction, or cribbing, installation of plant materials for erosion control, and recommendations of a registered soils engineer and/or engineering geologist which may be made requirements for further work.

b. Where it appears that storm damage may result because the grading on any development site is not complete, work may be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments or where unusual site conditions prevail, the Village may specify the time of starting 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.

8. *Amendment of plans.* Major amendments of the site development or erosion and sedimentation control plans shall be submitted to the Planning Department and shall be processed and approved or disapproved in the same manner as the original plans. Field modifications of a minor nature may be authorized by the Building Official by written authorization to the permittee.

Section 2.6. Enforcement.

1. *Exceptions.* The Board of Trustees may, in accordance with the following procedures, authorize exceptions to any of the requirements and regulations set forth in this ordinance.
 - a. Application for any exception shall be made by a verified petition of the applicant for a site development permit, stating fully the grounds of the petition and the facts relied upon by the applicant. Such petition shall be filed with the site development application. In order for the petition to be granted, it shall be necessary that the Board of Trustees find all of the following facts with respect to the land referred to in the petition:
 - i. That the land is of such shape or size or is affected by such physical conditions or is subject to such title limitations of record, that it is impossible or impractical for the applicant to comply with all of the requirements of this ordinance;
 - ii. That the exception is necessary for the preservation and enjoyment of a substantial property right of the applicant; and
 - iii. That the granting of the exception will not be detrimental to the public welfare or injurious to other property in the vicinity of the subject property.
 - b. Each application for an exception shall be referred to the Planning Department for review. The Village Planner shall transmit his/her recommendations to the Board of Trustees, which shall review such recommendations prior to granting or denying such recommendations prior to granting or denying the exception.
 - c. The Board of Trustees shall hold a public hearing on each application for exception, within 30 days after receiving application, in the manner provided with respect to appeals. After public hearing, the Board may approve the site development permit application with the exceptions and conditions it deems necessary or it may disapprove such site development permit application and exception application or it may take such other action as appropriate.
2. *Stop-work order; revocation of permit.* In the event any person holding a site development permit pursuant to this ordinance violates the terms of the permit, or carries on site development in such a manner as to materially adversely affect the health, welfare, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the Village may suspend or revoke the site development permit.
 - a. Suspension of a permit shall be by a written stop-work order issued by the Building Official and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately, shall

state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until the next regularly scheduled meeting of the Board of Trustees at which the conditions of subparagraph (b) below can be met, unless the permittee immediately takes all action necessary to come into compliance with the ordinance.

b. No site development permit shall be permanently suspended or revoked until a hearing is held by Board of Trustees. Written notice of such hearing shall be served on the permittee, either personally or by registered mail, and shall state:

- i. The grounds for complaint or reasons for suspension or revocation, in clear and concise language; and
- ii. The time when and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to the date set for hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his behalf. At the conclusion of the hearing the Board of Trustees shall determine whether the permit shall be suspended or revoked.

3. *Violations and penalties.* No person shall construct, enlarge, alter, repair, or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any terms of this ordinance. Any person violating any of the provisions of this ordinance shall be deemed guilty of an ordinance violation, and each day during which any violation of any of the provisions of this ordinance is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not more than seven hundred fifty dollars (\$750.00) for each offense. In addition to any other penalty authorized by this Section, any person, partnership, or corporation convicted of violating any of the provisions of this ordinance shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

4. *Separability.* The provisions and Sections of this ordinance shall be deemed to be separable, and the invalidity of any portion of this ordinance shall not affect the validity of the remainder.

Sec. 3.0 Stream and Wetland Protection Ordinance.

Section 3.1 – Authority.

The Lowland Conservancy Overlay District is adopted by the Board of Trustees, pursuant to 65 Illinois Compiled Statutes 5/11-13-1.

Section 3.2 – Short title.

This ordinance shall be known and may be cited as the Beecher Lowland Conservancy Overlay District Ordinance.

Section 3.3 – Purpose and intent.

It is the purpose and intent of this ordinance to promote the health, safety and general welfare of the present and future residents of Beecher and downstream drainage areas by providing for the protection, preservation, proper maintenance, and use of Beecher watercourses, lakes, ponds, floodplain and wetland areas. This ordinance applies to all development within the Village. This ordinance is more specifically adopted:

1. To prevent flood damage by preserving storm and flood water storage capacity;
2. To maintain the normal hydrologic balance of streams, floodplains, ponds, lakes, wetlands, and groundwater by storing and providing for infiltration of wet-period runoff in floodplains and wetlands, and releasing it slowly to the stream to maintain in-stream flow;
3. To manage stormwater runoff and maintain natural runoff conveyance systems, and minimize the need for major storm sewer construction and drainage way modification;
4. To improve water quality, both by filtering and storing sediments and attached pollutants, nutrients, and organic compounds before they drain into streams or wetlands, and by maintaining the natural pollutant-assimilating capabilities of streams, floodplains and wetlands;
5. To protect shorelines and stream banks from soil erosion, using natural means and materials wherever possible;
6. To protect fish spawning, breeding, nursery and feeding grounds;
7. To protect wildlife habitat;
8. To preserve areas of special recreational, scenic, or scientific interest, including natural areas and habitats of endangered species;
9. To maintain and enhance the aesthetic qualities of developing areas; and

10. To encourage the continued economic growth and high quality of life of the Village, which depends in part on an adequate quality of water, a pleasing natural environment, and recreational opportunities in proximity to the Village.

In order to achieve the purpose and intent of this ordinance, the Village hereby designates the Lowland Conservancy Overlay District which shall be considered as an overlay to the zoning districts created by the Village zoning ordinances as amended. Any proposed development activity with the district must obtain a Special Use Permit as approved by the governing body of the Village.

Section 3.4 – Definitions.

Armoring. A form of channel modification which involves the placement of materials (concrete, riprap, bulkheads, etc.) within a stream channel or along a shoreline to protect property above streams, lakes, and ponds from erosion and wave damage caused by wave action and stream flow.

Bulkhead. A retaining wall that protects property along water.

Channel. A natural or artificial watercourse of perceptible extent that periodically or continuously contains moving water, or which forms a connecting link between two (2) bodies of water. It has a definite bed and banks that serve to contain the water.

Channel modification or channelization. To alter a watercourse by changing the physical dimension or materials of the channel. Channel modification includes damming, riprapping (or other armoring), widening, deepening, straightening, relocating, lining and significant removal of bottom or woody vegetation. Channel modification does not include the clearing of debris or trash from the watercourse. Channelization is a severe form of channel modification involving a significant change in the channel cross-section and typically involving relocation of the existing channel (e.g., straightening).

Control structure. A structure designed to control the rate of stormwater runoff that passes through the structure, given a specific upstream and downstream water surface elevation.

Culvert. A structure designed to carry drainage water or small streams below barriers such as roads, driveways, or railway embankments.

Depressional area. Any area which is lower in elevation on all sides than surrounding properties (i.e., does not drain freely), or whose drainage is severely limited such as by a restrictive culvert. A depressional area will fill with water on occasion when run off into it exceeds rate of infiltration into underlying soil or exceeds the discharge through its controlled outlet. Large depressional areas may provide significant stormwater or floodplain storage.

Development. The carrying out of any building, agricultural, or mining operation, or the making of any change in the use or appearance of land, and the dividing of land into two (2) or more parcels. The following activities or uses shall be taken, for the purposes of this ordinance, to involve development as defined herein:

1. Any construction, reconstruction, or alteration of a structure to occupy more or less ground area, or the on-site preparation for same;
2. Any change in the intensity of use of land, such as an increase in the number of dwelling units on land; or a material increase in the site coverage of businesses, manufacturing establishments, offices, and dwelling units, including mobile homes, campers, and recreational vehicles, on land;
3. Any agricultural use of land including, but not limited to, the use of land in horticulture, floriculture, forestry, dairy, livestock, poultry, beekeeping, pisciculture, and all forms of farm products and farm production;
4. The commencement of drilling, except to obtain soil samples, or the commencement of mining, filling, excavation, dredging, grading or other alterations of the topography;
5. Demolition of a structure or redevelopment of a site;
6. Clearing of land as an adjunct of construction for agricultural, private residential, commercial or industrial use;
7. Deposit of refuse, solid or liquid waste, or fill on a parcel of land, or the storage of materials;
8. Construction, excavation, or fill operations relating to the creation or modification of any road, street, parking facility or any drainage canal, or to the installation of utilities or any other grading activity that alters the existing topography;
9. Construction or erection of dams, levees, walls, fences, bridges or culverts; and
10. Any other activity that might change the direction, height, or velocity of flood or surface waters.

District. The Lowland Conservancy Overlay District as defined in Section 3.14 of this ordinance.

Erosion. The general process whereby soils are moved by flowing water or wave action.

Filtered view. The maintenance or establishment of woody vegetation of sufficient density to screen developments from a stream or wetland, to provide for streamback stabilization and erosion control, to serve as an aid to infiltration of surface runoff, and to provide cover to shade the water. The vegetation need not be so dense as to completely block the view. Filtered view means no clear cutting.

Floodplain. That land adjacent to a body of water with ground surface elevations at or below the 100-year frequency flood elevation.

Floodway. That portion of the floodplain (sometimes referred to as the base floodplain or special flood hazard area) required to store and convey the base flood. The floodway is the 100-year floodway as designated and regulated by the Illinois Department of Transportation/Division of Water Resources. The remainder of the floodplain which is outside the regulatory floodway is referred to as the flood fringe or floodway fringe.

Hydraulic characteristics. The features of a watercourse which determine its water conveyance capacity. These features include but are not limited to: size and configuration of the cross-section of the watercourse and floodway; texture and roughness of materials along the watercourse; alignment of watercourse; gradient of watercourse; amount and type of vegetation within the watercourse; and size, configuration, and other characteristics of structures within the watercourse. In low-lying areas the characteristics of the overbank area also determine water conveyance capacity.

Lake or pond. Any inland waterbody, fed by spring or surface water flow.

Lot. An area of land, with defined boundaries, that is designated in official assessor's records as being one (1) parcel.

Natural. In reference to watercourses, means those stream channels, grassed waterways and swales formed by the existing surface topography of the earth prior to changes made by unnatural causes. A natural stream tends to follow a meandering path; its floodplain is not constrained by levees; the area near the bank has not been cleared, mowed or cultivated; the stream flows over soil and geologic materials typical of the area with no alteration of the course or cross-section of the stream caused by filling or excavating.

Ordinary high water mark (OHWM). The point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation, or other easily recognized characteristics.

Qualified professional. A person trained in one (1) or more of the disciplines of biology, geology, soil science, engineering, or hydrology whose training and experience ensure a competent analysis and assessment of stream, lake, pond and wetland conditions and impacts.

Registered Professional Engineer. A Professional Engineer registered under the provisions of the Illinois Professional Engineering Act and any act amendatory thereof.

Retention/detention facility. A facility that provides for storage of storm water runoff and controlled release of this runoff during and after a flood or storm.

Runoff. The portion of precipitation on the land that is not absorbed by the soil or plant material and which runs off the land.

Sedimentation. The processes that deposit soils, debris, and other materials either on other ground surfaces or in water bodies or watercourses.

Setback. The horizontal distance between any portion of a structure or any development activity and the ordinary high water mark of a perennial or intermittent stream, the ordinary high water mark of a lake or pond, or the edge of a wetland, measured from the structure's or development's closest point to the ordinary high water mark, or edge.

Stream. A body of running water flowing continuously or intermittently in a channel on or below the surface of the ground; 7.5 minute topographic maps of the U.S. Geological Survey are one (1) reference for identifying perennial and intermittent streams. For purposes of this ordinance, the term "stream" does not include storm sewers.

Structure. Anything that is constructed, erected or moved to or from any premises which is located above, on, or below the ground including, but not limited to roads, signs, billboards, and mobile homes. Temporary recreational facilities including, but not limited to, tents, camper trailers, and recreation vehicles are not considered structures when used less than 180 days per year and located landward of the minimum setback provided as a natural vegetation strip.

Vegetation. All plant growth, especially trees, shrubs, mosses, and grasses.

Watercourse. Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, slough, gulch, draw, ditch, channel, conduit, culvert, swale, grass waterway, gully, ravine, wash, or natural or man-made drainage way, which has a definite channel, bed and banks, in or into which stormwater runoff and floodwater flow either regularly or intermittently.

Wetland. Those transitional lands between terrestrial and aquatic system where the water table is usually at or near the surface or the land is covered by shallow water. Classification or areas as wetlands shall follow the Classification of Wetlands and Deepwater Habitats of the United States as published by the U.S. Fish and Wildlife Service (FWS/OBS-79/31).

Section 3.5 – Special Use Permit.

To ensure that proposed development activity can be carried out in a manner which is compatible and harmonious with the natural amenities of the Lowland Conservancy Overlay District and with surrounding land uses, a request for a Special Use Permit for such development activity must be submitted for approval by the governing body of the Village.

No Special Use Permit shall be issued unless the Village finds that:

1. The development will not detrimentally affect or destroy natural features such as ponds, streams, wetlands, and forested areas, nor impair their natural functions, but will preserve and incorporate such features into the development's site;
2. The location of natural features and the site's topography have been considered in the designing and siting of all physical improvements;
3. Adequate assurances have been received that the clearing of the site of topsoil, trees, and other natural features will not occur before the commencement of building

operations; only those areas approved for the placement of physical improvements may be cleared;

4. The development will not reduce the natural retention storage capacity of any watercourse, nor increase the magnitude and volume of flooding at other locations; and that in addition, the development will not increase stream velocities; and

5. The soil and subsoil conditions are suitable for excavation and site preparation, and the drainage is designed to prevent erosion and environmentally deleterious surface runoff.

There shall be no development, including the immediate or future clearing or removal of natural ground cover and/or trees, within the Lowland Conservancy Overlay District for any purpose, unless a Special Use Permit is granted subject to the provisions of this ordinance or the provisions of the Village zoning ordinance.

Dumping, filling, mining, excavating, dredging, or transferring of any earth material within the district is prohibited unless a Special Use Permit is granted.

No ponds or impoundments shall be created nor shall other alterations or improvements be allowed in the district for recreational uses, storm water management, flood control, agricultural uses or as scenic features unless a Special Use Permit is granted.

Section 3.6 – Application for permit; fee.

Application for a Special Use Permit shall be made by the owner of the property, or his/her authorized agent, to the Village on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit. All costs incurred by the Village and their associates during the review of this permit application will be paid by the developer.

Section 3.7 – Submissions.

Each application for a Special Use Permit shall be accompanied by the following information as specified in the sections cited:

General Provisions:

Item	Section
Site development plan	3.16
Geologic and soil report	3.17
Drainage control plan	3.18
Site grading and excavation plan	3.19
Landscape plan	3.20

Justification for watercourse relocation and minor modifications:

Item	Section
Stream modification/relocation plan	3.23
Channel and bank armoring	3.24
Culverts	3.25
On-stream impoundments	3.26
Impact assessment (at option of the Village)	3.27

Where a proposed development activity is less than two and one-half (2 1/2) acres in area the Village, upon approval of the Village Engineer, may waive or simplify any or all of the submission requirements provided, that the person responsible for any such development shall implement necessary protection measures to satisfy the purpose and intent set forth in Section 3.3 of this ordinance.

Section 3.8 – Bonds.

The applicant may be required to file with the Village a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the Village Attorney, in an amount deemed sufficient by the Village to cover all costs of improvements, landscaping, or maintenance of improvements and landscaping, for such period as specified by the Village, and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.

Section 3.9 – Review and approval.

Each application for a Special Use Permit shall be reviewed and acted upon according to the following procedures:

1. The Village Board will review each application for a Special Use Permit to determine its conformance with the provisions of this ordinance. The Board may also refer any application to the Will County Soil and Water Conservation District and/or any other local government or public agency within whose jurisdiction the site is located for review and comments. Within 30 days after receiving an application, the Village Board shall in writing: (1) approve the permit application, if it is found to be in conformance with the provisions of this ordinance and issue the permit; (2) approve the permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this ordinance, and issue the permit subject to these conditions; or (3) disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission.
2. No Special Use Permit shall be issued for an intended development site unless:
 - a. The development, including but not limited to subdivisions and planned unit developments, has been approved by the Village where applicable; or

- b. Such permit is accompanied by or combined with a valid building permit issued by the Village; or
 - c. The proposed development is coordinated with any overall development program previously approved by the Village for the area in which the site is situated.
3. Failure of the Village to act on an original or revised application within 30 days of receipt shall authorize the applicant to proceed in accordance with the plans as filed, unless such time is extended by agreement between the Village and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the Village.

Section 3.10 – Permit exceptions.

The provisions of this ordinance shall not apply to:

1. Emergency work necessary to preserve life or property; when emergency work is performed under this section, the person performing it shall report the pertinent facts relating to the work to the Village within ten (10) days after commencement of the work and shall thereafter obtain a Special Use Permit and shall perform such work as may be determined by the agency to be reasonably necessary to correct any impairment to the watercourse, lake, pond, floodplain or wetland (in terms of the purposes of this ordinance, Subsection 3.3 (1) through (10));
2. Work consisting of the operation, repair, or maintenance of any lawful use of land existing on the date of adoption of this ordinance;
3. Land adjacent to farm ditches if:
 - a. Such lands are not adjacent to a natural stream or river; or
 - b. Those parts of such drainage ditches adjacent to such lands were not streams before ditching; or
 - c. Such lands are maintained in agricultural uses without buildings and structures.

Where farm ditches are found to contribute to adverse environmental impacts or hazards to persons or property, the Village may include designated farm ditches in the district. The Village may also require that linings, bulkheads, dikes and culverts to be removed to mitigate hazards, or that other mitigative measures be taken, such as the maintenance of a natural vegetation buffer strip.

Section 3.11 – Effect on other permits.

The granting of a Special Use Permit under the provisions herein shall in no way affect the owner's responsibility to obtain the approval required by any other statute, ordinance, or

regulation of any state agency or subdivision thereof, or to meet other Village ordinances and regulations. Where state and/or federal permits are required, a Special Use Permit will not be issued until they are obtained.

Section 3.12 – General provisions; area affected.

This ordinance applies to development in or near streams, lakes, ponds and wetlands within the Village. Streams, lakes, and ponds (including intermittent streams) are those which are shown on the United States Department of the Interior Geological Survey (USGS) 7.5 minute quadrangle maps and those additional streams, lakes, and ponds delineated on maps adopted as part of this ordinance. Those maps are hereby made a part of this ordinance, and two (2) copies thereof shall remain on file in the office of the Village clerk for public inspection. Within the jurisdiction of the Village, those waterbodies and watercourses that are named and are subject to the provisions of this ordinance are: (list of waterbodies and watercourses). Wetlands are those designated in the U.S. Fish and Wildlife Service/Illinois Department of Conservation wetland inventory and those additional wetlands delineated on maps adopted as part of this ordinance.

If new drainage courses, lakes, ponds or wetlands are created as part of a development, the requirements for setbacks and uses within setbacks, and the criteria for watercourse relocation and minor modification shall apply. The district shall be amended as appropriate to include these areas.

Section 3.13 – Lowland Conservancy Overlay District.

The Lowland Conservancy Overlay District shall be considered as an overlay to the zoning districts created by the Village zoning ordinance as amended. In addition to the requirements of this ordinance, applicants for a Special Use Permit within the district shall meet all requirements of the underlying zoning districts. In the event of a conflict between the overlay district requirements and the underlying zoning district requirements, the most restrictive requirements prevail.

Section 3.14 – District boundary.

The procedures, standards and requirements contained in this ordinance shall apply to all lots within wetlands and streams, and all lots lying wholly or in part:

1. Within the special flood hazard area (SFHA) designated by the federal emergency management agency (FEMA); or
2. Within 100 feet of the ordinary high water mark (OHWM) of a perennial stream or intermittent stream, the ordinary high watermark of a lake or pond, or the edge of a wetland; or
3. Within depressional areas serving as floodplain or stormwater storage areas, as designated on the lowland conservancy district map.

The district is designated on a map labeled "Lowland Conservancy Overlay District Map", which is made to be part of this ordinance and which has the same force and effect as if all the notations, references, and descriptions shown thereon were set forth or described herein. Designated areas are shown on said map which shall be and remain on file in the office of the Village clerk, and additional areas may be approved from time to time and be made exhibits hereto.

Section 3.15 – Minimum setback of development activity from streams.

1. *Minimum setback.* Absolutely no development activity (except as provided below) may occur within the minimum setback which is defined as 75 feet from the ordinary high water mark of streams, lakes and ponds, or the edge of wetlands, or within a designated depressional area. In no case shall the setback be less than the boundary of the 100-year floodway as defined by FEMA. These setback requirements do not apply to a stream in a culvert unless the stream is taken out of the culvert as part of development activity. If a culvert functions as a low-flow culvert, where water is intended to periodically flow over it, the setback requirements apply.

2. *Development activities.* The following development activities may be permitted, subject to issuance of a Special Use Permit, within the minimum setback areas only if, as a practical matter, they cannot be located outside the setback area. Such development activities will only be approved based upon a report, prepared by a qualified professional, which demonstrates that they will not adversely affect water quality; destroy, damage or disrupt significant habitat area, adversely affect drainage and/or stormwater retention capabilities; adversely affect flood conveyance and storage; lead to unstable earth conditions, create erosion hazards, or be materially detrimental to any other property in the area of the subject property or to the Village as a whole, including the loss of open space or scenic vistas:

- a. Minor improvements such as walkways, benches, comfort stations, informational displays, directional signs, foot bridges, observation decks, and docks;
 - b. The maintenance, repair, replacement, and reconstruction of existing highways and bridges, electrical transmission and telecommunication lines, poles, and towers; and
 - c. The establishment and development of public and private parks and recreation areas, outdoor education areas, historic natural and scientific areas, game refuges, fish and wildlife improvement projects, game bird and animal farms, wildlife preserves and public boat launching ramps.
3. *Considerations.* Review of the proposed development activity within the minimum setback area will consider the following:
- a. Only limited filling and excavating necessary for the development of public boat launching ramps, swimming beaches, or the development of park shelters or

similar structures is allowed. The development and maintenance of roads, parking lots and other impervious surfaces necessary for permitted uses are allowed only on a very limited basis, and where no alternate location outside of the setback area is available.

b. Land surface modification within the minimum setback shall be permitted for the development of stormwater drainage swales between the developed area of the site (including a stormwater detention facility on the site) and a stream, lake or pond, or wetlands detention basins within the setback are generally discouraged, unless it can be shown that resultant modification will not impair water quality, habitat, or flood storage functions.

c. No filling or excavating within wetlands is permitted except to install piers for the limited development of walkways and observation decks. Walkways and observation decks should avoid high quality wetland areas, and should not adversely affect natural areas designated in the Illinois Natural Areas Inventory or the habitat of rare or endangered species.

d. Wetland area occupied by the development of decks and walkways must be mitigated by an equal area of wetland habitat improvement.

e. Modification of degraded wetlands for purposes of stormwater management is permitted where the quality of the wetland is improved and total wetland acreage is preserved. Where such modification is permitted, wetlands shall be protected from the effects of increased stormwater runoff by measures such as detention or sedimentation basins, vegetated swales and buffer strips, and sediment and erosion control measures on adjacent developments. the direct entry of storm sewers into wetlands shall be avoided. Environmental impact analysis of wetland modification may be required in accordance with Section 3-27 of this ordinance.

4. *Applicants for Special Use Permit.*

a. An applicant for a Special Use Permit must stabilize areas left exposed after land surface modification with vegetation normally associated with that stream or wetland. The planting of native riparian vegetation is recommended as the preferred stabilization measure. Other techniques should be used only when and where vegetation fails to control erosion. The preferred alternative is riprap, using natural rock materials where practicable, installed on eroding bank areas in a manner that provides interstitial space for vegetative growth and habitat for macroinvertebrates and other stream organisms. Lining of the stream channel bottom is not permitted.

b. The applicant shall minimize access to the applicant's proposed development activity within all or part of the Lowland Conservancy Overlay District where such access could adversely affect the stream, lake, pond, wetland, or related environmentally sensitive areas.

Section 3.16 – Site development plan.

A site development plan must be prepared for any proposed development within, or partly within, the Lowland Conservancy Overlay District and must indicate:

1. Dimension and area of parcel, showing also the vicinity of the site in sufficient detail to enable easy location, in the field, of the site for which the Special Use Permit is sought, and including the boundary line, underlying zoning, a legend, a scale, and a north arrow (this requirement may be satisfied by the submission of a separate vicinity map);
2. Location of any existing and proposed structures;
3. Location of existing or proposed on-site sewage systems or private water supply systems;
4. Location of any perennial or intermittent stream, lake or pond, and its ordinary high water mark;
5. Location and landward limit of all wetlands;
6. Location of setback lines as defined in this ordinance;
7. Location of the 100-year floodway;
8. Location of existing or future access roads;
9. Specifications and dimensions of stream, wetland or other water areas proposed for alterations;
10. Cross-sections and calculations indicating any changes in flood storage volumes; and
11. Such other information as reasonably requested by Village.

The applicant shall present evidence, prepared by a qualified professional, that demonstrates that the proposed development activity will not endanger health and safety, including danger from the obstruction or diversion of flood flow. The developer shall also show, by submitting appropriate calculations and resource inventories, that the proposed development activity will not substantially reduce natural floodwater storage capacity, destroy valuable habitat for aquatic or other flora and fauna, adversely affect water quality or ground water resources, increase stormwater runoff velocity so that water levels on other lands are substantially raised or the danger from flooding increased, or adversely impact any other natural stream, floodplain, or wetland functions, and is otherwise consistent with the intent of this ordinance.

Section 3.17 – Geologic and soil characteristics; report.

The site proposed for development shall be investigated to determine the soil and geologic characteristics, including soil erosion potential. A report, prepared by a licensed Professional Engineer, Geoscientist, or Soil Scientist experienced in the practice of geologic and soil mechanics, shall be submitted with every application for land development within the Lowland Conservancy Overlay District. This report shall include a description of soil type and stability of surface and subsurface conditions. Any area which the investigation indicates as being subject to geologic or soil hazards shall not be subjected to development, unless the engineer or soil scientist can demonstrate conclusively that these hazards can be overcome.

Section 3.18 – Hydrologic controls/drainage control plan.

A drainage control plan that describes the hydraulic characteristics of on-site and nearby watercourses as well as the proposed drainage plan, prepared by a Registered Professional Engineer experienced in hydrology and hydraulics, shall be submitted with each application for land development within the Lowland Conservancy Overlay District. Unless otherwise noted, the following restrictions, requirements and standards shall apply to all development within the Lowland Conservancy Overlay District:

1. Natural open-channel drainageways shall be preserved; and
2. Runoff from areas of concentrated impervious cover (e.g., roofs, driveways, streets, patios, etc.) shall be collected and transported to a drainageway (preferably a natural drainageway) with sufficient capacity to accept the discharge without undue erosion or detrimental impact. Vegetated drainage swales are preferred over conveyances constructed of concrete or other manufactured materials.

The drainage control plan shall identify appropriate measures, such as recharge basins and detention/retention basins, which will limit the quantitative and qualitative effects of stormwater runoff to pre-development conditions.

Section 3.19 – Site grading and excavation plan.

This section applies to the extent that grading and excavation and erosion control plans, which satisfy the following requirements, are not already required by a jurisdiction.

1. *Application; contents of plan.* A site grading and excavation plan, prepared by a Registered Professional Engineer, trained and experienced in civil engineering, shall be submitted with each application for a Special Use Permit and shall include the following:
 - a. Details of the existing terrain and drainage pattern with one (1) foot contours;
 - b. Proposed site contours at one (1) foot intervals;
 - c. Dimensions, elevation and contours of grading, excavation and fill;

- d. A description of methods to be employed in disposing of soil and other materials that is removed from allowable grading and excavation sites, including location of the disposal site if on the property;
 - e. A schedule showing when each stage of the project will be completed, including the total area of soil surface to be disturbed during each stage, and estimated starting and completion dates. The schedule shall be prepared so as to limit, to the shortest possible period, the time soil is exposed and unprotected. In no case shall the existing natural vegetation be destroyed, removed or disturbed more than 15 days prior to initiation of the improvements; and
 - f. A detailed description of the re-vegetation and stabilization methods to be employed, to be prepared in conjunction with the landscape plan per Section 3.20. This description should include locations of erosion control measures such as sedimentation basins, straw bales, diversion swales, etc.
2. *Compliance with ordinance.* The grading and excavation plan must be consistent with all the provisions of this ordinance.
3. *Restrictions and requirements.* Unless otherwise provided in this ordinance, the following restrictions, requirements and standards shall apply to all development within the district:
- a. Every effort shall be made to develop the site in such a manner so as to minimize the alteration of the natural topography;
 - b. No grading, filling, cleaning, clearing, terracing or excavation of any kind shall be initiated until final engineering plans are approved and the Special Use Permit is granted by the Village; and
 - c. The depositing of any excavation, grading or clearing material within a stream, lake, pond or wetland area (i.e., within the district) shall be prohibited.
4. *Installation of physical barrier.* In addition to locating all site improvements on the subject property to minimize adverse impacts on the stream, lake, pond, or wetland, the applicant shall install a berm, curb, or other physical barrier during construction, and following completion of the project, where necessary, to prevent direct runoff and erosion from any modified land surface into a stream, lake, pond, or wetland. All parking and vehicle circulation areas should be located as far as possible from a stream, lake, pond or wetland.
5. *Limit activity.* The Village may limit development activity in or near a stream, lake, pond, or wetland to specific months, and to a maximum number of continuous days or hours, in order to minimize adverse impacts. Also, the Village may require that equipment be operated from only one (1) side of a stream, lake, or pond in order to minimize bank disruption. Other development techniques, donations, and restrictions may

be required in order to minimize adverse impacts on streams, lakes, ponds or wetlands, and on any related areas not subject to development activity.

Section 3.20 – Natural vegetation buffer strip required.

To minimize erosion, stabilize the streambank, protect water quality, maintain water temperature at natural levels, preserve fish and wildlife habitat, to screen man-made structures, and also to preserve aesthetic values of the natural watercourse and wetland areas, a natural vegetation strip shall be maintained along the edge of the stream, lake, pond or wetland. The natural vegetation strip shall extend landward a minimum of 60 feet from the ordinary high water mark of a perennial or intermittent stream, lake or pond and the edge of a wetland to adjacent lotlines. Structures must be set back a minimum of 100 feet from the OHWM of a stream, lake, or pond or the edge of a wetland. The 60 foot natural vegetation strip must be protected in a permanent conservation easement.

Within the natural vegetation strip, trees and shrubs may be selectively pruned or removed for harvest of merchantable timber, to achieve a filtered view of the waterbody from the principal structure and for reasonable private access to the stream, lake, pond or wetland. Said pruning and removal activities shall ensure that a live root system stays intact to provide for streambank stabilization and erosion control.

A landscape plan, prepared by a professional landscape architect, shall be submitted with each Special Use Permit application for development activity within the Lowland Conservancy Overlay District and contain the following:

1. A plan describing the existing vegetative cover of the property and showing those areas where the vegetation will be removed as part of the proposed construction; and
2. A plan describing the proposed re-vegetation of disturbed areas specifying the materials to be used.

The vegetation must be planned in such a way that access for stream maintenance purposes shall not be prevented.

Section 3.21 – Watercourse relocation and minor modifications.

Watercourse relocation or modification is generally not permitted because these activities are not usually consistent with the purposes of this ordinance. Under certain circumstances, relocation and minor modification may be permitted through a Special Use Permit where certain problems can be mitigated by relocation and/or minor modification, specifically when:

1. Off-site hydrologic conditions are causing erosion, flooding and related problems; or
2. On-site soil and geologic conditions are resulting in unstable conditions that pose hazards to life, health, and existing structures or property; or

3. The quality of previously modified or relocated streams can be improved through restoration; or
4. Officially adopted stormwater management plans call for placement of detention or retention facilities in a stream; or
5. Public utilities, including sanitary sewers, pipelines, and roadways require stream crossing or relocation where there are not practical alternatives.

Modifications of watercourses as a convenience for site design purposes is not permitted.

Section 3.22 – Conditions and restrictions for permitting stream modification.

Stream modification, when permitted, is subject to the following conditions and restrictions:

1. Water quality, habitat and other natural functions must be significantly improved by the modification; no significant habitat area may be destroyed;
2. The amount of flow and velocity of a stream is not to be increased or decreased as the stream enters or leaves a subject property, unless this reflects an improvement over previous conditions in terms of reduced flooding, reduced erosion, or enhanced low-flow conditions;
3. Prior to diverting water into a new channel, a qualified professional approved by the Village shall inspect the stream modification, and issue a written report to the Village that the modified stream complies with the requirements of Section 3.23; and
4. Stream channel enlargement, or other modifications that would increase conveyance, shall not be permitted if the intended purpose is to accommodate development activities in the floodplain.

Section 3.23 – Required content of stream modification/relocation plan.

Stream relocation may be permitted in accordance with a stream relocation plan which provides for:

1. The creation of a natural meander pattern, pools, riffles, substrate;
2. The formation of gentle side slopes (at least three (3) feet horizontally per one (1) foot vertically), including installation of erosion control features;
3. The utilization of natural materials wherever possible;
4. The planting of vegetation normally associated with streams, including primarily native riparian vegetation;
5. The creation of spawning and nesting areas wherever appropriate;

6. The reestablishment of the fish population wherever appropriate;
7. The restoration of water flow characteristics compatible with fish habitat areas, wherever appropriate;
8. The filling and re-vegetation of the prior channel;
9. A proposed phasing plan, specifying time of year for all project phases;
10. Plans for sediment and erosion control; and
11. Establishment of a low-flow channel which reflects the conditions of a natural stream.

Section 3.24 – Criteria for permitting armoring of channels and banks.

Armoring in the form of bulkheads, riprap or other materials or devices is not permitted except in accordance with the following:

1. Significant erosion cannot be prevented in any other way and the use of vegetation and gradual bank slopes has not sufficiently stabilized the shoreline or bank;
2. The bulkhead or other device is not placed within a wetland, or between a wetland and a lake or pond;
3. The bulkhead, riprap or other device will minimize the transmittal of wave energy or currents to other properties; and
4. The exchange in the horizontal or vertical configuration of the land must be kept to a minimum.

Where permission to install bulkheads or other armoring devices is requested as part of the Special Use Permit application, documentation and certification pertaining to the items above must be submitted.

Section 3.25 – Use of culverts.

Culverts are not permitted in streams except in accordance with the following:

1. Where a culvert is necessary for creating access to a property; use of culverts as a convenience, in order to facilitate general site design, is not to be considered.
2. The culvert must allow passage of fish inhabiting the stream, and accommodate the 100-year flood event without increasing upstream flooding, except where a restricting culvert is desirable as part of an overall storm and floodwater management plan;

3. The culvert must be maintained free of debris and sediment to allow free passage of water, and if applicable, fish; and
4. The stream bottom should not be significantly widened for the placement of a culvert as this increases siltation; if multiple culverts must be installed, one (1) culvert should be at the level of the bottom of the stream and the others at or above normal water elevation.

Section 3.26 – On-stream impoundments.

Impoundment of streams is not permitted except in accordance with the following:

1. The impoundment is determined to be in the public interest by providing regional stormwater detention, flood control, or public recreation;
2. The impoundment will not prevent the upstream migration of indigenous fish species;
3. A nonpoint source control plan has been implemented in the upstream watershed to control the effects of sediment runoff as well as minimized the input of nutrients, oil and grease, metals, and other pollutants;
4. Impoundments without permanent low-flow pools are preferred except where a permanent pool is necessary to achieve the intended benefits of the impoundment (e.g., recreation or water quality mitigation); and
5. Impoundment design shall include gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin.

Section 3.27 – Impact assessment.

The Village may ask an applicant to submit a report prepared by a qualified professional, and approved by the Village, in order to assess the potential impact of proposed development on a lake, stream or wetland and associated environmentally sensitive areas, including loss of flood storage potential, loss of habitat, changes in species diversity and quantity, impacts on water quality, increases in human intrusion, and impacts on associated streams, lakes, ponds, wetlands or downstream areas.

Section 3.28 – Stream maintenance easement.

The applicant shall grant an access easement for stream maintenance purposes to the Village over 25 feet parallel to the stream bank.

Section 3.29 – Bonds.

The Village may require the posting of a bond or surety to ensure compliance with any aspect of this ordinance.

Section 3.30 – Liability.

Prior to issuance of a construction permit, the applicant shall enter into an agreement with the Village which runs with the property, in a form acceptable to the Village Attorney, indemnifying the Village for any damage resulting from development activity on the subject property which is related to the physical condition of the stream or wetland.

Section 3.31 – Separability.

Every section, provision, or part of this ordinance is declared separable from every other section, provision, or part; and if any section, provision, or part thereof shall be held invalid, it shall not affect any other section, provision, or part.

Section 3.32 – Retroactivity.

The requirements of this ordinance apply to all platted and unplatted lands within the jurisdiction of the Village.

Section 3.33 – Enforcement.

Authority for administration of this ordinance resides with the Village Board.

Section 3.34 – Stop-work order; revocation of permit.

In the event any person holding a Special Use Permit pursuant to this ordinance violates the terms of the permit, or carries on-site development in such a manner so as to materially adversely affect the health, welfare, or safety of persons residing or working in the neighborhood of the development site, or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the Village may suspend or revoke the Special Use Permit.

1. Suspension of a permit shall be by a written stop-work order issued by the Village and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until the next regularly scheduled meeting of the Village Board, at which the conditions of Subsection (2) below can be met.
2. No Special Use Permit shall be permanently suspended or revoked until a hearing is held by the Village Board. Written notice of such hearing shall be served on the permittee, either personally or by registered mail, and shall state:
 - a. The grounds for complaint or reasons for suspension or revocation, in clear and concise language; and
 - b. The time when and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to the date set for the hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his/her behalf. At the conclusion of the hearing the Village Board shall determine whether the permit shall be suspended or revoked.

Section 3.35 – Violations and penalties.

No person shall undertake or continue any development activity contrary to or in violation of any terms of this ordinance. Any person violating any of the provisions of this ordinance shall be deemed guilty of an ordinance violation, and each day during which any violation of any of the provisions of this ordinance is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not more than seven hundred fifty dollars (\$750.00) for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted by violating any of the provisions of this ordinance shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

Section 4.0 An Ordinance Regulating Development in Special Flood Hazard Areas

Section 4.1 – Purpose

This Ordinance is enacted pursuant to the police powers granted to this Village by 65 ILCS 5/1-2-1, 65 ILCS 5/11-12-12, 65 ILCS 5/11-30-2, 65 ILCS 5/11-30-8, 65 ILCS 5/11-31-2. The purpose of this Ordinance is to maintain this Village's eligibility in the National Flood Insurance Program; to minimize potential losses due to periodic flooding including loss of life, loss of property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare; and to preserve and enhance the quality of surface waters, conserve economic and natural values and provide for the wise utilization of water and related land resources. This Ordinance is adopted in order to accomplish the following specific purposes:

- a. To meet the requirements of 615 ILCS 5/18g, Rivers, Lakes and Streams Act.
- b. To assure that new development does not increase the flood or drainage hazards to others, or creating unstable conditions susceptible to erosion.
- c. To protect new buildings and major improvements to buildings from flood damage.
- d. To protect human life and health from the hazards of flooding;
- e. To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, and flood rescue and relief operations.
- f. To make federally subsidized flood insurance available for property in the Village by fulfilling the requirements of the National Flood Insurance Program.
- g. To comply with the rules and regulations of the National Flood Insurance Program codified as 44 CFR 59-79, as amended.
- h. To protect, conserve, and promote the orderly development of land and water resources.
- j. To preserve the natural characteristics of stream corridors in order to moderate flood and storm water impacts, improve water quality, reduce soil erosion, protect aquatic and riparian habitat, provide recreational opportunities, provide aesthetic benefits and enhance community and economic development.

Section 4.2 – Definitions

For the purposes of this Ordinance, the following definitions are adopted:

- a. *Act.* An act in relation to the regulation of the rivers, lakes and streams of the State of Illinois, 615 ILCS 5/5 et seq.

- b. *Applicant.* Any person, firm, corporation or agency which submits an application.
- c. *Appropriate use.* Only uses of the regulatory floodway that are permissible and will be considered for permit issuance. The only uses that will be allowed are as specified in Section 151:07(d).
- d. *Base flood.* The flood having a one (1) percent probability of being equaled or exceeded in any given year. The base flood is also known as the 100-year

frequency flood event. Application of the base flood elevation at any location is as defined in Section 151:05 of this Ordinance.

- e. *Building.* A structure that is principally above ground and is enclosed by walls and a roof. The term includes a gas or liquid storage tank, a manufactured home, mobile home or a prefabricated building. This term also includes recreational vehicles and travel trailers to be installed on a site for more than 180 days.
- f. *Channel.* Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or man-made drainageway, which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.
- g. *Channel modification.* Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, rip-rapping (or other armoring), widening, deepening, straightening, relocating, lining and significant removal of bottom or woody vegetation. Channel modification does not include the clearing of dead or dying vegetation, debris, or trash from the channel. Channelization is a severe form of channel modification involving a significant change in the channel cross-section and typically involving relocation of the existing channel (e.g., straightening).
- h. *Compensatory storage.* An artificially excavated, hydraulically equivalent volume of storage within the SFHA used to balance the loss of natural flood storage capacity when artificial fill or structures are placed within the flood plain. The uncompensated loss of natural flood plain storage can increase off-site floodwater elevations and flows.
- i. *Conditional approval of a regulator floodway map change.* Preconstruction approval by DWR and the Federal Emergency Management Agency of a proposed change to the floodway map. This preconstruction approval, pursuant to this part, gives assurances to the property owner that once an appropriate use is constructed according to permitted plans, the floodway map can be changed, as previously agreed, upon review and acceptance of as-built plans.

- j. *Conditional letter of map revision (CLOMR).* A letter which indicates that the Federal Emergency Management Agency will revise base flood elevations, flood insurance rate zones, flood boundaries or floodway as shown on an effective Flood Hazard Boundary Map or Flood Insurance Rate Map, once the as-built plans are submitted and approved.
- k. *Control structure.* A structure designed to control the rate of flow that passes through the structure, given a specific upstream and downstream water surface elevation.
- l. *Dam.* All obstructions, wall embankments or barriers, together with their abutments and appurtenant works, if any, constructed for the purpose of storing or diverting water or creating a pool. Underground water storage tanks are not included.
- m. *Designated Floodway.* The channel, including on-stream lakes, and that portion of the floodplain adjacent to a stream or watercourse as designated by INDR/OWR, which is needed to store and convey the existing 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a 10 percent increase in velocities.
 - (1) The floodways are designated for Trim Creek Tributary and Trim Creek on the Flood Boundary and Floodway Map prepared by FEMA (or the Department of Housing and Urban Development) and dated September 6, 1995.
 - (2) The floodways for those parts of unincorporated Will County that are within the extrajurisdiction of the Village that may be annexed into the Village are designated for Trim Creek, Trim Creek Tributary, Black Walnut Creek, Exline Slough, Pike Creek, Plum Creek, and South Branch Rock Creek on the Flood Boundary and Floodway map prepared by FEMA (or Department of Housing and Urban Development) and dated September 6, 1995.
 - (3) To locate the designated floodway boundary on any site, the designated floodway boundary should be scaled off the designated floodway map and located on a site plan, using reference marks common to both maps. Where interpretation is needed to determine the exact location of the designated floodway boundary, the Division should be contacted for interpretation.
- n. *Development.* Any man-made change to real estate, including:
 - (1) Construction, reconstruction, repair, or placement of a building or any addition to a building.
 - (2) Installing a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days. If the travel trailer or recreational vehicle is on site for less than 180 days, it must be fully licensed and ready for highway use.

- (3) Drilling, mining, installing utilities, construction of roads, bridges, or similar projects.
- (4) Demolition of a structure or redevelopment of a site.
- (5) Clearing of land as an adjunct of construction.
- (6) Construction or erection of levees, walls, fences, dams, or culverts; channel modification; filling, dredging, grading, excavating, paving, or other non-agricultural alterations of the ground surface; storage of materials; deposit of solid or liquid waste;
- (7) Any other activity of man that might change the direction, height, or velocity of flood or surface water, including extensive vegetation removal.

Development does not include maintenance of existing buildings and facilities such as re-roofing or resurfacing of roads when there is no increase in elevation, or gardening, plowing, and similar agricultural practices that do not involve filling, grading, or construction of levees.

- o. *DWR*. Illinois Department of Transportation, Division of Water Resources.
- p. *Elevation certificates*. A form published by the Federal Emergency Management Agency that is used to certify the elevation to which a building has been elevated.
- q. *Erosion*. The general process whereby soils are moved by flowing water or wave action
- r. *Exempt organizations*. Organizations which are exempt from this Ordinance per the Illinois Revised Statutes including state, federal or local units of government.
- s. *FEMA*. Federal Emergency Management Agency and its regulations at 44 CFR 59-79 effective as September 29, 1989. This incorporation does not include any later editions or amendments.
- t. *Flood*. A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waves, or the unusual and rapid accumulation or runoff of surface waters from any source.
- u. *Flood frequency*. A period of years, based on a statistical analysis, during which a flood of a stated magnitude may be expected to be equaled or exceeded.
- v. *Flood fringe*. That portion of the flood plain outside of the regulatory floodway.

- w. *Flood insurance rate maps (FIRM)*. A map prepared by the Federal Emergency Management Agency that depicts the special flood hazard area (SFHA) within a community. This map includes insurance rate zones and flood plains and may or may not depict floodways.
- x. *Flood plain*. That land typically adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation. Flood plains may also include detached Special Flood Hazard Areas, ponding areas, etc. The flood plain is also known as the Special Flood Hazard Area (SFHA). The flood plains are those lands within the jurisdiction of the Village that are subject to inundation by the base flood or 100-year frequency flood. The SFHA's of the Village are generally identified as such on the flood insurance rate map of the Village of Beecher prepared by the Federal Emergency Management Agency (or the U.S. Department of Housing and Urban Development) and dated September 6, 1995. The SFHA's of those parts of unincorporated Will County that are within the extraterritorial jurisdiction of the Village or that may be annexed into the Village are generally identified as such on the flood insurance rate map prepared for Will County by the Federal Emergency Management Agency (or the U.S. Department of Housing and Urban Development) and dated September 6, 1995.
- y. *Floodproofing*. Any combination of structural and non-structural additions, changes or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.
- z. *Floodproofing certificate*. A form published by the Federal Emergency Management Agency that is used to certify that a building has been designed and constructed to be structurally dry floodproofed to the flood protection elevation.
- aa. *Flood protection elevation (FPE)*. The elevation of the base flood or 100-year frequency flood plus one (1) foot of freeboard at any given location in the SFHA.
- bb. *Freeboard*. An increment of elevation added to the base flood elevation to provide a factor of safety for uncertainties in calculations, unknown localized conditions, wave actions and unpredictable effects such as those caused by ice or debris jams.
- cc. *Hydrologic and hydraulic calculations*. Engineering analysis which determines expected flood flows and flood elevations based on land characteristics and rainfall events.
- dd. *Letter of map amendment (LOMA)*. Official determination by FEMA that a specific structure is not in a 100-year flood zone: amends the effective Flood Hazard Boundary Map or FIRM.
- ee. *Letter of map revision (LOMR)*. Letter that revises base flood or 100-year frequency flood elevations, flood insurance rate zones, flood boundaries or floodways as shown on an effective FHBM or FIRM.

- ff. *Manufactured home.* A structure, transportable in one (1) or more sections, which is built on a permanent chassis and is designated for use with or without a permanent foundation when connected to the required utilities. The term manufactured homes also includes park trailers, travel trailers and other similar vehicles placed on site for more than 180 consecutive days.
- gg. *Manufactured home park or subdivision.* A parcel (or contiguous parcels) of land divided into two (2) or more manufactured home lots for rent or sale.
- hh. *Mitigation.* Mitigation includes those measures necessary to minimize the negative effects which flood plain development activities might have on the public health, safety and welfare. Examples of mitigation include compensatory storage, soil erosion and sedimentation control, and channel restoration.
- ii. *NGVD.* National Geodetic Vertical Datum of 1929. Reference surface set by the National Geodetic Survey deduced from a continental adjustment of all existing adjustments in 1929.
- jj. *Natural.* When used in reference to channels means those channels formed by the existing surface topography of the earth prior to changes made by man. A natural stream tends to follow a meandering path; its flood plain is not constrained by levees; the area near the bank has not been cleared, mowed or cultivate; the stream flows over soil and geologic materials typical of the area with no substantial alteration of the course or cross-section of the stream caused by filling or excavating. A modified channel may regain some natural characteristics over time as the channel meanders and vegetation is re-established. Similarly, a modified channel may be restored to more natural conditions by man through re-grading and re-vegetation.
- kk. *Ordinary high water mark (OHWM).* The point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation or other easily recognized characteristics.
- ll. *Public flood control project.* A flood control project which will be operated and maintained by a public agency to reduce flood damages to existing buildings and structures which includes a hydrologic and hydraulic study of the existing and proposed conditions of the watershed. Nothing in this definition shall

preclude the design, engineering, construction or financing, in whole or in part, of a flood control project by persons or parties who are not public agencies.
- mm. *Public Bodies of Water.* All open public streams and lakes capable of being navigated by watercraft, in whole or in part, for commercial uses and purposes, and all lakes, rivers and streams which in their natural condition were capable of being improved and made navigable, or that are connected with or discharge their waters into navigable lakes or rivers within, or upon the borders of the State of Illinois,

together with all bayous, sloughs, backwaters, and submerged lands that are open to the main channel or body of water directly accessible thereto.

- nn. *Publicly navigable waters.* All streams and lakes capable of being navigated by watercraft.
- oo. *Registered land surveyor.* A land surveyor registered in the State of Illinois, under the Illinois Land Surveyors Act (225 ILCS 330/1, et seq.).
- pp. *Registered professional engineer.* An engineer registered in the State of Illinois, under the Illinois Professional Engineering Act (225 ILCS 325/1 et seq.).
- qq. *Regulatory floodway.* The channel, including on-stream lakes, and that portion of the flood plain adjacent to a stream or watercourse as designated by DWR, which is needed to store and convey the existing and anticipated future 100-year frequency flood discharge with no more than a one-tenth (0.1) foot increase in stage due to the loss of flood conveyance or storage, and no more than a ten (10) percent increase in velocities. The regulatory floodways are designated for the Trim Creek Tributary and Trim Creek on the flood boundary and floodway map prepared by FEMA (or Department of Housing and Urban Development) and dated September 6, 1995. The regulatory floodways for those parts of unincorporated Will County that are within the extraterritorial jurisdiction of the Village that may be annexed into the Village are designated for Trim Creek, Trim Creek Tributary, Black Walnut Creek, Exline Slough, Pike Creek, Plum Creek, and South Branch Rock Creek on the flood boundary and floodway map prepared by FEMA (or Department of Housing and Urban Development) and dated September 6, 1995. To locate the regulatory floodway boundary on any site, the regulatory floodway boundary should be scaled off the regulatory floodway map and located on a site plan, using reference marks common to both maps. Where interpretation is needed to determine the exact location of the regulatory floodway boundary, the Division should be contacted for the interpretation.
- rr. *Repair, remodeling or maintenance.* Development activities which do not result in any increases in the outside dimension of a building or any changes to the dimensions of a structure.
- ss. *Retention/detention facility.* A retention facility stores stormwater runoff without a gravity release. A detention facility provides for storage of stormwater runoff and controlled release of this runoff during and after a flood or storm.
- tt. *Riverine SFHA.* Any SFHA subject to flooding from a river, creek, intermittent stream, ditch, on stream lake system or any other identified channel. This term does not include areas subject to flooding from lakes, ponding areas, areas of sheet flow, or other areas not subject to overbank flooding.
- uu. *Runoff.* The water derived from melting snow or rain falling on the land surface, flowing over the surface of the ground or collected in channels or conduits.

- vv. *Sedimentation.* The processes that deposit soils, debris, and other materials either on other ground surfaces or in bodies of water or watercourses.
- ww. *Special flood hazard area (SFHA).* Any base flood area subject to flooding from a river, creek, intermittent stream, ditch, or any other identified channel or ponding and shown on a flood hazard boundary map or flood insurance rate map as zone A, A0, A1--30 AE, A99, AH, V0, V30, VE, V, M, or E.
- xx. *Structure.* The results of a man-made change to the land constructed on or below the ground, including the construction, reconstruction or placement of a building or any addition to a building; installing a manufactured home on a site; preparing a site for a manufactured home or installing a travel trailer on a site for more than 180 days.
- yy. *Substantial improvement.* Any repair, reconstruction or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either, (a) before the improvement or repair is started, or (b) if the structure has been damaged, and is being restored, before the damage occurred. For the purposes of this definition "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include either (1) any project for improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions or (2) any alteration of a structure listed on the National Register of Historic Places or a state inventory of historic places.
- zz. *Transition section.* Reaches of the stream or floodway where water flows from a narrow cross-section to a wide cross-section or vice versa.

Section 4.3 – How to Use This Ordinance

The Village Administrator shall be responsible for fulfilling all of the duties listed in Section 151:04.

To fulfill those duties, Village Engineer first should use the criteria listed in Section 151:05, Base Flood Elevations, to determine whether the development site is located within a flood plain. Once it has been determined that a site is located within a flood plain, the Village Engineer must determine whether the development site is within a flood fringe, a regulatory floodway, or within a SFHA or flood plain on which no floodway has been identified. If the site is within a flood fringe, the Village Engineer shall require that the minimum requirements of Section 151:06 be met. If the site is within a floodway, the Village Engineer will require that the minimum requirements of Section 151:07.0 be met. If the site is located within a SFHA or flood plain for which no detailed study has been completed and approved, the Village Engineer shall require that the minimum requirements of Section 151:08 be met.

In addition, the general requirements of Section 151:09 shall be met for all developments meeting the requirements of Section 151:06, 151:07, or 151:08. The Village Engineer shall assure that all subdivision proposals shall meet the requirements of Section 151:10.

If a variance is to be granted for a proposal, the Village Engineer shall review the requirements of Section 151:11 to make sure they are met. In addition, the Village Engineer shall complete all notification requirements.

In order to assure that property owners obtain permits as required in this Ordinance, the Village Administrator may take any and all actions as outlined in Section 151:13.

Section 4. 4 – Duties of the Enforcement Official(s)

The Village Administrator shall be responsible for the general administration and enforcement of this Ordinance which shall include the following:

- a. *Determining the flood plain designation.* Check all new development sites to determine whether they are in a special flood hazard area (SFHA). If they are in a SFHA, determine whether they are in a floodway, flood fringe or in a flood plain on which a detailed study has not been conducted which drains more than one (1) square mile.
- b. *Professional engineer review.* If the development site is within a floodway or in a flood plain on which a detailed study has not been conducted which drains more than one (1) square mile then the permit shall be referred to a registered professional engineer (PE) under the employ or contract of the Village for review to ensure that the development meets the requirements of Section 151:07. In the case of an appropriate use, the PE shall state in writing that the development meets the requirements of Section 151:07.
- c. *Dam safety requirements.* Ensure that a DWR dam safety permit has been issued or a letter indicating no dam safety permit is required if the proposed development activity includes construction of a dam as defined in Section 151:02l. Regulated dams may include weirs, restrictive culverts or impoundment structures.
- d. *Other permit requirements.* Ensure that any and all required federal, state and local permits are received prior to the issuance of a flood plain development permit.
- e. *Plan review and permit issuance.* Ensure that all development activities within the SFHAs of the jurisdiction of the Village meet the requirements of this Ordinance and issue a flood plain development permit in accordance with the provisions of this Ordinance and other regulations of this community when the development meets the conditions of this Ordinance.
- f. *Inspection review.* Inspect all development projects before, during and after construction to assure proper elevation of the structure and to ensure they comply with the provisions of this Ordinance;

- g. *Elevation and floodproofing certificates.* Maintain in the permit files an elevation certificate certifying the elevation of the lowest floor (including basement) of a residential or non-residential building or the elevation to which a non-residential building has been floodproofed, using a floodproofing certificate, for all buildings subject to Section 151:09 of this Ordinance for public inspection and provide copies of same;
- h. *Records for public inspection.* Maintain for public inspection and furnish upon request base flood data, SFHA and regulatory floodway maps, copies of federal or state permit documents, variance documentation, conditional letter of map revision, letter of map revision, letter of map amendment and "as built" elevation and floodproofing or elevation and floodproofing certificates for all buildings constructed subject to this Ordinance.
- i. *State permits.* Ensure that construction authorization has been granted by the Illinois Division of Water Resources, for all development projects subject to Sections 151:07 and 151:08 of this Ordinance, unless enforcement responsibility has been delegated to the Village. Upon acceptance of this Ordinance by DWR and FEMA, responsibility is hereby delegated to the Village as per 92 Illinois Administrative Code 708 for construction in the regulatory floodway and flood plain when floodways have not been defined in Sections 151:07 and 151:08 of this Ordinance. However, the following review approvals are not delegated to the Village and shall require review or permits from DWR:
 - (1) Organizations which are exempt from this Ordinance, as per the Illinois Revised Statutes;
 - (2) Department of Transportation projects, dams or impoundment structures as defined in Section 151:02l and all other state, federal or local unit of government projects, including projects of the Village and County, except for those projects meeting the requirements of Section 151:07i;
 - (3) An engineer's determination that an existing bridge or culvert crossing is not a source of flood damage and the analysis indicating the proposed flood profile, per Section 151:07e(5);
 - (4) An engineer's analysis of the flood profile to Section 151:07e(4);
 - (5) Alternative transition sections and hydraulically equivalent compensatory storage as indicated in Section 151:07e(1), (2), (8);
 - (6) Permit issuance of structures within or over publicly navigable rivers, lakes and streams;
 - (7) Any changes in the base flood elevation or floodway locations; and,

- (8) Base flood elevation determinations where none now exist.
- j. *Cooperation with other agencies.* Cooperate with state and federal flood plain management agencies to improve base flood or 100-year frequency flood and floodway data and to improve the administration of this Ordinance. Submit data to DWR and the Federal Emergency Management Agency for proposed revisions of a regulatory map. Submit reports as required for the National Flood Insurance Program. Notify the Federal Emergency Management Agency of any proposed amendments to this Ordinance.
- k. *Promulgate regulations.* Promulgate rules and regulations as necessary to administer and enforce the provisions of this Ordinance, subject however to the review and approval of DWR and FEMA for any Ordinance changes.

Section 4.5 – Base Flood Elevations

This Ordinance's protection standard is based on the flood insurance study for the Village. If a base flood elevation or 100-year frequency flood elevation is not available for a particular site, then the protection standard shall be according to the best existing data available in the Illinois State Water Survey's Flood Plain Information Repository. When a party disagrees with the best available data, he/she may finance the detailed engineering study needed to replace existing data with better data and submit it to DWR and FEMA.

- a. The base flood or 100-year frequency flood elevation for the SFHAs of the Trim Creek Tributary and Trim Creek shall be as delineated on the 100-year flood profiles in the flood insurance study of the Village prepared by FEMA (or the Department of Housing and Urban Development) and dated September 6, 1995 and such amendments to such study and maps as may be prepared from time to time.
- b. The base flood or 100-year frequency flood elevation for the SFHAs of those parts of unincorporated Will County that are within the extraterritorial jurisdiction of the Village or that may be annexed into the Village shall be as delineated on the 100-year flood profiles in the flood insurance study of Will County prepared by FEMA (or the Department of Housing and Urban Development) and dated September 6, 1995, and such amendments or revisions to such study and maps as may be prepared from time to time.
- c. The base flood or 100-year frequency flood elevation for each SFHA delineated as an "AH zone" or "AO zone" shall be that elevation (or depth) delineated on the flood insurance rate map of the Village.
- d. The base flood or 100-year frequency flood elevation each of the remaining SFHAs delineated as an "A zone" on the flood insurance rate map of the Village shall be according to the best existing data available in the Illinois State Water Survey Flood Plain Information Repository. When no base flood or 100-year frequency flood elevation for a riverine SFHA shall be determined from a backwater model, such as HEC-II, WSP-2, or a dynamic model such as HIP. The flood flows used in the

hydraulic models shall be obtained from a hydrologic model, such as HEC-I, TR-20, or HIP, or by techniques presented in various publications prepared by the United States Geological Survey for estimating peak flood discharges. Flood flows should be based on anticipated future land use conditions in the watershed as determined from adopted local and regional land use plans. Along any watercourses draining more than one (1) square mile, the above analyses shall be submitted to DWR for approval, once approved it must be submitted to the Illinois State Water Survey Floodplain Information Repository for filing. For a non-riverine SFHA, the base flood elevation shall be the historic flood of record plus three (3) feet, unless calculated by a detailed engineering study and approved by the Illinois State Water Survey.

Section 4.6 – Occupation and Use of Flood Fringe Areas

Development in and/or filling of the flood fringe may be permitted if protection is provided against the base flood or 100-year frequency flood by proper elevation, and compensatory storage and other provisions of this Ordinance are met. No use will be permitted which adversely affects the capacity of drainage facilities or systems. Developments located within the flood fringe shall meet the requirements of this section, along with the requirements of Section 151:09.

- a. *Development permit.* No person, firm, corporation, or governmental body not exempted by state law shall commence any development in the SFHA without first obtaining a development permit from the Village.
- b. Application for a development permit shall be made on a form provided by the Village. The application shall be accompanied by drawings of the site, drawn to scale, showing property line dimensions and legal description for the property and sealed by a licensed engineer, architect or land surveyor; existing grade elevations in MSL, 1929 adj. datum or NGVD and all changes in grade resulting from excavation or filling; the location and dimensions of all buildings and additions to buildings. For all proposed buildings, the elevation of the lowest floor (including basement) and lowest adjacent grade shall be shown on the submitted plans and the development will be subject to the requirements of Section 151:09 of this Ordinance.
- c. Upon receipt of a development permit application, the Village Engineer shall compare the elevation of the site to the base flood or 100-year frequency flood elevation. Any development located on land that can be shown to have been higher than the base flood elevation as of the site's first flood insurance rate map identification is not in the SFHA and, therefore, not subject to the requirements of this Ordinance. The building official shall maintain documentation of the existing ground elevation at the development site and certification that this ground elevation existed prior to the date of the site's first flood insurance rate map identification.
- d. A soil erosion and sedimentation control plan for disturbed areas shall be submitted. This plan shall include a description of the sequence of grading activities and the temporary sediment and erosion control measures to be implemented to mitigate their effects. This plan shall also include a description of final stabilization and re-

vegetation measures, and the identification of a responsible party to ensure post-construction maintenance.

- e. The Village Engineer shall be responsible for obtaining from the application, copies of all other local, state and federal permits, approvals or permit-not-required letters that may be require for this type of activity. The Village Administrator shall not issue a permit unless all other local, state and federal permits have been obtained.
- f. *Preventing increased damages.* No development in the flood fringe shall create a threat to public health and safety.
- g. If fill is being used to elevate the site above the base flood or 100-year frequency flood elevation, the applicant shall submit sufficient data and obtain a letter of map revision (LOMR) from FEMA for the purpose of removing the site from the flood plain.
- h. *Compensatory storage.* Whenever any portion of a flood plain is authorized for use, the volume of space which will be occupied by the authorized fill or structure below the base flood or 100-year frequency flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood or 100-year frequency flood elevation. The excavation volume shall be at least equal to one and one half (1.5) times the volume of storage lost due to the fill or structure. In the case of streams and watercourses, such excavation shall be made opposite or adjacent to the areas so filled or occupied. All flood plain storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All flood plain storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All such excavations shall be constructed to drain freely and openly to the watercourse.

A recorded covenant running with the land is required to maintain the compensatory storage volume in areas modified to provide compensatory storage volume.

- i. Basement floor and sump pump pit elevations shall be established with a minimum of two (2) feet of freeboard above the seasonal high groundwater table.

Section 4.7 – Occupation and Use of Identified Floodways

This section applies to proposed development, redevelopment, site modification or building modification within a regulatory floodway. The regulatory floodway for the Trim Creek Tributary, Trim Creek, Black Walnut Creek, Exline Slough, Pike Creek, Plum Creek, and South Branch Rock Creek shall be as delineated on the regulatory floodway maps designated by DWR according and referenced in 151:0200. Only those uses and structures will be permitted which meet the criteria in this Section. All floodway modifications shall be the minimum necessary to accomplish the purpose of the project. The development shall also meet the requirements of Section 151:09.

- a. *Development permit.* No person, firm, corporation or governmental body not exempted by state law shall commence any development in a floodway without first obtaining a development permit from the Village.
- b. Application for a development permit shall be made on a form provided by the Village. The application shall include the following information:
 - (1) Name and address of applicant;
 - (2) Site location (including legal description) of the property, drawn to scale, on the regulatory floodway map, indicating whether it is proposed to be in an incorporated or unincorporated area;
 - (3) Name of stream or body of water affected;
 - (4) Description of proposed activity;
 - (5) Statement of purpose of proposed activity;
 - (6) Anticipated dates of initiation and completion of activity;
 - (7) Name and mailing address of the owner of the subject property if different from the applicant;
 - (8) Signature of applicant or the applicant's agent;
 - (9) If the applicant is a corporation, the president or other authorized officer shall sign the application form;
 - (10) If the applicant is a partnership, each partner shall sign the application form; and
 - (11) If the applicant is a land trust, the trust officer shall sign the name of the trustee by him (her) as trust officer. A disclosure affidavit shall be filed with the application, identifying each beneficiary of the trust by name and address and defining the respective interests therein.
 - (12) Plans of the proposed activity shall be provided which include as a minimum:
 - (i) A vicinity map showing the site of the activity, name of the waterway, boundary lines, names of roads in the vicinity of the site, graphic or numerical scale, and north arrow;
 - (ii) A plan view of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the structure or work, elevations in mean sea level (1929 adjustment) datum or NGVD, adjacent property lines and ownership, drainage and flood

control easements, location of any channels and any existing or future access roads, distance between proposed activity and navigation channel (when the proposed construction is near a commercially navigable body of water), regulatory floodway limit, flood plain limit, specifications and dimensions of any proposed channel modifications, location and orientation of cross-sections, north arrow, and a graphic or numerical scale;

- (iii) Cross-section views of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the work as shown in plan view, existing and proposed elevations, normal water elevation, 10-year frequency flood elevation, 100-year frequency flood elevation, and graphic or numerical scales (horizontal and vertical);
 - (iv) A soil erosion and sedimentation control plan for disturbed areas. This plan shall include a description of the sequence of grading activities and the temporary sediment and erosion control measures to be implemented to mitigate their effects. This plan shall also include a description of final stabilization and re-vegetation measures, and the identification of a responsible party to ensure post-construction maintenance;
 - (v) A copy of the regulatory floodway map, marked to reflect any proposed change in the regulatory floodway location.
- (13) Any and all other local, state and federal permits or approval letters that may be required for this type of development.
 - (14) Engineering calculations and supporting data shall be submitted showing that the proposed work will meet the permit criteria of Section 151:07d.
 - (15) If the regulatory floodway delineation, base flood or 100-year frequency flood elevation will change due to the proposed project, the application will not be considered complete until DWR has indicated conditional approval of the regulatory floodway map change. No structures may be built until a letter of map revision has been approved by FEMA.
 - (16) The application for a structure shall be accompanied by drawings of the site, drawn to scale showing property line dimensions and existing ground elevations and all changes in grade resulting from any proposed excavation or filling, and flood plain and floodway limits; sealed by a registered professional engineer, licensed architect or registered land surveyor; the location and dimensions of all buildings and additions to buildings; and the elevation of the lowest floor (including basement) of all proposed buildings subject to the requirements of Section 151:09 of this Ordinance.

- (17) If the proposed project involves a channel modification, the applicant shall submit following information:
 - (i) A discussion of the purpose of and need for the proposed work;
 - (ii) A discussion of the feasibility of using alternative locations or methods to accomplish the purpose of the proposed work;
 - (iii) An analysis of the extent and permanence of the impacts the project would have on the physical and biological conditions of the body of water affected;
 - (iv) An analysis of the extent and permanence of the impacts each feasible alternative identified in Section 151:07e(4)(i) would have on the physical and biological conditions of the body of water affected; and
 - (v) An analysis of the impacts of the proposed project, considering cumulative effects on the physical and biological conditions of the body of water affected.
- c. The Village Engineer shall be responsible for obtaining from the applicant copies of all other local, state, and federal permits and approvals that may be required for this type of activity. The Village Administrator shall not issue the development permit unless all required federal and state permits have been obtained. A registered Professional Engineer, under the employ or contract of the Village, shall review and approve applications reviewed under this section.
- d. *Preventing increased damages and a list of appropriate uses.* The only development in a floodway which will be allowed are appropriate uses, which will not cause a rise in the base flood elevation, and which will not create a damaging or potentially damaging increase in flood heights or velocity or be a threat to public health and safety and welfare or impair the natural hydrologic and hydraulic functions of the floodway or channel, or permanently impair existing water quality or aquatic habitat. Construction impacts shall be minimized by appropriate mitigation methods as called for in this Ordinance. Only those appropriate uses listed in 92 Illinois Administrative Code 708 will be allowed. Appropriate uses do not include the construction or placement of any new structures, fill, building additions, buildings on stilts, excavation or channel modifications done to accommodate otherwise non-appropriate uses in the floodway, fencing (including landscaping or planting designed to act as a fence) and storage of materials except as specifically defined above as an appropriate use. The approved appropriate uses are as follows:
 - (1) Flood control structures, dikes, dams and other public works or private improvements relating to the control of drainage, flooding, erosion, or water quality or habitat for fish and wildlife.
 - (2) Structures or facilities relating to the use of, or requiring access to, the water or shoreline, such as pumping and treatment facilities, and facilities and

improvements related to recreational boating, commercial shipping and other functionally water dependent uses.

- (3) Storm and sanitary sewer outfalls.
 - (4) Underground and overhead utilities.
 - (5) Recreational facilities such as playing fields and trail systems including any related fencing (at least 50 percent open when viewed from any one direction) built parallel to the direction of flood flows, and including open air pavilions.
 - (6) Detached garages, storage sheds, or other non-habitable accessory structures without toilet facilities to existing buildings that will not block flood flows, nor reduce floodway storage.
 - (7) Bridges, culverts, roadways, sidewalks, railways, runways and taxiways and any modification thereto.
 - (8) Parking lots and any modifications thereto (where depth of flooding at the 100-year frequency flood event will not exceed one (1.0) foot) and aircraft parking aprons built at or below ground elevation.
 - (9) Regulatory floodway re-grading, without fill, to create a positive non-erosive slope toward a watercourse.
 - (10) Flood proofing activities to protect previously existing lawful structures including the construction of water tight window wells, elevating structures, or construction of floodwalls around residential, commercial or industrial principal structures where the outside toe of the floodwall shall be no more than ten (10) feet away from the exterior wall of the existing structure, and, which are not considered substantial improvements to the structure.
 - (11) In the case of damaged or replacement buildings, reconstruction or repairs made to a building that are valued at less than 50 percent of the market value of the building before it was damaged or replaced, and which do not increase the outside dimensions of the building.
 - (12) Additions to existing buildings above the BFE that do not increase the building's foot print and are valued at less than 50 percent of the market value of the building.
- e. Within the regulatory floodway as identified on the regulatory floodway maps designate by DWR, the construction of an appropriate use, will be considered permissible provided that the proposed project meets the following engineering and mitigation criteria and is so stated in writing with supporting plans, calculations and data by a registered professional engineer and provided that any structure meets the protection requirements of Section 151:09 of this Ordinance:

- (1) *Preservation of flood conveyance, so as not to increase flood stages upstream.* For appropriate uses other than bridge or culvert crossings, on-stream structures or dams, all effective regulatory floodway conveyance lost due to the project will be replaced for all flood events up to and including the 100-year frequency flood. In calculation effective regulatory floodway conveyance, the following factors shall be taken into consideration:

- (i) Regulatory floodway conveyance:

$$K' = \frac{1.486}{n} AR^{2/3}$$

Where "n" is Manning's roughness factor, "A" is the effective area of the cross-section, and "R" is the ratio of the area to the wetted perimeter. (See Open Channel Hydraulics, Ven Te Chow, 1959, McGraw-Hill Book Company, New York)

- (ii) The same Manning's "n" value shall be used for both existing and proposed conditions unless a recorded maintenance agreement with a federal, state or local unit of government can assure the proposed conditions will be maintained or the land cover is changing from a vegetative to a non-vegetative land cover.
- (iii) Transition sections shall be provided and used in calculations of effective regulatory floodway conveyance. The following expansion and contraction ratios shall be used unless and applicant's engineer can prove to DWR through engineering calculations or model tests that more abrupt transitions may be used with the same efficiency:
- (a) When water is flowing from a narrow section to a wider section, the water should be assumed to expand no faster than at a rate of one (1) foot horizontal for every four (4) feet of the flooded stream's length.
- (b) When water is flowing from a wide section to a narrow section, the water should be assumed to contract no faster than at a rate of one (1) foot horizontal for every one (1) foot of the flooded stream's length.
- (c) When expanding or contracting flows in a vertical direction, a minimum of one (1) foot vertical transition for every ten (10) feet of stream length shall be used.
- (d) Transition sections shall be provided between cross-sections with rapid expansions and contractions and when meeting the regulatory floodway delineation on adjacent properties.

- (e) All cross-sections used in the calculations shall be located perpendicular to the flood flows.
- (2) *Preservation of floodway storage so as not to increase downstream flooding.* Compensatory storage shall be provided for any regulatory floodway storage lost due to the proposed work from the volume of fill or structures placed and the impact of any related flood control projects. Compensatory storage for fill or structures shall be equal to at least one and one-half (1 1/2) times the volume of flood plain storage lost. Artificially created storage lost due to a reduction in head loss behind a bridge shall not be required to be replaced. The compensatory regulatory floodway storage shall be placed between the proposed normal water elevation and the proposed 100-year flood elevation. All regulatory floodway storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All regulatory floodway storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All such excavations shall be constructed to drain freely and openly to the watercourse. If the compensatory storage will not be placed at the location of the proposed construction, the applicant's engineer shall demonstrate to DWR through a determination of flood discharges and water surface elevations that the compensatory storage is hydraulically equivalent. Finally, there will be no reduction in floodway surface area as a result of a floodway modification, unless such modification is necessary to reduce flooding at an existing structure.
- (3) *Preservation of floodway velocities so as not to increase stream erosion of flood heights.* For all appropriate uses, except bridges or culverts or on stream structures, the proposed work will not result in an increase in the average channel or regulatory floodway velocities or stage for all flood events up to and including the 100-year frequency event. However in the case of bridges or culverts or on stream structures built for the purpose of backing up water in the stream during normal or flood flows, velocities may be increased at the structure site if scour, erosion and sedimentation will be avoided by the use of rip-rap or other design measures.
- (4) *Construction of new bridges or culvert crossings and roadway approaches.* The proposed structure shall not result in an increase of upstream flood stages greater than one-tenth (0.1) of one foot when compared to the existing conditions for all flood events up to and including the 100-year frequency event or the upstream flood stage increases will be contained within the channel banks (or within existing vertical extensions of the channel banks) such as within the design protection grade of existing levees or flood walls or within recorded flood easements. If the proposed construction will increase upstream flood stages greater than one-tenth (0.1) of one foot, the developer must contact DWR, dam safety section for a dam safety permit or waiver.

- (i) The engineering analysis of upstream flood stages must be calculated using the flood study flows, and corresponding flood elevations for tailwater conditions for the flood study specified in Section 151:05 of this Ordinance. Culverts must be analyzed using the U.S. DOT, FHWA Hydraulic Chart for the Selection of Highway Culverts. Bridges must be analyzed using the U.S. DOT/Federal Highway Administration Hydraulics of Bridge Waterways calculation procedures.
 - (ii) Lost floodway storage must be compensated for per Section 151:07e(2).
 - (iii) Velocity increases must be mitigated per Section 151:07e(3).
 - (iv) If the crossing is proposed over a public water that is used for recreational or commercial navigation, a Department of Transportation permit must be received.
 - (v) The hydraulic analysis for the backwater caused by the bridge showing the existing condition and proposed regulatory profile must be submitted to DWR for concurrence that a CLOMR is not required by Section 151:07d.
 - (vi) All excavations for the construction of the crossing shall be designated per Section 151:07e(8).
- (5) *Reconstruction or modification of existing bridges, culverts, and approach roads.*
- (i) The bridge or culvert and roadway approach reconstruction or modification shall be constructed with no more than a one-tenth (0.1) foot increase in backwater over the existing flood profile for all flood frequencies up to and including the 100-year event, if the existing structure is not a source of flood damage.
 - (ii) If the existing bridge or culvert and roadway approach is a source of flood damage to buildings or structures in the upstream flood plain, the applicant's engineer shall evaluate the feasibility of redesigning the structure to reduce the existing backwater, taking into consideration the effects of flood stages on upstream and downstream properties.
 - (iii) The determination as to whether or not the existing crossing is a source of flood damage and should be redesigned must be prepared in accordance with the Department of Transportation Rules 92 Illinois Administrative Code 708 (Floodway Construction in Northeastern Illinois) and submitted to the division for review and concurrence before a permit is issued.

- (6) *On-stream structures built for the purpose of backing up water.* Any increase in upstream flood stages greater than zero (0.0) feet when compared to the existing conditions, for all flood events up to and including the 100 year frequency event shall be contained within the channel banks (or within existing vertical extensions of the channel banks) such as within the design protection grade of existing levees or flood walls or within recorded flood easements. A permit or letter indicating a permit is not required must be obtained from DWR, dam safety section for a dam safety permit or waiver for any structure built for the purpose of backing up water in the stream during normal or flood flow. All dams and impoundment structures as defined in Section 151:021 shall meet the permitting requirements of 92 Illinois Administrative Code 702 (Construction and maintenance of dams). If the proposed activity involves a modification of the channel or floodway to accommodate an impoundment, it shall be demonstrated that:
- (i) The impoundment is determined to be in the public interest by providing flood control, public recreation, or regional stormwater detention;
 - (ii) The impoundment will not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning;
 - (iii) The impoundment will not cause or contribute to degraded water quality or habitat conditions. Impoundment design should include gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin.
 - (iv) A non-point source control plan has been implemented in the upstream watershed to control the effects of sediment runoff as well as minimize the input of nutrients, oil and grease, metals and other pollutants. If there is more than one (1) municipality in the upstream watershed, the municipality in which the impoundment is constructed should coordinate with upstream municipalities to ensure comprehensive watershed control;
 - (v) The project otherwise complies with the requirements of this section.
- (7) *Flood proofing of existing habitable, residential and commercial structures.* If construction is required beyond the outside dimensions of the existing building, the outside perimeter of the floodproofing construction shall be placed no further than ten (10) feet from the outside of the building. Compensation of lost storage and conveyance will not be required for floodproofing activities.
- (8) *Excavation in the floodway.* When excavation is proposed in the design of bridges and culvert openings, including the modifications to and replacement of existing bridge and culvert structures, or to compensate for lost conveyance

for other appropriate uses, transition sections shall be provided for the excavation . The following expansion and contraction ratios shall be used unless an applicant engineer can prove to DWR through engineering calculations or model tests that more abrupt transitions may be used with the same efficiency:

- (i) When water is flowing from a narrow section to a wider section, the water should be assumed to expand no faster than at a rate of one (1) foot horizontal for every four (4) feet of the flooded stream's length;
 - (ii) When water is flowing from a wide section to a narrow section, the water should be assumed to contract no faster than at a rate of one (1) foot horizontal for every one (1) foot of the flooded stream's length; and
 - (iii) When expanding or contracting flows in a vertical direction, a minimum of one (1) foot vertical transition for every ten (10) feet of stream length shall be used.
 - (iv) Erosion/scour protection shall be provided inland upstream and downstream of the transitions sections.
- (9) *Channel modification.* If the proposed activity involves a channel modification, it shall be demonstrated that:
- (i) There are no practicable alternatives to the activity which would accomplish its purpose with less impact to the natural conditions of the body of water affected. Possible alternatives include levees, bank stabilization, flood proofing of existing structures, removal of structures from the flood plain, clearing the channel, high flow channel, or the establishment of a stream side buffer strip or green belt. Channel modification is acceptable if the purpose is to restore natural conditions and improve water quality and fish and wildlife habitat;
 - (ii) Water quality, habitat, and other natural functions would be significantly improved by the modification and no significant habitat area may be destroyed, or the impacts are offset by the replacement of an equivalent degree of natural resource values;
 - (iii) The activity has been planned and designed and will be constructed in a way which will minimize its adverse impacts on the natural conditions of the body of water affected, consistent with the following criteria:
 - (a) The physical characteristics of the modified channel shall match as closely as possible those of the existing channel in length, cross-section, slope and sinuosity. If the existing channel has been previously modified, restoration of more natural physical conditions

should be incorporated into channel modification design, where practical.

- (b) Hydraulically effective transitions shall be provided at both the upstream and down stream ends of the project, designed such that they will prevent erosion.
- (c) One-sided construction of a channel shall be used when feasible. Removal of streamside (riparian) vegetation should be limited to one (1) side of the channel, where possible to preserve the shading and stabilization effects of the vegetation.
- (d) Clearing of vegetation shall be limited to that which is essential for construction of the channel.
- (e) Channel banks shall be constructed with a side slope no steeper than three (3) to one (1) horizontal to vertical,

wherever practicable. Natural vegetation and gradual side slopes are the preferred methods for bank stabilization. Where high velocities or sharp bends necessitate the use of alternative stabilization measures, natural rock or rip-rap are preferred materials. Artificial materials such as concrete, gabions, or construction rubble should be avoided unless there are no practicable alternatives.

- (f) All disturbed areas associated with the modification shall be seeded or otherwise stabilized as soon as possible upon completion of construction. Erosion blanket or an equivalent material shall be required to stabilize disturbed channel banks prior to establishment of the vegetative cover.
- (g) If the existing channel contains considerable bottom diversity such as deep pools, riffles, and other similar features, such features shall be provided in the new channel. Spawning and nesting areas and flow characteristics compatible with fish habitat shall also be established, where appropriate.
- (h) A sediment basin shall be installed at the downstream end of the modification to reduce sedimentation and degradation of downstream water quality.
- (i) New or relocated channels should be built in the dry and all items of construction, including vegetation, should be completed prior to diversion of water into the new channel.
- (j) There shall be no increases in stage or velocity as the channel enters or leaves the project site for any frequency flood unless necessitated

by a public flood control project or unless such an increase is justified as part of a habitat improvement or erosion control project.

(k) Unless the modification is for a public flood control project, there shall be no reduction in the volume of floodwater storage outside the floodway as a result of the modification; and

(l) The project otherwise complies with the requirements of this section.

(10) *Seeding and stabilization plan.* For all activities located in a floodway, a seeding and stabilization plan shall be submitted by the applicant.

(11) *Soil erosion and sedimentation measures.* For all activities in the floodway, including grading, filling, and excavation, in which there is potential for erosion of exposed soil, soil erosion and sedimentation control measures shall be employed consistent with the following criteria:

(i) The construction area shall be minimized to preserve the maximum vegetation possible. Construction shall be scheduled to minimize the time soil is exposed and unprotected. In no case shall the existing natural vegetation be destroyed, removed, or disturbed more than 15 days prior to the initiation of improvements.

(ii) Temporary and/or permanent soil stabilization shall be applied to denuded areas as soon as possible. As a minimum, soil stabilization shall be provided within 15 days after final grade is reached on any portion of the site, and within 15 days to denuded areas which may not be at final grade but will remain undisturbed for longer than 60 days.

(iii) Sedimentation control measures shall be installed before any significant grading or filling is initiated on the site to prevent the movement of eroded sediments off site or into the channel. Potential sediment control devices include filter fences, straw bale fences, check dams, diversion ditches, and sediment basins.

(iv) A vegetated strip of at least ~~60~~ 25 feet in width shall be preserved and/or re-established, where possible, along existing channels (See Section 151:07e(16)). The buffer width shall be measured from the channel's OHWM to the adjacent lotlines. Construction vehicle use of channels shall be minimized. Temporary stream crossings shall be constructed, wherever necessary, to minimize erosion. Necessary construction in or along channels shall be restabilized immediately.

(v) Soil erosion and sedimentation control measures shall be designed and implemented consistent with "Procedures and Standards for Urban Soil Erosion and Sedimentation Control in Illinois" (1988) also known as the

"Green Book" and "Standards and Specifications for Soil Erosion and Sediment Control" (IEPA, 1987).

- (12) *Public flood control projects.* For public flood control projects, the permitting requirements of this section will be considered met if the applicant can demonstrate to DWR through hydraulic and hydrologic calculations that the proposed project will not singularly or cumulatively result in increased flood heights outside the project right-of-way or easements for all flood events up to and including the 100-year frequency event.
- (13) *General criteria for analysis of flood elevations.*
- (i) The flood profiles, flows and floodway data in the regulatory floodway study, referenced in Section 151.05, must be used for analysis of the base conditions. If the study data appears to be in error or conditions have changed, DWR shall be contacted for approval and concurrence on the appropriate base conditions data to use.
 - (ii) If the 100-year regulatory floodway elevation at the site of the proposed construction is affected by backwater from a downstream receiving stream with a larger drainage area, the proposed construction shall be shown to meet the requirements of this section for the 100-year frequency flood elevations of the regulatory floodway conditions and conditions with the receiving stream at normal water elevations.
 - (iii) If the applicant learns from DWR, local governments, or a private owner that a downstream restrictive bridge or culvert is scheduled to be removed, reconstructed, modified, or a regional flood control project is scheduled to be built, removed, constructed or modified within the next five (5) years, the proposed construction shall be analyzed and shown to meet the requirements of this section for both the existing conditions and the expected flood profile conditions when the bridge, culvert or flood control project is built.
- (14) *Conditional letter of map revision.* If the appropriate use would result in a change in the regulatory floodway location or the 100-year frequency flood elevation, the applicant shall submit to DWR and to FEMA all the information, calculations and documents necessary to be issued a conditional regulatory floodway map revision and receive from DWR a conditional approval of the regulatory floodway change before a permit is issued. However, the final regulatory floodway map will not be changed by DWR until as-built plans or record drawings are submitted and accepted by FEMA and DWR. In the case of non-government projects, the municipality in incorporated areas and the county in unincorporated areas shall concur with the proposed conditional regulatory floodway map revision before DWR approval can be given. No filling, grading, dredging or excavating shall take place until a conditional approval is issued. No further development activities

shall take place until a final letter of map revision (LOMR) is issued by FEMA and DWR.

- (15) *Professional engineer's supervision.* All engineering analyses shall be performed by or under the supervision of a registered professional engineer.
- (16) *Buffer strips.* For all activities in the floodway involving construction within 60 feet of the channel, the following criteria shall be met:
 - (i) A natural vegetation buffer strip shall be preserved within at least sixty (60) feet of the ordinary high water mark of the channel.
 - (ii) Where it is impossible to protect this buffer strip during the construction of an appropriate use, a vegetated buffer strip shall be established upon completion of construction.
 - (iii) The use of native riparian vegetation is preferred in the buffer strip. Access through this buffer strip shall be provided, when necessary, for stream maintenance purposes.

After receipt of conditional approval of the regulatory floodway change and issuance of a permit and a conditional letter of map revision, construction as necessary to change the regulatory floodway designation may proceed but no buildings or structures or other construction that is not an appropriate use may be placed in that area until the regulatory floodway map is changed and a final letter of map revision is received. The regulatory floodway map will be revised upon acceptance and concurrence by DWR and FEMA of the "as built" plans.

- f. State review. For those projects listed below located in a regulatory floodway, the following criteria shall be submitted to DWR for their review and concurrence prior to the issuance of a permit:
 - (1) DWR will review an engineer's analysis of the flood profile due to a proposed bridge pursuant to Section 151:07e(4).
 - (2) DWR will review an engineer's determination that an existing bridge or culvert crossing is not a source of flood damage and the analysis indicating the proposed flood profile, pursuant to Section 151:07e(5).
 - (3) The DWR will review alternative transition sections and hydraulically equivalent storage pursuant to Section 151:07e (1), (2), and (8).
 - (4) The DWR will review and approve prior to the start of construction any department projects, dams (as defined in Section 151:02l) and all other state, federal or local units of government projects, including projects of the municipality or country.

- g. Other permits. In addition to the other requirements of this Ordinance, a development permit for a site located in a floodway shall not be issued unless the applicant first obtains a permit or written documentation that a permit is not required from DWR, issued pursuant to 615 ILCS 5/5 et seq. No permit from DWR shall be required if the division has delegated this responsibility to the Village.
- h. Dam safety permits. Any work involving the construction, modification or removal of a dam as defined in Section 151:021 per 92 Illinois Administrative Code 702 (Rules for Construction of Dams) shall obtain an Illinois Division of Water Resources dam safety permit prior to the start of construction of a dam. If the Village Administrator finds a dam that does not have a DWR permit, the Village Administrator shall immediately notify the Dam Safety Section of the Division of Water Resources (DWR). If the Village Administrator finds a dam which is believed to be in unsafe condition, the Village Administrator shall immediately notify the owner of the dam, DWR, Dam Safety Section in Springfield and the Illinois Emergency Services and Disaster Agency (ESDA).
- i. Activities that do not require a registered professional engineer's review. The following activities may be permitted without a registered professional engineers review. Such activities shall still meet the other requirements of this Ordinance, including the mitigation requirements.
 - (1) Underground and overhead utilities that:
 - (i) Do not result in any increase in existing ground elevations;
 - (ii) Do not require the placement of above ground structures in the floodway; or
 - (iii) In the case of underground stream crossings, the top of the pipe or encasement is buried a minimum of three (3) feet below the existing stream bed; and
 - (iv) In the case of overhead utilities, no supporting towers are placed in the watercourse and are designed in such a fashion as not to catch debris.
 - (2) Storm and sanitary sewer outfalls that:
 - (i) Do not extend riverward or lakeward of the existing adjacent natural bank slope;
 - (ii) Do not result in an increase in ground elevation; and
 - (iii) Are designed so as not to cause stream erosion at the outfall location.

- (3) Construction of sidewalks, athletic fields excluding fences, properly anchored playground equipment and patios at grade.
- (4) Construction of shoreline and streambank protection that:
 - (i) Does not exceed 1,000 feet in length.
 - (ii) Materials are not placed higher than the existing top of bank.
 - (iii) Materials are placed so as not to reduce the cross-sectional area of the stream channel or bank of the lake.
- (5) Temporary stream crossing in which:
 - (i) The approach roads will be one-half (0.5) foot or less above natural grade.
 - (ii) The crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall invert.
 - (iii) The top of the roadway fill in the channel will be at least two (2) feet below the top of the lowest bank. Any fill in the channel shall be non-erosive material, such as rip-rap or gravel.
 - (iv) All disturbed stream banks will be seeded or otherwise stabilized as soon as possible upon installation and again upon removal of construction.
 - (v) The access road and temporary crossings will be removed within one (1) year after authorization.
 - (vi) The crossing shall be designed to convey a 2-year flood (minimum) without overtopping, and to pass the base flood event without washing out.

Section 4.8 – Occupation and Use of Special Flood Hazard Areas (SFHA) where Floodways Are Not Identified.

In SFHA or flood plains, where no floodways have been identified and no base flood or 100-year frequency flood elevations have been established by FEMA, and draining more than a square mile, no development shall be permitted unless the cumulative effect of the proposals, when combined with all other existing and anticipated uses and structures, shall not significantly impede or increase the flow and passage of the floodwaters no significantly increase the base flood or 100-year frequency flood elevation.

- a. *Development permit.* No person, firm, corporation, or governmental body, not exempted by state law, shall commence any development in a SFHA or flood plain,

or on property which includes a SFHA or flood plain, without first obtaining a development permit from the Village. Application for a development permit shall be made on a form provided by the Village. The application shall be accompanied by drawings of the site, drawn to scale showing property line dimensions; and existing grade elevations and all changes in grade resulting from excavation or filling, sealed by a licensed engineer, architect or surveyor; the location and dimensions of all buildings and additions to buildings; and the elevations of the lowest floor (including basement) of all proposed buildings subject to the requirements of Section 151:09 of this Ordinance.

The application for a development permit shall also include the following information:

- (1) A detailed description of the proposed activity, its purpose, and intended use;
- (2) Site location (including legal description) of the property, drawn to scale, on the regulatory floodway maps, indicating whether it is proposed to be in an incorporated or unincorporated area;
- (3) Anticipated dates of initiation and completion of activity;
- (4) Plans of the proposed activity shall be provided which include as a minimum:
 - (i) A vicinity map showing the site of the activity, name of the waterway, boundary lines, names of roads in the vicinity of the site, graphic or numerical scale, and north arrow;
 - (ii) A plan view of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the structure or work, elevations in mean sea level (1929 adjustment) datum or NGVD, adjacent property lines and ownership, drainage and flood control easements, distance between proposed activity and navigation channel (when the proposed construction is near a commercially navigable body of water), flood plain limit, location and orientation of cross-sections, north arrow, and a graphical or numerical scale;
 - (iii) Cross-section views of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the work as shown in plan view, existing and proposed elevations, normal water elevation, 10-year frequency flood elevation, 100-year frequency flood elevation, and graphical or numerical scales (horizontal and vertical).
 - (iv) A soil erosion and sedimentation control plan for disturbed areas. This plan shall include a description of the sequence of grading activities and the temporary sediment and erosion control measures to be implemented

to mitigate their effects. This plan shall also include a description of final stabilization and revegetation measures, and the identifications of a responsible party to ensure post-construction maintenance.

- (5) Engineering calculations and supporting data shall be submitted showing that the proposed work will meet the criteria of Section 151:08d.
 - (6) Any and all other local, state and federal permits or approvals that may be required for this type of development.
- b. Based on the best available existing data according to the Illinois State Water Survey's Flood Plain Information Repository, the Village Engineer shall compare the elevation of the site to the base flood or 100-year frequency flood elevation. Should no elevation information exist for the site, the developer's engineer shall calculate the elevation according to Section 151:05d. Any development located on land that can be shown to have been higher than the base flood elevation as of the site's first flood insurance rate map identification is not in the SFHA and, therefore, not subject to the requirements of this Ordinance. The building official shall maintain documentation of the existing ground elevation at the development site and certification that this ground elevation existing prior to the date of the site's first flood insurance rate map identification.
- c. The Village Engineer shall be responsible for obtaining from the applicant copies of all other local, state, and federal permits, approvals or permit-not-required letters that may be required for this type of activity. The Village Administrator shall not issue the development permit unless all required local, state and federal permits have been obtained.
- d. *Preventing increased damages.* No development in the SFHA, where a floodway has not been determined shall create a damaging or potentially damaging increase in flood heights or velocity or threat to public health, safety and welfare or impair the natural hydrologic and hydraulic functions of the floodway or channel, or impair existing water quality or aquatic habitat. Construction impacts shall be minimized by appropriate mitigation methods as called for in this Ordinance.
- e. *Applicable standards.* Within all riverine SFHA's where the floodway has not been determined, the following standards shall apply:
 - (1) The developer shall have a registered professional engineer state in writing and show through supporting plans, calculations, and data that the project meets the engineering requirements of Section 151:07e(1) through (10) for the entire flood plain as calculated under the provisions of Section 151:05d of this Ordinance. As an alternative, the developer should have an engineering study performed to determine a floodway and submit that engineering study to DWR for acceptance as a regulatory floodway. Upon acceptance of their floodway by the department, the developer shall then demonstrate that the project meets the requirements of Section 151:07 for the regulatory floodway.

The floodway shall be defined according to the definition in Section 151:0200 of this Ordinance.

- (2) A development permit shall not be issued unless the applicant first obtains a permit from DWR or written documentation that a permit is not required from DWR.
- (3) No permit from DWR shall be required if the division has delegated permit responsibility to the Village per 92 Illinois Administrative Code, part 708 for regulatory floodways, per DWR statewide permit entitled "Construction in Flood Plains With No Designated Floodways in Northeastern Illinois."
- (4) Dam safety permits. Any work involving the construction, modification or removal of a dam or an on-stream structure to impound water as defined in Section 151:021 shall obtain an Illinois Division of Water Resources Dam safety permit or letter indicating a permit is not required prior to the start of construction of a dam. If the Village Administrator finds a dam that does not have DWR permit, the Village Administrator shall immediately notify the dam safety section of the division of water resources. If the Village Administrator finds a dam which is believed to be in unsafe condition, the Village Administrator shall immediately notify the owner of the dam and the Illinois Emergency Services and Disaster Agency (ESDA), and the DWR, Dam Safety Section in Springfield
- (5) The following activities may be permitted without a registered professional engineer's review or calculation of a base flood elevation and regulatory floodway. Such activities shall still meet the other requirements of this Ordinance:
 - (i) Underground and overhead utilities that:
 - (a) Do not result in any increase in existing ground elevations, or
 - (b) Do not require the placement of above ground structures in the floodway, or
 - (c) In the case of underground stream crossings, the top of the pipe or encasement is buried a minimum of three (3) feet below the existing streambed, and
 - (d) In the case of overhead utilities, no supporting towers are placed in the watercourse and are designed in such a fashion as not to catch debris.
 - (e) Disturbance of streamside vegetation shall be kept to a minimum during construction to prevent erosion and sedimentation.

- (ii) Storm and sanitary sewer outfalls that:
 - (a) Do not extend riverward or lakeward of the existing adjacent natural bank slope, and
 - (b) Do not result in an increase in ground elevation, and
 - (c) Are designed so as not to cause stream bank erosion at the outfall location.
- (iii) Construction of shoreline and streambed protection that:
 - (a) Does not exceed 1,000 feet in length or two (2) cubic yards per lineal foot of streambed.
 - (b) Materials are not placed higher than the existing top of bank.
 - (c) Materials are placed so as not to reduce the cross-sectional area of the stream channel by more than ten (10) percent.
 - (d) Stabilization utilizing native vegetation and gradual side slopes are the preferred mitigation methods for existing erosion problems. Where high channel velocities, sharp bends or wave action necessitate the use of alternative stabilization measures, soil bioengineering techniques, natural rock or rip-rap are preferred materials. Artificial materials such as concreted, construction rubble, and gabions should be avoided unless there are no practicable alternatives.
- (iv) Temporary stream crossings in which:
 - (a) The approach roads will be one-half (0.5) foot or less above natural grade.
 - (b) The crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall invert.
 - (c) The top of the roadway fill in the channel will be at least two (2) below the top of the lowest bank. Any fill in the channel shall be non-erosive material, such as rip-rap or gravel.
 - (d) All disturbed stream banks will be seeded or otherwise stabilized as soon as possible upon installation and again upon removal of construction.

- (e) The access road and temporary crossings will be removed within one (1) year after authorization.
 - (v) The construction of light poles, sign posts and similar structures;
 - (vi) The construction of sidewalks, driveways, athletic fields (excluding fences), patios and similar surfaces which are built at grade;
 - (vii) The construction of properly anchored, unwallled, open structures such as playground equipment, pavilions, and carports built at or below existing grade that would not obstruct the flow of flood waters;
 - (viii) The placement of properly anchored buildings not exceeding 70 square feet in size, nor ten (10) feet in any one dimension (e.g., animal shelters and tool sheds);
 - (ix) The construction of additions to existing buildings which do not increase the first floor area by more than 20 percent, which are located on the upstream or downstream side of the existing building, and which do not extend beyond the sides of the existing building that are parallel to the flow of flood waters;
 - (x) Minor maintenance dredging of a stream channel where:
 - (a) The affected length of stream is less than 1,000 feet.
 - (b) The work is confined to reestablishing flows in natural stream channels, or
 - (c) The cross-sectional area of the dredged channel conforms to that of the natural channel upstream and downstream of the site.
- (6) The flood carrying capacity within any altered or relocated watercourse shall be maintained.
- f. *Compensatory storage.* Whenever any portion of a flood plain is authorized for use, the volume of space which will be occupied by the authorized fill or structure below the base flood or 100-year frequency flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood or 100-year frequency flood elevation. The excavation volume shall be at least equal to one and one half (1.5) times the volume of storage lost due to the fill or structure. In the case of streams and watercourses, such excavation shall be made opposite or adjacent to the areas so filled or occupied. All flood plain storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All flood plain storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation shall be

replaced above the proposed 10-year flood elevation. All such excavations shall be constructed to drain freely and openly to the watercourse.

Section 4.9 – Permitting Requirements Applicable to All Flood Plain Areas and Protection of Building

In addition to the requirements found in Sections 151:06, 151:07 and 151:08 for development in flood fringes, regulatory floodways, and SFHA or flood plains where no floodways have been identified (zones A, AO, AH, AE A1--A30, A99, VO, V1--V30, VE, V, M or E), the following requirements shall be met.

- a. *Public health standards.*
 - (1) No developments in the SFHA shall include locating or storing chemicals, explosives, buoyant materials, animal wastes, fertilizers, flammable liquids, pollutants, or other hazardous or toxic materials below the flood plain elevation.
 - (2) New and replacement water supply systems, wells, sanitary sewer lines and on-site waste disposal systems may be permitted providing all manholes or other above ground openings located below the FPE are watertight.
- b. *Carrying capacity and notification.* For all projects involving channel modification, fill, or stream maintenance (including levees), the flood carrying capacity of the watercourse shall be maintained. In addition, the Village shall notify adjacent communities in writing 30 days prior to the issuance of a permit for the alteration or relocation of the watercourse.
- c. *Protecting buildings.*
 - (1) All buildings located within a 100-year flood plain also known as SFHA, shall be protected from flood damage below the flood protection elevation. However, existing buildings located within a regulatory floodway shall also meet the more restrictive appropriate use standards included in Section 151:07. This building protection criteria applies to the following situations:
 - (i) Construction or placement of a new building;
 - (ii) A structural alteration to an existing building that either increases the first floor area by more than 20 percent or the building's market value by more than 50 percent;
 - (iii) Installing a manufactured home on a new site or a new manufactured home on an existing site. This building protection requirements does not apply to returning a mobile home to the same site it lawfully occupied before it was removed to avoid flood damage; and

- (iv) Installing a travel trailer on a site for more than 180 days.
- (2) This building protection requirement may be met by one (1) of the following methods:
- (i) A residential or non-residential building, when allowed, may be constructed on permanent land fill in accordance with the following:
 - (a) The lowest floor, (including basement) shall be at or above the flood protection elevation.
 - (b) The fill shall be placed in layers no greater than one (1) foot deep before compaction and should extend at least ten (10) feet beyond the foundation of the building before sloping below the flood protection elevation. The top of the fill shall be above the flood protection elevation. However, the ten (10) foot minimum may be waived if a structural engineer certifies an alternative method to protect the building from damages due to hydrostatic pressures. The fill shall be protected against erosion and scour. The fill shall not adversely affect the flow or surface drainage from or onto neighboring properties.
 - (ii) A residential or non-residential building may be elevated in accordance with the following:
 - (a) The building or improvements shall be elevated on crawl space, stilts, piles, walls, or other foundation that is permanently open to flood waters and not subject to damage by hydrostatic pressures of the base flood or 100-year frequency flood. The permanent openings shall be no more than one (1) foot above grade, and consists of a minimum of two (2) openings. The openings must have a total net area of not less than one (1) square inch for every one (1) square foot of enclosed area subject to flooding below the base flood elevation.
 - (b) The foundation and supporting members shall be anchored and aligned in relation to flood flows and adjoining structures so as to minimize exposure to known hydrodynamic forces such as current, waves, ice and floating debris.
 - (c) All areas below the flood protection elevation shall be constructed of materials resistant to flood damage. The lowest floor (including basement) and all electrical, heating, ventilating, plumbing and air conditioning equipment and utility meters shall be located at or above the flood protection elevation. Water and sewer pipes, electrical and telephone lines, submersible pumps, and other

waterproofed service facilities may be located below the flood protection elevation.

- (d) No area below the flood protection elevation shall be used for storage of items or materials.
 - (e) Manufactured homes and travel trailers to be installed on a site for more than 180 days, shall be elevated to or above the flood protection elevation; and, shall be anchored to resist flotation, collapse, or lateral movement by being tied down in accordance with the Rules and Regulations for the Illinois Mobile Home Tie-Down Act issued pursuant to 77 Illinois Administrative Code 870.
- (iii) Only a non-residential building may be structurally floodproofed (in lieu of elevation) provided that a registered professional engineer shall certify that the building has been structurally dry floodproofed below the flood protection elevation, the structure and attendant utility facilities are watertight and capable of resisting the effects of the base flood or 100-year frequency flood. The building design shall take into account flood velocities, duration, rate of rise, hydrostatic and hydrodynamic forces, the effects of buoyancy, and impacts from debris or ice. Floodproofing measures shall be operable without human intervention and without an outside source of electricity (levees, berms, floodwalls and similar works are not considered floodproofing for the purpose of this subsection).
- (iv) Non-conforming structures located in a regulatory floodway may remain in use, but may not be enlarged, replaced or structurally altered. A non-conforming structure damaged by flood, fire, wind or other natural or man-made disaster may be restored unless the damage exceeds 50 percent of its market value before it was damaged, in which case it shall conform to this Ordinance.
- (v) Buildings constructed on property removed from the floodplain by filling shall have their lowest habitable floors (including basements) set at the flood protection elevation. If the builder chooses to accept the higher risk of constructing habitable floors below the flood protection elevation, the lowest floor may be as much as five (5) feet below the base flood elevation, provided the builder demonstrates compliance with the simplified approach identified in the Federal Emergency Management Agency's Technical Bulletin 10-01.

Section 4.10 – Other Development Requirements

The Board of Trustees shall take into account flood hazards, to the extent that they are known in all official actions related to land management, use and development.

- a. New subdivisions, manufactured home parks, annexation agreements, and planned unit developments (PUDs) within the SFHA shall be reviewed to assure that the proposed developments are consistent with Sections 151:06, 151:07, 151:08 and 151:09 of this Ordinance and the need to minimize flood damage. Plats or plans for new subdivisions, mobile home parks and planned unit developments (PUDs) shall include a signed statement by a registered professional engineer that the plat or plans account for changes in the drainage of surface waters in accordance with the Plat Act 765 ILCS 205/2.
- b. Proposals for new subdivisions, manufactured home parks, travel trailer parks, planned unit developments (PUDs) and additions to manufactured home parks and additions to subdivisions shall include base flood or 100-year frequency flood elevation data and floodway delineations.. Where this information is not available from an existing study filed with the Illinois State Water Survey, the applicant's engineer shall be responsible for calculating the base flood or 100-year frequency flood elevation per Section 151:05d and the floodway delineation per the definition in Section 151:02oo and submitting it to the State Water Survey and DWR for review and approval as best available regulatory data.
- c. Streets, blocks, lots, parks and other public grounds shall be located and laid out in such a manner as to preserve and utilize natural streams and channels. Wherever possible, the flood plains shall be included within parks or other public grounds.
- d. The Board of Trustees shall not approve any planned unit development (PUD) or plat of subdivision located outside the corporate limits unless such agreement or plat is in accordance with the provisions of this Ordinance.
- e. All new plats recorded shall show the location of any SFHA which appears on the platted property and shall be signed, sealed and certified by an Illinois registered land surveyor as per the requirements of Public Act 85-267.

Section 4.11 – Variances

No variances shall be granted to any development located in a regulatory floodway as defined in Section 151:02m. However, when a development proposal is located outside of a regulatory floodway, and whenever the standards of this Ordinance place undue hardship on a specific development proposal, the applicant may apply to the Village Administrator for a variance. The Village Administrator shall review the applicant's request for a variance and shall submit his recommendation to the Board of Trustees.

- a. No variance shall be granted unless the applicant demonstrates that:
 - (1) The development activity cannot be located outside the SFHA;
 - (2) An exceptional hardship would result if the variance were not granted;

- (3) The relief requested is the minimum necessary;
 - (4) There will be no additional threat to public health and safety or creation of a nuisance, beneficial stream uses and functions, especially aquatic habitat, or creation of a nuisance;
 - (5) There will be no additional public expense for flood protection, lost environmental stream uses and functions, rescue or relief operations, policing, or repairs to stream beds and banks, roads, utilities, or other public facilities;
 - (6) The provisions of Sections 151.06f and 151.08d of this Ordinance shall still be met;
 - (7) The activity is not in a regulatory floodway;
 - (8) The applicant's circumstances are unique and do not represent a general problem; and
 - (9) The granting of the variance will not alter the essential character of the area involved including existing stream uses.
- b. The Village Administrator shall notify an applicant in writing that a variance from the requirements of Section 151:09 that would lessen the degree of protection to a building will:
- (1) Result in increased premium rates for flood insurance up to amounts as high as twenty-five dollars (\$25.00) for one hundred dollars (\$100.00) of insurance coverage;
 - (2) Increase the risks to life and property; and
 - (3) Require that the applicant proceed with knowledge of these risks and that he will acknowledge in writing that he assumes the risk and liability.
- c. Variances requested in connection with restoration of a site or building listed on the National Register of Historical Places or documented as worthy of preservation by the Illinois Historic Preservation Agency may be granted using criteria more permissive than the requirements of Sections 151:11a and 151:11b.

Section 4.12 – Disclaimer of Liability

The degree of flood protection required by this Ordinance is considered reasonable for regulatory purposes and is based on available information derived from engineering and scientific methods of study. Larger floods may occur or flood heights may be increased by man-made or natural causes. This Ordinance does not imply that development, either inside or outside of the SFHA, will be free from flooding or damage. This Ordinance does not create liability on the part of the Village or any officer or employee thereof for any flood damage that

results from reliance on this Ordinance or any administrative decision made lawfully thereunder.

Section 4.13 – Penalty

Failure to comply with the requirements of a permit or conditions of a variance resolution shall be deemed to be a violation of this Ordinance. Upon due investigation, the Village Administrator may determine that a violation of the minimum standards of this Ordinance exist. Village Administrator shall notify the owner in writing of such violation.

- a. If such owner fails after ten (10) days notice to correct the violation:
 - (1) The Village may make application to the circuit court for an injunction requiring conformance with this Ordinance or make such other order as the court deems necessary to secure compliance with the Ordinance.
 - (2) Any person who violates this Ordinance shall, upon conviction thereof, be fined not less than fifty dollars (\$50.00) or more than one thousand dollars (\$1000.00) for each offense.
 - (3) A separate offense shall be deemed committed upon each day during or on which a violation occurs or continues.
 - (4) The Village may record a notice of violation on the title to the property.
- b. The Village Administrator shall inform the owner that any such violation is considered a willful act to increase flood damages and, therefore, may cause coverage by a standard flood insurance policy to be suspended.
- c. Nothing herein shall prevent the Village from taking such other lawful action to prevent or remedy any violations. All costs connected therewith shall accrue to the person or persons responsible.

Section 4.14 – Abrogation and Greater Restrictions

This Ordinance is not intended to repeal, abrogate or impair any existing easements, covenants, or deed restrictions. Where this Ordinance and other Ordinance, easements, covenants, or deed restrictions conflict or overlap, whichever imposes the more stringent restrictions shall prevail. This Ordinance is intended to repeal the original Ordinance or resolution which was adopted to meet the National Flood Insurance Program regulations, but is not intended to repeal the resolution which the Village passed in order to establish initial eligibility for the program.

Section 4.15 – Separability

The provisions and sections of this Ordinance shall be deemed separable and the invalidity of any portion of this Ordinance shall not affect the validity of the remainder.

Appendix A - Retention Best Management Practices

Document from the Kane County Dept. of Environmental Management
Prepared by Conservation Design Forum
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July 2005

Section 1.0 Introduction

This section provides guidance on a number of retention based stormwater BMP's that can be used to meet Village BMP requirements. The BMP's outlined in this Article include:

- 2.0 - Permeable Interlocking Concrete Pavements
- 3.0 - Rain Gardens
- 4.0 - Infiltration Trenches
- 5.0 - Level Spreader and Filter Strips
- 6.0 - Naturalized Stormwater Basins

Guidance for each of these BMP's is provided in subsequent sections of this chapter. For each of the BMP's, the following are provided.

- Design guidance: Describes site suitability, design parameters, hydrologic analysis, and sizing.
- Example specification: Written specifications that can be used within construction documents.
- Standard detail: A standard detail that may be used within construction drawings or inform the production of construction drawings.

Section 1.1 Terminology

There are many terms used to describe the various stormwater management practices that are in use today. To avoid confusion caused by local variations in terminology, the following abbreviated glossary is provided. Because this glossary is short, the terms are not arranged alphabetically. Rather the terms are arranged in a progression from the most commonly understood to the least.

A. Detention:

The temporary storage of stormwater runoff with a slow, controlled release. Detention is typically provided in detention basins that use orifices, weirs, and other structures to control the discharge rate from the storage facility. There are a number of types of detention basins.

1. Dry detention basins: Detention basins which remain dry between events. This is typically due to the outlet control structure being located at the bottom of the basin and the basin having adequate bottom slope to drain all runoff water.
2. Wet detention basins: Detention basins that include a permanent pool of water that is intended not to drain. The permanent pool is provided by locating the outlet control structure above the bottom of the excavation. In addition to providing detention of runoff water, wet detention basins are often constructed to provide aesthetic benefits, water quality benefits, and to reduce space requirements. (No storage is lost to the sloping bottom often necessary within dry detention basins.) Wet detention basins are sometimes, incorrectly referred to as retention basins (see “retention” below).
3. Wetland detention basins: Detention basins constructed with appropriate morphology (cross-sectional shape) and hydrology to provide habitat for wetland vegetation. Wetland detention basins are generally created wetlands. Wetland detention basins can take on a variety of forms from a generally wet detention basin with a wetland shoreline to a shallow marsh with little or no permanent pool but sufficiently flat bottom and sufficiently wet conditions to support wetland plant species.

B. Retention:

In relation to stormwater, retention is the opposite of surface discharge. With retention, runoff water does not leave the site and is instead infiltrated, evaporated, or reused within the site. Although there may be storage associated with retention facilities, the runoff water is not permanently stored on the site. In relation to stormwater, retention is the opposite of surface discharge. Retention strategies mimic the natural water cycle and release runoff back to the environment as groundwater recharge or evaporation or both but not as surface runoff. Reuse of collected rainwater for later irrigation or grey water reuse could also be considered a retention strategy. Although there may be storage associated with retention facilities, the runoff water is not permanently stored on the site.

Wet detention basins are often referred to as retention basins. However, because the permanent pool is ever-present, the only retention is the small amount of drawdown that may occur between events due to evaporation or mild infiltration.

The Best Management Practices outlined in this chapter are all at least partially retention practices. While many of these practices can be designed to retain most any volume of runoff, the design guidance provided here is specifically targeted to meeting the 0.75-inch extended detention standard.

C. Infiltration:

Infiltration refers to the introduction of runoff water into the underlying soil. Infiltration facilities typically provide temporary storage to allow slow infiltration of runoff water from a particular size event.

D. Bioretention:

Bioretention is a special class of retention BMP. Bioretention facilities temporarily store runoff water within soil or vegetation for later evaporation. With a bioretention facility, the stored water is used by the vegetation and evaporated or transpired but not infiltrated. Examples of bioretention include rain gardens located on impervious soils and green roofs.

E. Bioinfiltration:

Bioinfiltration is a special class of retention BMP. Bioinfiltration facilities temporarily store runoff water for infiltration.

BMP	Detention	Retention		
		Infiltration	Bioretention	Bioinfiltration
Detention basin	√			
Infiltration basin		√		
Infiltration trench		√		
Permeable pavement	√	√		
Green roof	√		√	
Rain garden		√	√	√
Bioswale		√	√	√
Filter strip			√	√

Table 1 – Classification of Typical Stormwater BMPs

F. Combination Facilities:

Many BMP's do not fall into only one category as evidenced in Table 1. For example, permeable pavement systems are both detention and infiltration. These systems temporarily store runoff water in the aggregate below the paving surface. Some of that water infiltrates into the subgrade and some is slowly drained (and therefore detained) by an edge drain that discharges to the surface.

As can be seen in the table, there are many BMP's that fall into the categories of bioinfiltration and bioretention; in particular, rain gardens and bioswales. Rain

gardens are shallow depressions lined with amended topsoil that are often underlain with a gravel storage/drainage layer. Bioswales are essentially the same as rain gardens except they tend to be long and linear and sometimes provide conveyance as well as storage. Because bioswales often provide both retention in the topsoil and infiltration through the bottom, the term bioswale is conveniently used rather than the more limiting terms of bioinfiltration swale and bioretention swale.

Although guidance for green roofs is not included in this document, a green roof is a bioretention BMP. A green roof (or vegetated roof) does not provide infiltration (for obvious reasons) but can retain significant runoff. Rain water that falls onto the engineered green roof soil hydrates the soil where the water is retained for later evaporation and transpiration by plants. Most green roofs are capable of retaining 0.75-inches and more runoff. Thus, with approval from the enforcement officer, green roofs can be assumed to meet the Village's 0.75-inch extended detention standard.

Section 1.2 BMP Systems

Although it is convenient to discuss individual BMP's, it is best to design stormwater management systems to provide necessary retention, conveyance, and detention. It is also best to distribute those systems throughout a site (decentralization of the stormwater treatment system) rather than using the more typical end-of-pipe approach to mitigating stormwater runoff. With a decentralized system, no one facility or one location of the site must manage all of the runoff and therefore greater volumes of retention are possible to better mimic natural hydrology. The Blackberry Creek Alternative Futures Analysis report (<http://www.co.kane.il.us/kcstorm/blackberry/FinalReport.pdf>) provides example BMP systems for various development types and densities and documents potential site and watershed scale benefits of implementing decentralized, retention based stormwater management systems.

Section 1.3 Guidance Organization

Although a systems approach is recommended, this guidance is organized by BMP for purposes of providing design guidance and specifications. Each BMP section provides guidance on suitable applications, limitations to their use, site data requirements, hydrologic design criteria and sizing guidance, guidance on vegetation selection and establishment, construction considerations, and maintenance and operation requirements. Sample construction details and specifications are also provided for each BMP.

Section 2.0 Permeable Interlocking Concrete Pavements

A. Definition and Examples

Permeable interlocking concrete pavement represents one type of porous pavement. These pavers are pre-cast units that have openings or large crevices (expanded joints) formed into them. The crevices (or expanded joints) are created through tabs or spacers that are cast onto the concrete unit block paver. The cast-on tabs or spacers lock into each other to create a flexible pavement system. Simple openings in the paver unit are provided by removing or adding a section from/to the cast.

The width and size of the crevices or opening in the interlocking pavers varies by the products and yields different ratios of openings per square foot. The crevices are filled with an open graded permeable material to allow water to infiltrate through the pavement. The gradation and permeability of this material will ultimately determine the rate at which water can be infiltrated through the porous paver surface.

Porous pavers can be combined with other BMP's in this guidance manual. Biofiltration measures, such as rain gardens (see Section 3.0) with or without infiltration trenches (see Section 4.0), can be used in parking lot islands to treat and convey runoff that may be discharged from the porous pavement surface during very intense rainfalls. Small rain gardens (see Section 3.0) can be used at the downstream end of porous pavements to treat and infiltrate surplus runoff that may be generated.

Other porous pavement options, although not addressed in this manual, are porous asphalt and porous cast-in-place concrete.

B. Suitable Applications

Porous pavers are an important structural BMP tool and valuable alternative to conventional pavements. Their application is ideal for small sites where surface detention is not feasible due to space constraints. Porous pavement systems may further be used on sites with high permeability soils where there is no drainage system to accept pavement runoff. They can be integrated into new developments and can be retrofitted into existing developments. Suitable areas or development types in which porous pavements can be incorporated are:

- Paths, sidewalks, and walkways
- Patios, terraces, and plazas
- Driveways
- Parking lots
- Main and service drives
- Emergency access areas

- Small subdivision roads and alleyways
- Non-commercial boat ramps and landings

C. Benefits

The purpose and concept behind porous unit block pavers is to offer a decentralized stormwater management tool. It provides retention and detention. The former allows for stormwater infiltration through the pavement wearing course, its base, and into the subgrade. It thus can be used to meet the Village's 0.75-inch extended detention standard. Depending on the subgrade infiltration rates, use of permeable pavement can help to maintain the natural water cycle, recharging local aquifers and supporting groundwater driven base flows in streams and other waterbodies. Permeable pavement systems can also improve water quality through filtration and a reduction in runoff temperatures¹.

Ancillary benefits:

- Increased longevity when compared to conventional asphalt and concrete pavements²
- Can reduce downstream detention needs
- Efficient land use through combination of stormwater management and vehicular infrastructure
- Can increase aesthetic value of the property
- Can reduce the need for costly stormwater infrastructure

D. Limitations

It is recommended that the contributing watershed not exceed 20% of the area of the porous pavement installation³.

The drain time for porous pavements should be limited to approximately 24-hours⁴ to ensure the structural integrity of the pavement subgrade. Where soil permeability is insufficient and/or the volume of runoff is too great, a lateral subsurface drain must be installed to meet the 24-hour drainage requirement (see Section 2.0(F)(12)).

Porous pavement systems must provide adequate separation above the seasonal high ground water table (see also Section 2.0(F)(3)) and should be located at least 10-feet down slope and 100-feet up slope from building foundations unless adequate waterproofing is provided and direct drainage to footing drains can be prevented⁵.

Soils on bed rock with very high infiltration rates may be unsuitable for porous pavement installations. Infiltration under such conditions may lead to sink holes and potential groundwater contamination.

Highly expansive clay soils are unsuitable for porous pavement installation⁶ unless adequate drainage is provided to prevent saturation of the expansive subgrade soils. An appropriate drainage system is necessary to collect and dispose of excess stormwater in a controlled manner.

Unless the system is lined, use of porous pavers is not recommended over contaminated soils and in areas with land uses such as:

- Gas stations, recycling facilities, salvaging yards, vehicle storage, service and cleaning facilities and other uses with risk of stormwater coming into contact with hazardous materials.
- Land uses where there is storage of agricultural contaminants (e.g. pesticides, fertilizers, sediments) that could come into contact with stormwater.
- Commercial marina services where there is a risk of fuel or other spills.
- Outdoor loading and storage facilities where hazardous materials are being managed.
- Well fields (see also Section 2.0(F)(4)).
- Land uses within the recharge zone of sensitive wetlands, such as fens and other areas where the impact of potential increased volumes of groundwater recharge could be detrimental unless the amount of infiltration is controlled.
- Locations where construction site runoff (that could clog the system) and other risks of sedimentation cannot be controlled.
- Interlocking paver systems are not suitable for roadways that exceed the Average Daily Traffic (ADT) of 2000 and the speed limit of 30 miles/hour (i.e. collector roads, arterial roads, freeways).

E. Required Design Data

Infiltration capacity / suitability of subgrades:

The infiltration capacity of the subsoils under the porous pavement will determine the volume of runoff that can be exfiltrated from the pavement base/subbase into the ground over a given time. The infiltration capacity, along with the contributing watershed and subgrade strength will help to determine the drainage and structural design for the porous pavement.

The Will County Soil Survey provides some guidance with regards to soil permeability and subgrade strength. It is, however, recommended to commission a soil report with density test reports and classification. The report should further include results of a hydraulic conductivity test performed at the location and elevation of the proposed bottom of the pavement to establish the site-specific permeability rate (double ring infiltrometer test per ASTM D3385, lab test per ASTM D2434 through a Shelby tube sample, or a Falling Head Percolation Test (described in Attachment A).

Seasonal high water table:

If the site in question for the porous pavement is known to have a relatively high water table, data on the elevation of the seasonal high water table is needed. The bottom of the porous pavement should be at least three feet above the seasonal high water table⁷ to reduce the potential for shallow ground water contamination.

Contributing drainage area:

Along with the infiltration capacity, the drainage area and level of imperviousness contributing to the porous pavement, if any, will determine the drainage design of the porous pavement. In generally, pervious areas should not be drained toward permeable pavement to minimize the risk of sediment clogging

F. Porous Pavement Design

1. Porous unit paver design principles:

Permeable interlocking concrete pavements behave as flexible pavements⁸. The surface is composed of tightly placed high-strength concrete pavers. The tight placement in combination with appropriate edge restraint, the laying pattern, and granular fill in the crevices allows the pavers to interact and function as a unified structure rather than individual units. This flexible pavement behavior mandates a flexible pavement design.

Permeable interlocking concrete pavements constitute a high strength, long-lived wearing course set into a setting bed. The purpose of the setting bed is to provide an accurate leveling course that allows the paver to be set at the specified elevations. The base and subbase course are the major load carrying element. They distribute the loads to the level where it can be tolerated by the subgrade without failure. An additional function of the subbase in porous pavement systems is to laterally drain the water that is infiltrated through the pavement surface as well as store water temporarily to allow additional time for infiltration and/or to provide detention. It should also perform as a capillary barrier. This prevents water from moving upwards into the pavement base. It helps to secure the pavement's structural integrity and prevents ice lenses from forming in the pavement. The subbase may be followed by a layer of improved or stabilized subgrade if the structural properties of the soil prove insufficient.

Design for porous paving has to reconcile structural and drainage objectives. To assure structural integrity of the pavement and prevent frost heave damage, a properly designed subbase with the appropriate drainage characteristics is of critical importance⁹. Good pavement design for porous

unit pavers results in water infiltration and particle filtration combined with structural strength.

2. Load bearing strength:

The subgrade strength is a dominant factor in flexible pavement design¹⁰. Soil, or subgrade strength, is sometimes expressed by the Modulus of Elasticity (E), but more typically by the California Bearing Ratio (CBR) as defined in the ASTM D 1883 specification. The CBR of soils, particularly those that are finer graded, varies with moisture content. This is important in porous pavement design, where the subgrade is expected to be wet. Soils with permeability lower than 0.8-inch/hour can be used for exfiltration as long as the subgrade remains stable while saturated. The saturated subgrade CBR in porous pavement must be at least 5% after a minimum of 96-hours of soaking if used for vehicular traffic¹¹. Other empirical design specifications require a 6,550 psi Modulus of Elasticity in porous pavement design¹², which translates into 4.3% CBR for relatively soft, fine grained soils¹³.

Most subgrades will require some compaction or other stabilization treatment to assure sufficient load bearing capacity. This may greatly reduce or eliminate the infiltration capacity on finer graded soils. In some instances, the use of a geotextile can help to balance structural with infiltration objectives. The use of a woven-monofilament geotextile will spread loads over a wider area and allows for bridging of weak spots in the subgrade. An increase in depth of the base or subbase is an alternative to the use of a geotextile. The increased depth of base or subbase spreads the load over a larger area. By using these methods, the need for compaction on finer graded soils can be reduced or eliminated to preserve infiltration rates. It is recommended to consult a geotechnical engineer to evaluate soils for their CBR and suitability under porous pavements.

3. Seasonal high water table:

On installations where the main objective is to exfiltrate stormwater into the ground, the bottom of the pavement must be a minimum of three-feet¹⁴ above the seasonal high groundwater table. This distance provides a filter to remove pollutants from the runoff and to prevent shallow ground water contamination.

Staying a minimum required distance above the seasonal high ground water table also has a structural rational. It prevents groundwater from entering into the pavement and allows for efficient subsurface drainage and exfiltration during storm events. Controlling the moisture content of the subgrade allows for improved load bearing capacity and reduces the potential for frost heave.

4. Well field set back:

Porous pavement systems should not be used in the immediate proximity of a well or a well field. The State of Illinois requires a minimum setback of 200-feet for potential primary or potential secondary sources of contamination to any existing or permitted community water supply wells.

5. Freezing conditions and frost depth:

The depth of frost penetration is an important factor in porous pavement design on soils with high silt content. Footing and foundation design frost depth is typically specified by local code. A porous pavement base does not need to extend to the design frost depth. Silty soils, however, should be adequately drained before frost penetrates through the pavement to minimize the potential for frost heave. Frost heave in porous pavement is, however, not necessarily a failure causing factor. The unit block pavement system is able to withstand modest amounts of frost heave without damage because of its flexible nature.

6. Edge restraint:

A rigid, stationary edge restraint is of critical importance to permeable interlocking concrete pavements due to the modular nature of the block system. The edge restraint prevents lateral creep, holds the pavers tightly together, and provides load transfer between blocks. Modular pavements without an edge restraint will move laterally, fail along the edges and cease to provide load transfer between blocks, which compromises the structural integrity of the pavement.

Methods of edge restraint include abutting existing structures, cast-in-place concrete curbs (see also Figure 4) or slabs, pre-cast concrete curbs, or soldier courses set into concrete (see also Figure 5). Recommended minimum dimensions for edge restraints are 6-inches wide and 12-inches deep¹⁵. The more structurally sound the edge (i.e. concrete products with stable footer and/or concrete haunch), the less the opportunity for pavement failure at the edges. No matter what edge restraint is used, it must remain stationary under stress or it is of no value to the porous block pavement system.

7. Traffic categories:

General roadway classification as defined in the AASHTO 'A Policy on Geometric Design of Highways and Streets'; also known as the "Green Book", distinguishes between:

local roads, collector roads, arterial roads, and freeways.

For the purpose of these guidelines, categories are created that reflect additional uses and traffic types at lower traffic volumes, loads and repetitions than those of 'local roads', including:

- Paths + patios (pedestrian and bicycle applications)
- Driveways + small parking (personal automobiles)
- Large parking (personal automobiles and some truck and bus traffic)
- Local roads

Porous pavement applications are suitable for traffic volumes up to those defined in the 'local road' category (ADT 2000 or less) and where the posted speed limit does not exceed 30 miles/hour. Typical examples for the 'local road' category are alleyways and small subdivision roads. The foremost rationale behind the 'local road' restriction is concerns over stormwater runoff quality and pollution. It also attempts to reduce the most common cause of pavement failure, which are heavy, repetitive loads. The occasional school bus, garbage truck, or fire engine represents an acceptable load at acceptable repetitions.

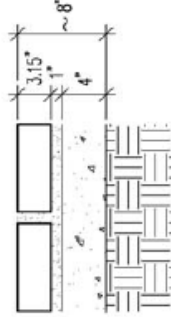
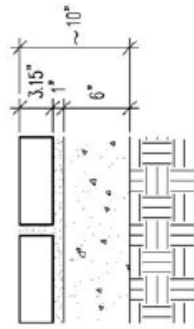
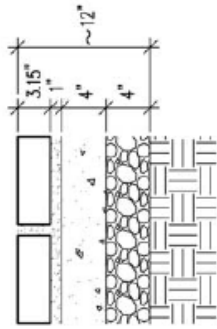
8. Typical cross sections:

Table 2, Table 3, Table 4, and Table 5 show recommended cross section designs for different interlocking porous paver applications. Porous pavement installations on subgrades with an infiltration capacity less than 0.1-inch/hour should be designed and evaluated by a qualified civil engineer.

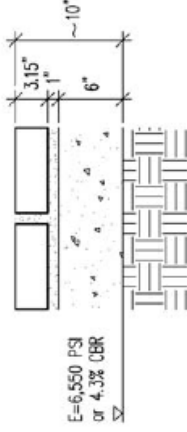
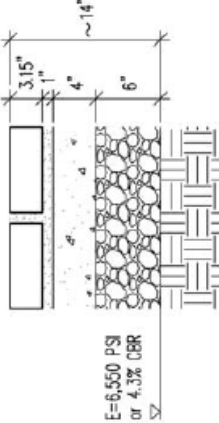
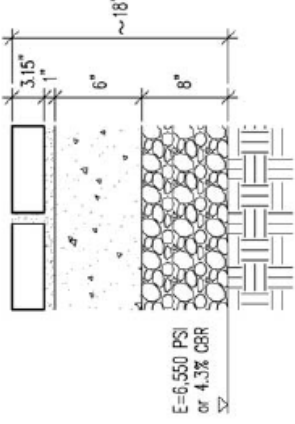
The indicated depths of the subbase in Table 2, Table 3, Table 4, and Table 5 may be increased if additional storage and detention of runoff is required, or if low subgrade strength requires additional subbase structure. The indicated infiltration rates must be based on the subgrade at the depth of the subbase/subgrade interface after compaction or soil treatment. It is highly recommended that a qualified civil engineer with porous paving experience be consulted if conditions vary from those represented below.

Some porous pavement design software is available by paver vendors to assist the design. An example is the software product Lockpave® Pro.

a. Paths and patios

Table 2 Cross section design for PATHS and PATIOS (pedestrian and bicycle applications)				
	Subgrade infiltration rate (after compaction or soil treatment) >8.0-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 8.0- to 0.8-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 0.8- to 0.1-inches/hour	
Block	3.15-inches	3.15-inches	3.15-inches	
Setting	1-inch	1-inch	1-inch	
Base	4-inches	6-inches	4-inches	
Subbase	n/a	n/a	4-inches	
Total	~ 8-inches	~ 10-inches	~ 12-inches	
				
Drainage	No drainage required	No drainage required	Allow for pavement base to drain within 24-hours, may require drainage at pavement edge)	

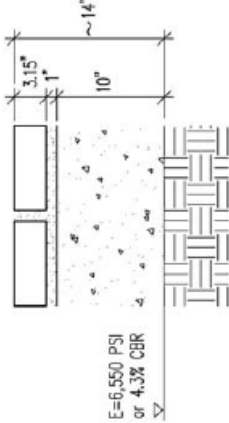
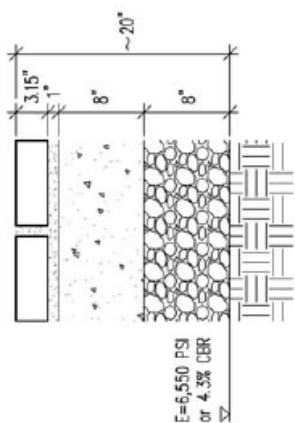
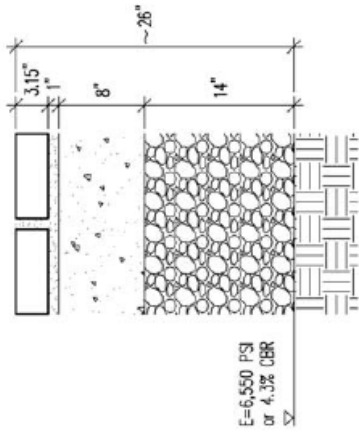
b. Driveways and small parking

Table 3 Cross section design for DRIVEWAYS and SMALL PARKING (personal automobiles)				
	Subgrade infiltration rate (after compaction or soil treatment) >8.0-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 8.0- to 0.8-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 0.8- to 0.1-inches/hour	
Block	3, 15-inches	3, 15-inches	3, 15-inches	
Setting	1-inch	1-inch	1-inch	
Base	6-inches	4-inches	6-inches	
Subbase	n/a	6-inches	8-inches	
Total	~ 10-inches	~ 14-inches	~ 18-inches	
				
Drainage	No drainage required	Allow for pavement base to drain within 24-hours, may require drainage at pavement edge	Allow for pavement base to drain within 24-hours, may require drainage at pavement edge	
CBR = California Bearing Ratio in % (soaked) E = Modulus of Elasticity (in psi) on soaked subgrade for relatively soft, fine grained soils				

c. Large parking

Table 4 Cross section design for LARGE PARKING (personal automobiles and some truck and bus traffic)			
	Subgrade infiltration rate (after compaction or soil treatment) >8.0-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 8.0- to 0.8-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 0.8- to 0.1-inches/hour
Block	3.15-inches	3.15-inches	3.15-inches
Setting	1-inch	1-inch	1-inch
Base	8-inches	6-inches	8-inches
Subbase	n/a	6-inches	10-inches
Total	~ 12-inches	~ 16-inches	~ 22-inches
Drainage	No drainage required	Allow for pavement base to drain within 24-hours, include drainage at pavement edge	Allow for pavement base to drain within 24-hours, include drainage at pavement edge
CBR = California Bearing Ratio in % (soaked) E = Modulus of Elasticity (in psi) on soaked subgrade for relatively soft, fine grained soils			

d. Local roads

Table 5 Cross section design for LOCAL ROADS			
	Subgrade infiltration rate (after compaction or soil treatment) >8.0-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 8.0- to 0.8-inches/hour	Subgrade infiltration rate (after compaction or soil treatment) from 0.8- to 0.1-inches/hour
Block	3.15-inches	3.15-inches	3.15-inches
Setting	1-inch	1-inch	1-inch
Base	10-inches	8-inches	8-inches
Subbase	n/a	8-inches	14-inches
Total	~ 14-inches	~ 20-inches	~ 26-inches
			
Drainage	No drainage required	Allow for pavement base to drain within 24-hours, include drainage at pavement edge	Allow for pavement base to drain within 24-hours, include drainage at pavement edge
CBR = California Bearing Ratio in % (soaked) E = Modulus of Elasticity (in psi) on soaked subgrade for relatively soft, fine grained soils			

9. Material/aggregate selection, function and performance:

A porous unit block paver system must be designed and constructed with open graded materials in the paver crevices or openings, the bedding layer, the base, and subbase to ensure and sustain good drainage and infiltration characteristics.

Typical road construction aggregates (including sharp sands) are unsuitable due to their percentage of fines (Sieve No. 16 to 200). These aggregates have small voids and tend to trap fine dust particles that wash into the pavement. This will lead to clogging and formation of an impervious “pan” over time. Infiltrated runoff will accumulate on the pan, which compromises the stormwater objectives of the porous pavement. A reduction in permeability in the base or subbase will also compromise structural objectives. Trapped water in the base can cause high pore-water pressure and result in pumping under dynamic traffic loads¹⁶. Only non-plastic, open-graded aggregates (plasticity index of 0) that sustain their strength in the presence of water should be used in porous pavement installations¹⁷.

Open-graded materials for porous pavements should originate from a hard, durable crushed rock with 90% fractured face and a Los Angeles (LA) Abrasion of <40. A design CBR of 80% is recommended¹⁸.

Crevice fill:

An IDOT CA16 (or ASTM C33 No. 8) crushed stone should be used to fill the paver openings and crevices. The IDOT CA16 is also commonly referred to as 3/8-inch stone chips. The size and porosity of this material allows accumulated dust particles to flush out during heavier storm events. This helps to prevent clogging and sustain good infiltration rates over time. The infiltration rate of the IDOT CA16 should be at least 1,000-inches/hour¹⁹. Because the crevice fill material is much finer than the base and subbase materials, the crevice material also creates a design failure point in a readily remediated location (see also Section 2.0(H)(2)). The crevice fill material will clog rather than pass material that could clog the base or subbase

Bedding layer:

Besides filling the paver openings and crevices, the IDOT CA16 (or ASTM C33 No. 8) crushed stone should be used for the bedding layer. As with the paver openings and crevices, the size and porosity of this material allows accumulated dust particles to flush out during heavier storm events. The infiltration rate of the IDOT CA16 should be at least 1,000-inches/hour²⁰.

Base course:

This structural/load bearing component of the pavement should be constructed using an IDOT CA7 (or ASTM C33 No. 57) crushed stone. The infiltration rate of the IDOT CA7 should be at least 1,000-inches/hour²¹.

Subbase course:

This pavement component has several objectives: capillary break, structural support of the pavement, and storage and drainage. The latter is essential, although a drainage rate (hydraulic conductivity) greater than necessary will reduce detention time and amount of runoff infiltrated unless other means are used to slow drainage of this layer. A crushed rock, such as the IDOT CA7 (or ASTM C33 No. 57) or larger rock, such as the IDOT CA1 (or ASTM C33 No. 2) has good porosity and structural characteristics and provides both excellent drainage and an effective capillary barrier.

10. Filter criteria:

It is of critical importance to specify and use materials that are resistant to migration within the pavement and thus meet filter criteria. Finer-graded materials that wash out (migrate) and erode into underlying coarser graded materials do not meet the filter criteria and lead to settlement and pavement failure. The installation of an IDOT CA16 (bedding layer) over an IDOT CA7 (base course) installed over an IDOT CA1 (subbase course) meets the filter criteria.

If materials are used that differ from the above stated gradations, it is recommended that their filter criteria be verified. The following method is commonly applied in geotechnical analysis²²:

$$\frac{D_{15}}{d_{85}} \leq 5$$

Another method, recommended by the International Concrete Pavement Institute (ICPI) is as follows²³:

$$\frac{D_{15}}{d_{50}} < 5 \text{ and } \frac{D_{50}}{d_{50}} > 2$$

Where:

D = coarser aggregate (open graded stone)

d = finer aggregate (choke stone)

A coarse, open-graded subbase placed over a subgrade of fine material may not meet the filter criteria. In this case, subgrade material can migrate up into the subbase, choking it and leading to failure. Wet subgrade (expected in porous pavement systems) in combination with dynamic traffic loads (causing vibration) can lead to pumping, which compromises the structural performance of the pavement.

Pumping can be prevented and the filter criteria met by placing an appropriate geotextile between the subbase and subgrade. Both woven monofilament and non-woven, needle-punched fabrics will provide an adequate filter. Woven monofilament fabrics may be less subject to blinding than non-woven, needle-punch fabrics. Further, woven monofilament fabrics generally have lower elongation than non-woven products and therefore provide superior bridging capability. However, many woven fabrics have relatively low permittivity and it is therefore critical that a high permittivity ($>1.2/\text{sec}$) be specified (see Section 2.0(J)). Standard woven (tape) filter fabrics should not be used as they are insufficiently permeable and do not pass sufficient volumes of water.

Aggregates must be kept clean and protected from soil contamination throughout the construction process. This is to preserve their porosity and drainage characteristics. All installed porous block paver systems must be protected from siltation during and during construction. Eroding soils that wash onto the pavement will clog the crevices and effectively eliminate the infiltration capacity of the paver surface.

11. Surface drainage design:

Runoff onto the porous paver surface from the contributing drainage area must be free of sediment, such as construction site runoff to prevent clogging of the crevices and loss of infiltration capacity. This requires thorough erosion control throughout the installation process, including the re-establishment of the vegetation on disturbed soils in the contributing drainage area. Porous pavements should be designed and installed in a manner that eliminates or reduces the risk of erosion contamination for the life of the pavement.

The porous unit block pavement in itself is a drainage tool since it transmits water through the pavement surface. The infiltration capacity of the pavement surface is not determined by the percentage of openings, rather it is determined by the infiltration capacity of the crevice fill material since runoff water is routed to the openings by the paver surface. That fill material must be open-graded with no or a limited amount of fines (see also Section 2.0(F)(9)). Use of the proper fill material will sustain a good infiltration capacity and surface drainage over the lifetime of the pavement and reduce or eliminate the need for catch basins and other drainage structures.

Field test data is available on the infiltration capacity of porous pavements that were constructed similar to the recommendations in these guidelines. One research project shows that virtually all water was infiltrated on permeable parking stalls for a number of monitored storms²⁴. Data from a six year old porous paver installation from Havre de Grace (MD) yielded average infiltration rates of 40 cfs/ac (~40 in/h)²⁵. In another instance, two and five year old installations were tested. The two year old installation infiltrated 2.8-inches/hour after 60-minutes of constant sprinkling, whereas the five year old installation infiltrated 5.7-inches/hour after the same loading. The lower infiltration capacity of the more recent installation (two years of age) is explained with a higher percentage of organic substances and fine particles in the crevice fill²⁶. This data illustrates the importance of clean and open-grade materials in porous pavement construction.

Data on the infiltration capacity through the pavement surface of permeable interlocking concrete pavements further shows that 2.5-inches/hour is a conservative design infiltration capacity for mature systems. It is, however, imperative that the open-graded materials meet the specifications. A significantly more conservative approach recommends the use of a surface infiltration capacity of 1-inch/hour over a 20-year life for porous pavements²⁷. This design infiltration capacity though is based on data from infiltration trenches and therefore may not be applicable to permeable pavement surfaces. One research project on pavement systems found that surface infiltration capacity of interlocking concrete paver systems was restored to near full capacity through remedial maintenance²⁸ (see Section 2.0(H)(1)).

As with most pavements, it is recommended that the porous unit block pavers be installed with at least 1% slope²⁹. Because a properly installed porous pavement will only generate surface runoff during very heavy storms, conventional catch basin and stormwater pipe installations can be reduced in number, substituted by vegetated swales or eliminated all together³⁰. The use of vegetated swales instead of catch basins reduces costs relative to conventional drainage infrastructure. Vegetated swales have the added advantage of treating and filtering the surface runoff. Provisions for frequent curb cuts should be made if the pavement edge is a raised curb. These curb cuts can be as frequent as one for every parking stall; this frequency allows any excess surface water to drain into adjacent vegetated swales with nominal energy dissipation such as a splash pad or small amount of stone.

For large flow rates through the curb cuts, larger stone material, level spreaders (see Section 5.0), or inflow chambers may be necessary (see also Section 3.0(F)(6)).

12. Subsurface drainage:

The subsurface drainage design of porous pavements is largely determined by the infiltration capacity of the subgrade soils. A porous pavement installation can tolerate temporary storage of runoff in the base and subbase without compromising its structural integrity. Maintaining structural integrity under periodic wet conditions is contingent on subgrade strength, sufficient base and subbase depth, and the use of appropriate aggregates and geotextiles³¹. The stored runoff will ultimately be exfiltrated into the ground, or collected and discharged through a drainage system.

Porous pavements on freely draining soils with an infiltration capacity that equals or exceeds 8.0-inches/hour and have adequate depth to groundwater do not require any additional drainage infrastructure. The soil permeability should be measured at the proposed depth of the subgrade and under compacted conditions.

The same also applies to paths, patios, driveways and small parking installations on soils with infiltration capacities between 8.0- and 0.8-inches/hour. However, it is important to ensure that the water in the pavement base is drained within 24-hours³² (see also Table 2 and Table 3). A geotechnical engineer should be consulted if a drainage time longer than 24-hours is required. Under no circumstances should the maximum ponding time under the pavement exceed 72-hours to ensure that the volume is available for subsequent events and to avoid sealing of the subgrade soils due to growth of biological slimes. To meet these drainage requirements, subsurface drainage may be necessary in many cases. For large parking lots and local roads, the same standard applies and, at a minimum, subsurface drainage should be provided at the pavement edge (see also Table 4 and Table 5). This requires that the subgrade of the installation is graded with a minimum of 1% slope towards the pavement edge.

Soils with an infiltration rate of 0.8- to 0.1-inch/hour may exhibit a reduction in their structural capacity when saturated for extended periods. The pavement base of paths, patios, driveways, and small parking installed on such soils should drain within 24-hours (see also Table 2 and Table 3). To meet the 24-hour requirement, subsurface drainage will be necessary in most cases, particularly at the low end of the permeability range. The same 24-hour drain time applies to porous pavement on large parking lots and local road installations. The traffic load on the latter two further necessitates subsurface drainage at the pavement edge (see also Table 4 and Table 5), which requires that the subgrade of the installation is graded with a minimum of 1% slope towards the edge and other locations of subsurface drainage.

Where drainage is required, adequately sized perforated pipe should be used to ensure drainage within 24-hours. In most cases 4-inch pipe will be

adequate. The openings should be sufficiently small to prevent migration of subbase material. No sock should be used as it may clog over time.

To provide detention within the pavement subbase and base, the perforated pipe may be fitted with an orifice(s) to control the rate of drainage. Provided that there is no surface inlet to the drain, very small orifices may be used since there is no access for debris that could clog the orifice. Never the less, cleanouts should be provided at all orifice locations. Cleanouts should also be provided at both ends of each drain and at all significant changes in direction.

Building foundation and basements:

Porous pavement installations should be a minimum of 10-feet downslope from building foundations and 100-feet upslope unless adequate waterproofing is provided and direct drainage to footing drains can be prevented. Another rule that can be applied to protect building basements is to set back the porous pavement 1.5 times the distance of the building foundation depth³³.

Retention volume and detention volume:

The runoff stored in porous pavements can be divided into the retention volume and detention volume. The retention volume represents the runoff in the porous pavement that is exfiltrated into the underlying subgrade. The detention volume represents the runoff that is removed from the pavement base through perforated drain pipes or other drainage structures to meet the 24-hour drainage requirement. Most porous pavements will have a combination of retention and detention volume, with the invert of the perforated drain pipe set at an elevation that allows the retention volume to exfiltrate in 24-hours.

To meet the Village's extended detention standards, porous pavements should be sized for 0.75-inch extended detention volume. However, porous pavements that contain the 1- to 2-year event prevent increases in runoff volumes for these storms that are most affected by urbanization. The storage in porous pavement can be sized for larger events to increase retention and reduce downstream detention needs. The sizing and drainage design for porous pavements is further described under Section 2.0(F)(13).

On subgrade soils with low or no infiltration capacity that require that an additional subsurface drain be located at the bottom of the subbase, it may be difficult to demonstrate that the 0.75-inch extended detention standard is being met. However, due to wetting of the aggregate and other losses that occur for small storms, it may be assumed for purposes of the Village's stormwater ordinances, that the 0.75-inch extended detention standard is being met for permeable interlocking concrete paver systems designed and installed according to this guidance.

With the large aggregate specified for the subbase, the subbase will drain quickly, providing only nominal detention. As described in Section 2.0(F)(12) above, orifices may be placed in the drains to extend the detention time to 24-hours.

Monitoring well:

In some instances a monitoring well may be installed with the system, which will provide for access to bottom of system for observation for rate of exfiltration. The monitoring well also could be used to take water samples to permit runoff water quality analysis.

13. Hydrologic analysis:

There are two components to the hydrologic analysis: the required size to meet the Village's extended detention standard and the impact of the porous pavement on downstream detention requirements.

Retention standard:

Assuming that the only drainage to the pavement base is from the rainfall onto the pavement surface, only 0.75-inches of retention depth would be required under the pavement. Assuming a porosity of the base material of 40%, 1.9-inches of base depth would be required to provide the retention storage. If the drainage area to the permeable paving is greater than the area of the paving itself, the base depth allocated to the retention storage will need to be increased accordingly.

The drainage time of the retention volume is:

$$T_r = \frac{D_r}{i}$$

Where:

T_r = retention drain time in hours

D_r = depth of retention storage volume in inches

i = infiltration capacity of subgrade soils in inches/hour

In most cases the retention depth will be 0.75-inches. The total drain time should not exceed 24-hours unless a geotechnical analysis or the measured CBR-value indicates that longer durations would be acceptable.

Impact on downstream detention sizing:

The critical duration for detention sizing is typically 24-hours. Thus, the volume of runoff exfiltrated from a permeable pavement system during a 24-hour detention design storm will often be significant. For example, for a pavement system that is only managing its own runoff and has a subgrade permeability equal to 0.1-in/hr, the volume of infiltrated runoff during a 24-hour period would be 2.4-inches, which would reduce the runoff volume associated with the 2-year event by over 75%.

Permeable pavement systems can be modeled as storage reservoirs in standard hydrologic models such as TR20 or HEC-1.

Rainfall intensities that exceed the infiltration capacity of the paver surface should be diverted away from the under paver storage reservoir as indicated in Figure 1. To represent mature pavement systems that may have received little or no maintenance, the diversion rate should be the equivalent of 2.5-inches per hour.

The rate of infiltration Q_i through the subgrade is equal to:

$$Q_i = i * A_p$$

Where:

Q_i = the volumetric flow rate through the pavement subgrade in cubic feet per second (cfs)

i = infiltration capacity of subgrade soils in inches/hour

A_p = Area of permeable pavement in acres

Permeable Pavement Modeling

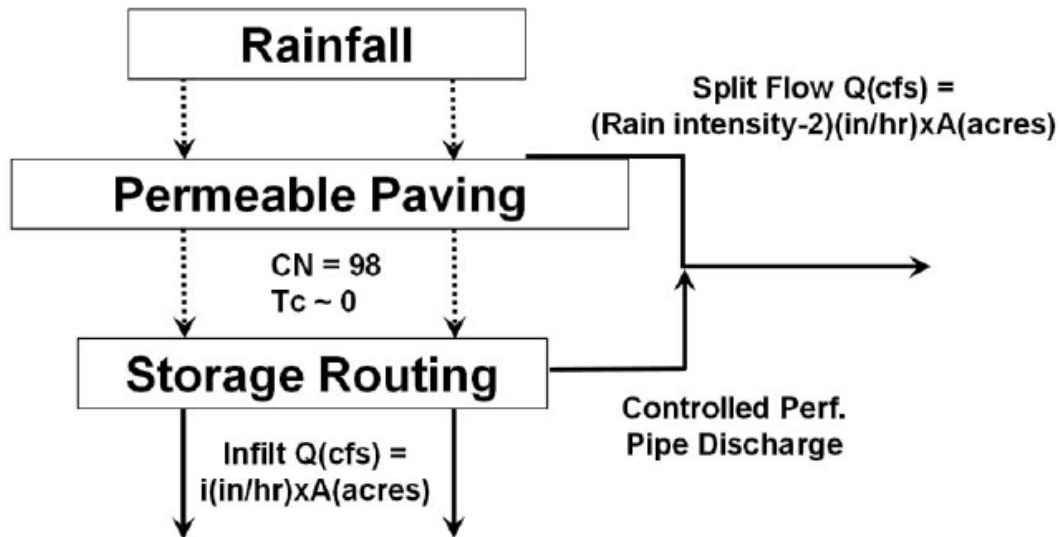


Figure 1 – Permeable Pavement Modeling Diagram

The rate of drainage by the perforated drains will depend on the characteristics of the aggregate material and the drain pipe. To more reliably predict the rate of drainage and to fully utilize the available volume within the base and subbase, the drains can be fitted with an orifice(s).

For models that allow multiple outlets, infiltration outflow can be treated as a separate outlet that does not contribute downstream. For models that only allow a single outlet, the total subbase outflow is equal to the infiltration outflow plus the surface outflow through the perforated drains (if any). The infiltration outflow rate can then be diverted out of the system so that it does not contribute to the downstream detention facility. The diverted flow from the pavement surface should then be combined with the perforated pipe discharge to obtain the permeable pavement discharge hydrograph.

G. Construction Considerations

Construction of porous pavements requires special care and changes to normal construction practice and schedules for the optimal functioning of the porous pavement and its long-term viability. It is recommended that the consultant meet with the contractor prior to construction to debrief him/her on preventative measures and to coordinate proper execution of the pavement installation. The consultant should further routinely visit the site to review and observe the installation process. This proactive approach can avoid pavement failure due to poor construction practices.

1. Excavation:

Unless the pavement can be protected from all construction site runoff, the excavation of the porous pavement area should be scheduled after the completion of other site work, such as all other earthwork, landscaping operations, and other heavy construction³⁴. This is to prevent soil compaction and clogging of the porous pavement system or contamination of the porous pavement aggregates (see also Section 2.0(G)(2)). It is recommended to use methods and means during final excavation of the porous pavement base that minimizes soil compaction and thus preserves the infiltration capacity of the natural soils.

2. Soil erosion and sediment control:

Runoff from the contributing watershed must be free of sediment, such as construction site runoff to prevent clogging of the subgrade, base, or crevices and loss of infiltration capacity. This requires thorough erosion control throughout the installation process, including the re-establishment of the vegetation on disturbed soils in the contributing watershed. Porous pavements should be designed and installed in a manner that eliminates or reduces the risk of erosion contamination for the life of the pavement. It is further recommended to limit the runoff from the contributing watershed onto the porous pavement.

Soil erosion and sediment control practices should be maintained and inspected on a regular basis. Accumulated sediments within on-lot sediment traps and along silt fences should be promptly removed. All disturbed areas shall be promptly stabilized and compromised erosion and sediment control devices should be promptly repaired.

Stockpiles should be located downstream of the porous pavement; if unable to do so, stockpiles shall have a double row of silt fence that surrounds the perimeter of the stockpile.

Before the porous pavement goes online, the contributing drainage area (if any beyond the surface of the pavement) must be stabilized/fully vegetated.

3. Aggregate installation principles:

Woven monofilament or non-woven, needle-punched fabrics should be placed over the subgrade to provide an adequate filter and prevent soil migration and pumping (see also Section 2.0(F)(2) and Section 2.0(F)(10)). Standard woven (tape) filter fabrics should not be used as they are insufficiently permeable and do not pass sufficient volumes of water.

The open graded subbase and base course must be installed in lifts that do not exceed 12-inches to assure sufficient compaction. Compaction equipment

should be approved by the project engineer. Depending on the size of the installation, a Steel Drum Compactor (min. 60-inch drum) or Vibratory Plate Compactor (min. 42-inch plate), both capable of controlled frequency, can be used. Full particle interlock of the open-graded material must be achieved, which requires three passes with an approved compactor. More than three passes may lead to over compaction, which may result in particle abrasion. The process of particle abrasion will add undesired fine matter to the open graded material.

The bedding layer is typically not compacted until after the paver installation. A plate compactor with 3000 to 5000 lbs of centrifugal compaction force that operates at 80-90 Hz should be used across the installed pavement³⁵. This operation sets the pavers firmly into place and also compacts the underlying bedding layer.

H. Operation and Maintenance

It is recommended that permeable interlocking concrete pavements be inspected on an annual basis, preferably in spring after a major rain storm to verify that the stormwater is infiltrating into the system. Areas that have pooled water standing on the surface need to be addressed through remedial maintenance as opposed to routine maintenance. A monitoring well may be installed with the system in some instances and will provide for access to the bottom of the system for observation for rate of exfiltration. The monitoring well also could be used to take water samples to permit runoff quality analysis.

1. Routine maintenance:

It is imperative that permeable interlocking concrete pavements be designed and installed in a manner that eliminates or reduces the risk of sedimentation and erosion contamination for the life of the pavement. If the permeable pavement is connected to a contributing watershed (i.e. other pavements or lawn areas) it should be monitored on an annual basis to insure that run-off from these sources is not depositing sediments and debris on the porous pavement. Areas near construction traffic, agricultural land (no ground cover), beaches, and areas subject to high winds that will carry fine particles will require more frequent monitoring and sweeping.

Sweeping:

Routine maintenance involves normal street sweeping, similar to that used on standard asphalt and concrete paving. While high efficiency vacuum sweepers are more effective at capturing and removing fine sediment than mechanical broom sweepers, mechanical sweeper equipment is sufficient to dislodge surface encrusted sediment. Permeable paving surfaces should be dry-swept (water should be turned off) in dry weather to remove encrusted

sediment that appears as small curled “potato chips”. When vacuum equipment is used, vacuum settings should be adjusted to prevent uptake of aggregate from the pavement openings and joints. Sweeping porous pavements once a year (preferably in spring) is normal; if excessive silts and fines are present, additional monitoring of the surface to determine silt buildup and additional sweeping may be needed (i.e. late fall and spring) to remove accumulated debris.

Closed joint permeable interlocking pavements may be pressure washed if desired. Care should be exercised to keep wand at an angle and away from the surface to prevent abrading and blasting of void material from joints and void openings. It is not recommended to utilize a pressure washer on openjointed systems.

Winter maintenance:

As with any pavement, snow plowing is required after snowstorms. Four season parking surfaces, streets, and plaza areas may be plowed with truck mounted blades, power brooms, snow-blowers, or manually shoveled.

Rubber or nylon, rather than steel, are recommended for the replaceable snowplow tip, if bladed snow plowing equipment is used. However, steel tips are used for plowing many installations, particularly where plowing speeds are low. Manufacturers of permeable interlocking concrete pavements state that the chamfered top edges minimize chipping and allows for normal plowing procedures. Shoes at the edges of the blade and rubber nylon tipped blades are recommended for all pavements to protect the equipment and driver from impact at manholes, pavement joints, etc. that are common to asphalt and poured concrete roads.

Due to the short flow distance from the paver surface to a joint opening, the opportunity for ice formation is greatly reduced. Also, researchers state that the underlying stone bed tends to absorb and retain heat, further reducing ice formation. For these reasons, regular deicing should not be necessary and is not recommended for water quality protection reasons. However, for occasions when icing does occur, a mild application of deicing salt may be used. If abrasives are necessary, stone chips that are preferably of the same quality and specification as the void material should be used rather than sand. The application of stone chips may require sweeping and removal in the spring. If sand is used, it will tend to clog the openings and lead to the premature need for remedial maintenance.

Void filling:

The open graded stone ships in the voids and joints are subject to settling, particularly during the first year after installation. If necessary, additional voids

materials may be added by manually sweeping into joints and voids. Refer to specifications for type and grade.

2. Remedial maintenance:

Studies have shown a high initial infiltration capacity of permeable interlocking concrete pavements with a decrease and leveling off over time³⁶. The decrease in infiltration capacity over time is due to deposition of fine material such as silt, organic debris, and subsequent vegetation in the joint aggregate.

The need for remedial maintenance can be determined by visual inspection. Areas that pond water on the surface will require remedial maintenance. Remediation can be achieved using a vacuum sweeper with water jets, sweeper, and vacuum bar attachment to evacuate clogged joint material. The evacuated joint material can either be washed and replaced or new joint material can be used to refill the joints (refer to specifications for size and grade). Jointing materials are to be swept into joints and voids until full, typically to the bottom of the chamfer. The frequency of required remedial maintenance depends on the degree of sediment and debris loading as well as the level of routine maintenance. Experiences from older installations show, however, that permeable interlocking concrete pavements continue to function many years after installation, which makes remedial maintenance operation more an exception. The need for remedial maintenance is also a function of sediment and erosion control during construction of the site and during the lifetime of the pavement. Proper erosion control will be necessary during construction of the homes and remedial maintenance should be performed after the home sites have been built out.

One research project on pavement systems found that surface infiltration capacity of interlocking concrete paver systems was restored to near full capacity after remedial maintenance³⁷.

Structural maintenance:

Settlement/ruts in pavement surface, access for utility repair, and removal of broken or damaged pavers may be performed by an experienced paver installer. Pavers should be removed, and the setting bed and void materials can be salvaged and kept separate. Base materials are to be removed if access for utilities is required. Settlement repair depending on depth should be restored with additional base materials if settlement exceeds 0.5-inch. The setting bed should be made level and pavers re-instated with void materials replaced in the joints and voids with compaction bringing the pavers to flush condition and ready for use.

I. Porous Pavement Easement Protection

The Beecher ordinance requires that stormwater features (such as the permeable pavement) are protected by an easement. All permeable pavement areas that are part of the submitted and approved stormwater management system thus are required to be in an easement. If the permeable pavement is not part of the stormwater management system, such as a parking stall installed by a homeowner on his or her own accord, it is exempt from the easement requirement.

J. Specifications

The ICPI (Interlocking Concrete Pavement Institute) provides "Guide Specifications" for the construction of interlocking concrete pavement" (1997 ICPI Tech Spec No. 9) that generally address most permeable interlocking concrete pavement issues. A guide specification is listed below that addresses the various porous pavement components more specifically.

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Concrete units
- B. Bedding Materials
- C. Geotextiles

1.02 RELATED SECTIONS

- A. Section [____ - ____]: Curbs.
- B. Section [____ - ____]: Open-graded base materials.
- C. Section [____ - ____]: Stabilized aggregate base.
- D. Section [____ - ____]: Impermeable liner.
- E. Section [____ - ____]: Edge restraints.
- F. Section [____ - ____]: Drainage pipes and appurtenances.
- G. Section [____ - ____]: Earthworks/excavation/soil compaction.

1.03 REFERENCES

- A. American Society of Testing Materials (ASTM)
 - 1. C 936, Standard Specification for Solid Interlocking Concrete Pavements.
 - 2. C 33, Specification for Concrete Aggregates.
 - 3. D 2490, Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.

1.04 QUALITY ASSURANCE

- A. The contractor shall have experience with placement of permeable interlocking concrete pavements. The contractor shall have completed [] projects comprising of not less than [] sy (m²) of permeable

interlocking concrete pavements within the last [24] months. The contractor shall submit a list of projects, the area of permeable paving for each, locations, and details on the type of permeable interlocking concrete pavement(s) built.

- B. As applicable by state/provincial and local laws, contractor shall hold a current contractor's and business license in the state/province and locality where work is to be performed.

1.05 SUBMITTALS

- A. Shop or product drawings data.
- B. Samples of paving units to indicate shape selections and color(s).
- C. Sieve analysis of aggregates for base and bedding materials.
- D. Test results for compliance of paving units to ASTM C 936 or CSA A231.2 as applicable.
- E. Soils report indicating density test reports, classification, and infiltration rate measured on-site under compacted conditions, and suitability for the intended project.
- F. Erosion and sediment control plan.
- G. Stormwater management (quality and quantity) calculations.

1.06 MOCK UPS

- A. Install a 6 ft. x 6 ft. (2 m x 2 m) paver area as described in Article 3.02. This area will be used to determine surcharge of the sand layer, joint sizes, lines, laying pattern(s), and texture of the job. This area shall be the standard form which the work will be judged.
- B. Mock up approved by [engineer] [architect] [landscape architect] shall be part of the work.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.
- B. [Protect sand and top soil with waterproof covering to prevent exposure to rainfall, removal by wind, or contamination from any source. Secure covering in place.]

1.08 ENVIRONMENTAL CONDITIONS

- A. Do not install pavers during rain or snowfall.
- B. Do not install frozen base materials.

PART 2 – PRODUCTS

2.01 PAVING UNITS

- A. Manufactured/supplied by a member(s) of the Interlocking Concrete Pavement Institute (ICIP). The ICIP manufacturer/supplier shall be:

```
[name: ]
[address: ]
[phone: ]
[fax: ]
```

- B. Product name/shape, overall dimensions, and thickness of the paver(s):

_____ mm/in. x _____ mm/in and _____ mm/in thick.

_____mm/in. x _____mm/in and _____mm/in thick

- C. Meet the requirements of ASTM C 936 or CSA A231.2 as applicable.
 - 1. When testing 3 1/8 in. (80mm) thick units for conformance to ASTM C 936, comprehensive strength tests shall be corrected by multiplying the results by 1.18.
 - 2. When testing 4 in. (100mm) thick units for conformance to ASTM C 936, comprehensive strength tests shall be corrected by multiplying the results by 1.24.
- D. Certified by the ICPI.

2.02 MATERIALS FOR BEDDING AND OPENINGS

Grading Requirements for ASTM C33 No.8

Sieve Size	Percent Passing
½ in. (12.5 mm)	100
3/8 in. (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.16 mm)	0 to 5

2.03 MATERIALS FOR BASE

Grading Requirements for ASTM C33 No. 57

Sieve Size	Percent Passing
1 ½ in. (37.5 mm)	100
1 in. (25mm)	95 to 1000
½ in. (12.5 mm)	25 to 60
No. 4 (4.75 mm)	0 to 10
No. 8 (2.36 mm)	0 to 5

2.04 MATERIALS FOR SUBBASE

Grading Requirements for ASTM C33 No. 57

Sieve Size	Percent Passing
1 ½ in. (37.5 mm)	100
1 in. (25mm)	95 to 1000
½ in. (12.5 mm)	25 to 60
No. 4 (4.75 mm)	0 to 10
No. 8 (2.36 mm)	0 to 5

or

Grading Requirements for ASTM C33 No. 2

Sieve Size	Percent Passing
3in. (75 mm)	100
2 ½ in. (63 mm)	90 to 100
2 in. (50 mm)	35 to 70
1 ½ in. (37.5 mm)	0 to 15
¾ in. (19 mm)	0 to 5

2.05 GEOTEXTILES

- A. Per [manufacturer, product name/number] as supplied by [source].

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that base is free from standing water, uniform, even, free from any organic material or debris, ready to accept bedding materials, pavers and imposed loads.
- B. Verify correct gradients and elevations of open-graded base.
- C. Verify placement of geotextile [impermeable liner].

- D. Verify compaction of soil to specified density and moisture content.
- E. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved.
- F. Beginning of installation means acceptance of base, edge restraints, drain pipes, and overflow devices.

3.02 INSTALLATION

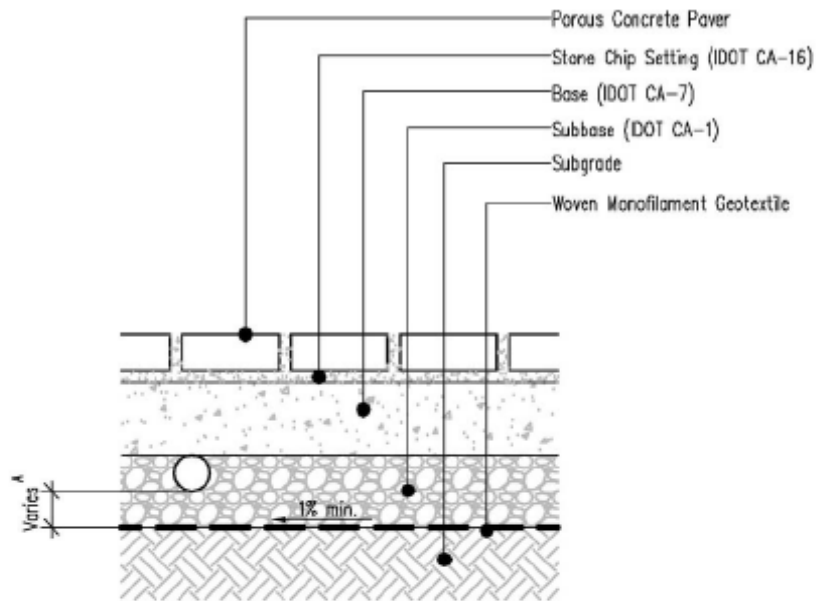
- A. Keep area where pavement is to be constructed free from sediment during entire job. Geotextiles, base and bedding materials contaminated with sediment shall be removed and replaced with clean materials.
- B. Place and compact the No. 8 bedding material. Compact with a minimum [10] ton static roller. Make at least [4] passes. No visible movement should occur in the base material when compaction is complete.
- C. The elevation of the compacted surface should not deviate more than $\pm 1/2$ in. (± 13 mm) over a 10 ft. (3 m) straightedge.
- D. Loosen and evenly smooth $3/4$ to 1 in. (20 to 25 mm) of the compacted surface of the No. 8 bedding material. Maintain smooth, even surface during paver installation.
- E. Lay the pavers [and spacers] in the pattern(s) and joint widths shown on the drawings. Maintain straight pattern lines.
- F. Fill gaps at the edges of the paved area with cut pavers [edge units].
- G. Cut pavers to be placed along the edges with a double-bladed splitter or masonry saw.
- H. Compact and seat the pavers into the bedding material using a low amplitude, 75-90 Hz plate compactor capable of at least 5,000 lbs. (22kN) centrifugal compaction force. For units thicker than 4 in. (100 mm) use a compactor capable of at least 6,800 lbf (30 kN).
- I. Vibrate and compact the pavers again, sweeping No. 8 aggregate into the openings until it is within $1/2$ inch (13 mm) from the top surface. This will require at least two or three passes with the compactor.
- J. Do not compact within 3 ft (1m) of the unrestrained edges of the paving units.
- K. Remove excess aggregate by sweeping pavers clean.
- L. All pavers within 3 ft (1 m) of the laying face must be left fully compacted at the completion of each day.
- M. The final surface elevations shall not deviate more than $\pm 3/8$ in. (± 10 mm) under a 10 ft (3 m) long straightedge.
- N. The surface elevation of pavers shall be $1/8$ to $1/4$ inch (3 to 7 mm) above adjacent drainage inlets, concrete collars or channels.

3.03 FIELD QUALITY CONTROL

- A. After removal of excess aggregate, check final elevations for conformance to the drawings.

END OF SECTION

K. Typical Detail



A) Maximum drain time not to exceed 24 hours.

Notes:

1. Depth of base and subbase varies based on structural requirements and/or detention storage needs.

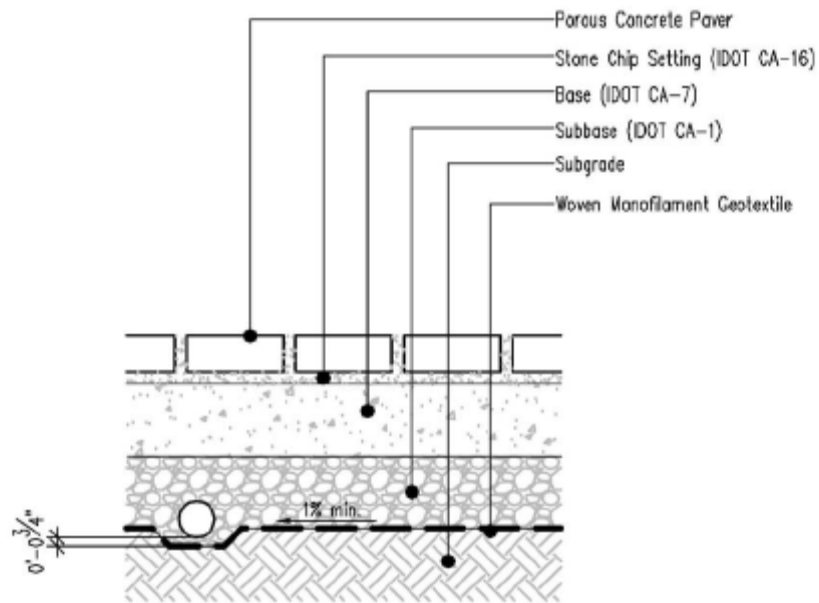
Porous Pavement with Retention Cross Section

Not to Scale



CONSERVATION DESIGN FORUM

Figure 2 – Porous Pavement Detail (with retention storage volume)



Notes:

1. Depth of base and subbase varies based on structural requirements and/or detention storage needs.

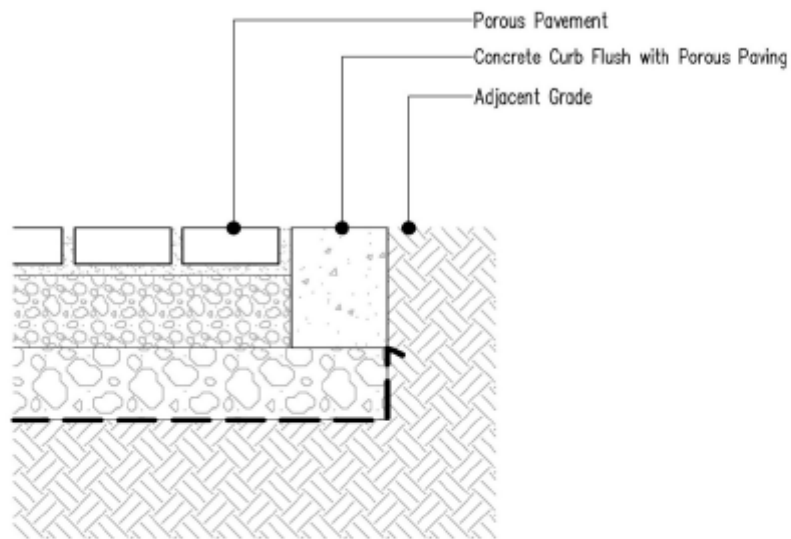
Porous Pavement Cross Section

Not to Scale



CONSERVATION DESIGN FORUM

Figure 3 – Porous Pavement Detail (without retention storage volume)



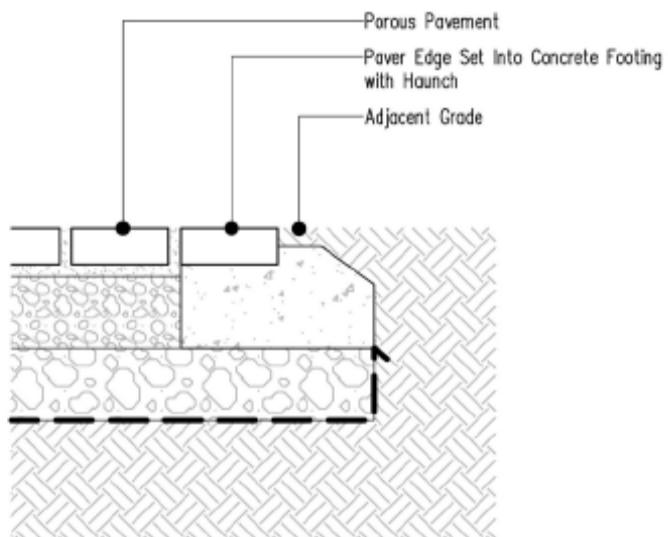
Flush Concrete Curb

Not to Scale



CONSERVATION DESIGN FORUM

Figure 4 – Porous pavement edge restraint: Flush Concrete Curb



Concrete Paver Footing

Not to Scale



CONSERVATION DESIGN FORUM

Figure 5 – Porous pavement edge restraint: Concrete Paver Footing

- ¹ Smith (2001); Smith (2003)
- ² JEGEL (2000)
- ³ Smith (2001); Smith (2003)
- ⁴ EPA (1999)
- ⁵ Smith (2001); Smith (2003)
- ⁶ Rollings *et al.* (1993)
- ⁷ Schueler (1987); Horner *et al.* (1994); EPA (1998)
- ⁸ Rollings *et al.* (1992)
- ⁹ Borgwardt *et al.* (2000); Rollings *et al.* (1992); Yoder *et al.* (1975)
- ¹⁰ Rollings *et al.* (1993)
- ¹¹ Smith (2001)
- ¹² Borgwardt *et al.* (2000)
- ¹³ Dorman *et al.* (1964)
- ¹⁴ Schueler (1987); Horner *et al.* (1994); EPA (1998)
- ¹⁵ Smith (2001)
- ¹⁶ Borgwardt *et al.* (2000)
- ¹⁷ Rollings *et al.* (1993)
- ¹⁸ Smith (2001)
- ¹⁹ Smith (2001)
- ²⁰ Smith (2001)
- ²¹ Smith (2001)
- ²² Dunn *et al.* (1980); Rollings *et al.* (1992); Borgwardt *et al.* (2000)
- ²³ Smith (2001)
- ²⁴ Brattebo (in print)
- ²⁵ Bean *et al.* (2004)
- ²⁶ Borgwardt (1994)
- ²⁷ Smith (2001)
- ²⁸ Bean *et al.* (2004)
- ²⁹ Smith (2003); Borgwardt *et al.* (2000)
- ³⁰ Backstrom (2000)
- ³¹ Hansen *et al.* (1997)
- ³² EPA (1999)
- ³³ Mahabadi (2001)
- ³⁴ Cahill *et al.* (2004)
- ³⁵ Rollings *et al.* (1992)
- ³⁶ Borgwardt(1994); Bean *et al.* (2004)
- ³⁷ Bean *et al.* (2004)

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Section 3.0 Rain Gardens

A. Definition and Examples

Rain gardens are shallow excavated garden areas designed to retain stormwater runoff from individual lots and associated impervious areas. They provide an effective runoff filtering mechanism through the vegetation and microorganisms in the root zone. Rain gardens should receive evenly distributed sheet flow, but can also receive point discharge runoff. The latter has to be specifically addressed in the rain garden design to prevent erosion and scour. Rain gardens are sized to drain or fully infiltrate the received runoff within approximately 12-hours and are typically planted with grasses and perennials, which help to improve and maintain stormwater infiltration over time.

The term “rain garden” is used here to denote a variety of biofiltration measures designed to filter and/or infiltrate runoff through a vegetated soil surface. For example, linear rain gardens located within parking lot islands are often referred to as biofiltration swales or simply bioswales.

Rain gardens can be combined with other BMP's in this guidance manual. For example, many rain gardens are combined with infiltration trenches (see Section 4.0) to provide for greater infiltration than a rain garden alone and improved water quality and resistance to clogging than an infiltration trench alone. Rain gardens can also be combined with vegetated swales to provide both infiltration and conveyance.

B. Suitable Applications

Rain gardens are a cost-effective stormwater management application if strategically placed near impervious surfaces such as roof areas (downspout discharge points) and pavements, or other areas that generate runoff, such as lawn areas. Rain gardens can be integrated into new developments and can be retrofitted into existing developments. Suitable areas or development types in which rain gardens can be incorporated are:

- Residential gardens/yards
- Commercial development plantings
- Parking lot landscape islands (often referred to as bioswales)
- Parkway/right-of-way areas along streets
- Median strips

C. Benefits

By minimizing the amount of stormwater that drains to the local storm sewer drainage system, rain gardens help to reduce the potential for flooding and associated bank and shoreline erosion in areas where stormwater discharges

into wetlands, streams, and lakes. Rain garden benefits can be summarized as follows:

- Reduces runoff volumes and rates from roofs, pavements, and lawns
- Recharges groundwater and sustains base flows to natural water bodies
- Reduces sediment, nutrient runoff, and other pollutants
- Can be used to meet Village's 0.75-inch extended detention standard

Ancillary benefits:

- Reduces maintenance requirements compared to conventional lawn surfaces or other irrigated plantings
- Can reduce detention needs
- Effective land use through combination of stormwater management and ornamental planting
- Can increase aesthetic value for the property
- Can diversify site habitat
- Can reduce the need for costly stormwater infrastructure

D. Limitations

The following considerations are necessary to sustain the long term performance of rain gardens:

The rain garden surface-area should generally be a minimum 10% to 15% of the contributing impervious area.

Rain gardens should not be used for areas with high sediment loadings such as plant nurseries, material storage yards, etc. unless the sediment load can be reduced using filters strips or other measures prior to release to the rain garden. The high sediment load can cause clogging.

Rain gardens and other infiltration measures should not be used for areas with potential for contaminated runoff to avoid groundwater contamination. Areas to be avoided include fueling and vehicle maintenance facilities (gas stations) and hazardous materials storage facilities. Runoff from parking lots, roofs and other typical urban surfaces should not lead to groundwater contamination, provided the design recommendations within the manual are followed.

Rain gardens must be protected from construction site runoff and/or the garden must be rehabilitated once the site is stabilized.

The drain time for rain gardens should be limited to approximately 12-hours to ensure longevity of the vegetation and prevent complaints. Where soil permeability is insufficient and/or the volume of runoff is too great, an infiltration

trench can be placed below the rain garden to increase the available storage volume (see also Section 4.0).

Rain gardens should not be placed over septic systems and should be located at least 100-feet from well heads.

Rain gardens must have an adequate separation above the seasonal high ground water table (see also Section 3.0(E)(2)).

Rain gardens should not be placed over contaminated soils.

Rain gardens should be located at least 10-feet down slope from building foundations unless adequate waterproofing is provided and direct drainage to footing drains can be prevented.

E. Required Design Data

1. Soil type and permeability:

The infiltration capacity of the subsoils under the rain garden will determine the volume of runoff that can be exfiltrated from the rain garden into the ground over a given time. The infiltration capacity, along with the contributing watershed will help to determine the rain garden size.

The Will County Soil Survey provides some guidance with regards to soil permeability. It is, however, recommended that a hydraulic conductivity test be performed at the location and elevation of the proposed rain garden bottom to establish the site-specific permeability rate (double ring infiltrometer test per ASTM D3385, lab test per ASTM D2434 through a Shelby tube sample, or a Falling Head Percolation Test (described in Attachment A). The data from the infiltration test will allow for adequate sizing and design of the rain garden.

2. Seasonal high water table:

If the site in question for the rain garden placement is known to have a relatively high water table, data on the elevation of the seasonal high water table is needed. The invert of the rain garden shall be at least three feet above the seasonal high water table¹ to provide adequate runoff treatment prior to discharge into shallow ground water.

3. Contributing drainage area and imperviousness:

Along with the infiltration capacity, the drainage area and level of imperviousness contributing to the rain garden are needed to determine its size.

F. Rain Garden Design

1. Rain garden location:

As a general rule, rain gardens should be located adjacent to or near the impervious surfaces they are designed to treat.

Topography:

Place the rain garden in flat areas to maximize the surface area for infiltration. Construct the rain garden with a shallow slope at the edges and flat invert to allow for even runoff distribution and infiltration. Avoid low areas with a longer ponding time, which may cause sediment accumulation and sealing. If the rain garden must be constructed in sloping terrain, give it a linear shape and place it along a contour, or terrace the rain garden along the slope.

Building foundation and basements:

Some references call for a minimum set back of 10-feet from any building foundation. Another rule that can be applied to protect building basements is to set back the rain garden 1.5-times the distance of the building foundation depth². These rules may not apply to foundation that are water proofed and where no leakage into the footing drain is assured.

Light level conditions:

An important component of rain garden design is the planting of grasses and sedges with strong fibrous root systems. Such root systems contribute to the build up of soil organic carbon that ensures the longevity of the rain garden's filtration and infiltration capacity. In order to maximize the production of soil organic carbon, the grasses and sedges need to be 'fueled' by sufficient sunlight. The placement of the rain garden in full sun or partial sun conditions is preferable. Sites that are exposed to full sun for about half the day are suitable for a rain gardens.

Seasonal high water table:

The rain garden invert will need to be a minimum of three feet³ above the seasonal high water table to provide adequate runoff treatment prior to discharge into shallow ground water. The greater the separation between the seasonal high water table and rain garden invert, the more effective the runoff treatment.

2. Rain garden ponding depth and drain time:

The drain time for rain gardens should be limited to 12-hours and the depth of ponding should generally be limited to 18-inches. However, greater depths may be appropriate if the duration can be limited to less than 12-hours.

The time necessary to drain the rain garden should be no more than approximately 12-hours to ensure the health of the vegetation in the rain garden and to avoid complaints. In many cases, the drain time and soil permeability will determine the maximum depth of ponding. For example, if the infiltration capacity of the soils is 1-inch/hour, the maximum depth would be 12-inches, if the infiltration capacity is 0.5-inches/hour, the maximum depth would be 6-inches.

In higher permeability soils, it may be feasible to support greater depths of ponding without exceeding the 12-hour duration. However, to protect the health of the vegetation, the depth should generally be limited to 18-inches unless the duration can be reduced to less than 12-hours. Where greater depths of ponding are necessary due to space constraints, rain gardens can be placed over infiltration trenches for which the maximum recommended drain time is 72-hours⁴ (see also Section 4.0(F)(3)).

3. Rain garden area:

Although the term rain garden conjures images of small backyard gardens, there is really no size limit to the area of a rain garden. Thus, a rain garden could be as large as what is commonly known as an infiltration basin provided the guidance in this document is followed, including ponding depth and drain time described above.

To minimize the potential for clogging at the bottom of the rain garden and to maximize the runoff volume potential, the rain garden area should not be less than 10% to 15% of the impervious drainage area.

4. Rain garden sizing:

To meet the Village's extended detention standards, rain gardens should be sized for 0.75-inches of runoff over the impervious area draining to the rain garden. However, rain gardens in other regions are often sized to contain the 1- to 2- year event to prevent increases in runoff volumes for these storms that are most affected by urbanization. Rain garden sizing is described further under Section 3.0(F)(9).

In general, the surface area of a rain garden will need to increase and the depth will need to decrease with lower permeability soils. In other words, the lower the soil permeability, the shallower the depth and the larger the surface

area needed to retain and infiltrate runoff within the recommended maximum drain time of 12-hours.

Depending on site limitations (e.g. soils with a very low infiltration rate, limited available space, etc.), it may be difficult or impossible to meet the 0.75-inch extended detention standard with a rain garden alone. In this case, rain gardens can be underlain with gravel filled infiltration trenches to provide additional storage without exceeding the surface ponding depth and duration standards. Also, rain gardens can be combined or sequenced in the watershed with other decentralized stormwater tools, such as porous pavements, to meet the retention standard.

5. Runoff treatment:

High runoff temperatures and poor water quality can stress the rain garden vegetation and their root systems that are important to ensure the system's long term performance and aesthetics. Runoff water quality can be improved and temperatures reduced by routing impervious runoff through level spreaders and vegetated filter strips (see Section 5.0).

High runoff temperatures can also be mitigated through the point discharge dissipation approaches, which are described in Section 3.0(F)(6), below.

6. Flow energy dissipation:

Energy dissipation is often necessary to prevent scour where runoff enters the rain garden. At curb cuts along a street or within a parking lot or for residential downspouts, only nominal energy dissipation such as a splash pad or small amount of stone may be necessary. For large flow rates (entering larger rain gardens), larger rip rap material, level spreaders or inflow chambers may be necessary.

Level spreader (see also Section 5.0):

Level spreaders can be as simple as a gravel edge where the parking surface meets the rain garden or can be more complex such as long gravel trenches containing perforated pipe to distribute the runoff over the length of the spreader. In addition to dissipating energy and distributing the runoff, level spreaders provide cooling of the first flush runoff from high temperature paved or roof surfaces.

Inflow-chamber:

Route point discharge to an inflow-chamber in the rain garden. The inflow chamber functions like a drywell in reverse, allowing the runoff to slowly rise by head pressure and flow into the rain garden.

7. Rain garden top soil:

Eight to 12-inches of loamy sand / sandy loam topsoil should be placed in the bottom of the rain garden to provide filtration and a growing media for the vegetation. The topsoil should generally conform to the following specifications to ensure adequate permeability and growing conditions.

- 70% medium to coarse sand (IDOT FA2)
- 8 to 10% organic content
- less than 10% clay
- Compaction of 70% (modified) to 75% (standard) max. dry density

In some cases, the existing site topsoil may meet the specifications above. In other cases, site topsoil may need to be amended with coarse sand (IDOT FA2) and/or organic material such as leaf compost. The specifications section provides detail on the amended topsoil (see Section 3.0(I)).

Where a rain garden is located above an infiltration trench, the minimum amended topsoil depth should be 8-inches. Where the rain garden is located directly on subgrade soils, the amended topsoil depth should be increased to 12-inches unless the subgrade soils have a tested infiltration capacity greater than 1-inch/hour.

8. Vegetation design:

The use of perennials, fibrous rooted grasses, and sedges will enhance the rain garden's longevity and improve water quality benefits. The extensive root system of native grasses and forbs contribute to the sustainability of soil organic carbon that ensures the longevity of the rain garden's filtration and infiltration capacity. Native grasses alone will achieve the rain garden objectives. However, forbs are often added to achieve certain aesthetic objectives. The vegetation of a rain garden depends on a number of factors:

Soil type and soil moisture content:

In spite of the name "rain garden" the vegetation should be that which flourishes in soils that are neither particularly wet nor particularly dry. Attachment B – Species Guide lists recommended native plant species. Rain gardens located over infiltration trenches or high permeability soils must be tolerant of dry conditions.

Light level conditions:

As described in Section 3.0(F)(1) native grasses and sedges need to be 'fueled' by sufficient sunlight to produce soil organic carbon. The placement of the rain garden in full sun or partial sun conditions is thus preferable.

Aesthetic objectives:

Use of the recommended native grasses, forbs, and sedges in a rain garden does not mean that the appearance automatically translates into a “naturalistic” look. Midwestern native vegetation provides sufficient variation in flowering color, flowering time, textures, and plant heights to create rain garden plantings that provide an ornamental “flowering border” appearance, or even a formal design. The latter two options will require more maintenance than a “naturalistic” planting (see Section 3.0(H)(1)).

If mowed more often than once a year or planted with a low ratio of grasses and sedges, soil organic carbon will deplete over time. This may reduce the water quality benefits of the rain garden over time. It may also lead to a slow loss of infiltration capacity that may need to be restored by tilling in additional organic material.

9. Hydrologic analysis:

There are two components to the hydrologic analysis: the required size to meet the Village’s extended detention standard and the impact of the rain garden on downstream detention requirements.

Retention standard:

The Village’s extended detention requirement states that 0.75-inches over the impervious area must be retained when an agricultural area is located downstream from the site. To ensure that the retention standard is met for all storm durations, a one-hour design storm should be used to size the rain garden. Except on soils with very high permeability, the volume of water infiltrated during a 1-hour event will be small. Thus, the required surface volume of the rain garden (V_R) is:

$$V_R = 0.75 * A_i * 0.083$$

Where:

V_R = extended detention storage volume in acre-feet

0.75 = extended detention volume standard in inches

A_i = impervious area (acres)

0.083 = conversion from acre-inches to acre-feet

If there is insufficient space to provide the required volume without exceeding the maximum ponding depth or duration, the rain garden may be supplemented with an infiltration trench below or with downstream retention features such as additional rain garden and native filter strips.

Impact on downstream detention sizing:

The critical duration for detention sizing is typically 24-hours. Thus, the volume of runoff infiltrated within a rain garden during a 24-hour detention design storm will often be significant. For example, with a watershed to rain garden area ratio of 8:1 and soil permeability equal to 0.5-in/hr, a properly sized rain garden, designed according to these guidelines can reduce the runoff volume associated with the 2-year event by 50%.

Rain gardens can be modeled as storage reservoirs in standard hydrologic models such as TR20 or HEC-1. The rate of infiltration Q_i is equal to:

$$Q_i = i * A_g$$

Where:

Q_i = the volumetric flow rate through the rain garden subgrade in cubic feet per second (cfs)

i = infiltration capacity of subgrade soils in inches/hour

A_g = bottom area of the rain garden in acres

For models that allow multiple outlets, infiltration outflow can be treated as a separate outlet that does not contribute downstream. For models that only allow a single outlet, the total rain garden outflow is equal to the infiltration outflow plus the surface outflow. The infiltration outflow rate can then be diverted out of the system so that it does not contribute to the downstream detention facility.

G. Construction Considerations

Construction of rain gardens requires special care and changes to normal construction practice and schedules for the optimal functioning of the rain garden facility and its long-term viability.

1. Soil erosion and sedimentation control:

Soil erosion and sediment control practices should be maintained and inspected on a regular basis. Accumulated sediments within on-lot sediment traps and along silt fences should be promptly removed. All disturbed areas shall be promptly stabilized and compromised erosion and sediment control devices should be promptly repaired.

Stockpiles should be located downstream of rain garden facility; if unable to do so, stockpile shall have a double row of silt fence that surrounds the perimeter of the stockpile.

Before the rain garden goes online, the contributing drainage area must be stabilized/fully vegetated.

Rain garden facility shall be stabilized with vegetation and erosion blanket prior to facility receiving stormwater runoff.

2. Avoidance of soil compaction and contamination:

Soil compaction in the rain garden area must be avoided to conserve the permeability rate of the existing subsoils.

Areas where rain gardens are to be located should be protected from construction traffic using construction fencing or other barriers.

Avoid working on or with soils that are excessively wet or saturated.

Excavation of the rain garden should be performed using a backhoe or other equipment that can be staged outside the rain garden facility during excavation operations. Where the rain garden is too large to be excavated from outside the garden, low ground pressure equipment should be used and the area tracked by the equipment should be minimized (see also sample specifications in Section 3.0(I)).

3. Amended soil mix:

After placement of topsoil, the rain garden facility must be protected from construction impacts, including placement of building materials and foot and vehicle traffic.

When onsite topsoil needs to be amended to meet the specifications of Section 3.0(F)(7) the recommended method of amended soil mix placement is:

- Mixing of the amended soil outside of the rain garden area.
- Unloading of the amended soil at the rain garden edge.
- Spreading of the amended soil with a backhoe or other equipment that can be staged outside the rain garden facility.
- Manual fine grading, such as raking.
- Compaction using a roller or other equipment that will provide adequate compaction to support moderate foot traffic but not exceed 80 to 85% compaction.

4. Vegetation installation:

Prepare seed bed through manual means or use low ground pressure equipment.

Hand broadcast seed or use low ground pressure seeding equipment.

Install erosion control blanket and plant live material by carefully slitting slots into the erosion blanket.

The success of a rain garden installation can be assured by simple proactive measures. It is recommended that the consultant meet with the contractor prior to construction to discuss the above listed items, construction sequencing and construction schedules. Supervisory construction staff, such as the foreman, should participate in the meeting. Construction inspections should be mandatory at crucial junctures to verify compliance with design parameters and specifications.

H. Operation and Maintenance

Rain garden maintenance can be greatly reduced by taking a proactive approach during construction. The greater the care taken during construction, the fewer items there will be to look after or to repair. Care during construction will also assure a smooth and shortened establishment period, which reduces intensive maintenance requirements.

The following activities should be completed routinely in the first two to three years of establishment: erosion repair, weed control, and supplemental watering. After full vegetation establishment, the required maintenance within rain gardens that use native grasses, sedges, and perennials in a naturalistic fashion should be minimal. More intensive maintenance may be required in rain gardens that use ornamental and non-native species but no greater than the maintenance required of a typical perennial garden.

1. Vegetation management:

Initially, plant plugs and other live material should be watered immediately after planting and continue to be watered as necessary until plugs are rooted into the ground, unless there is adequate rainfall.

During the plant establishment period – up to 3-years after installation – monthly site visits during the growing season (April – October) should be undertaken to identify and carry out maintenance requirements.

If a rain garden is seeded and plugged, the establishment period may be only 1.5- to 2-years, depending upon the success of the initial weed and weed seed bank treatment and the vigilance of the initial weed control.

Due to the typical size of a rain garden, the most effective manner of weed control will be hand weeding and/or use of appropriate herbicide (by licensed applicator). To determine the appropriate weed control, one has to distinguish

between annual weeds and perennial weeds. The former requires a less intense control than the latter.

Annual weeds:

Annual weeds do not need to be pulled but only to be cut/trimmed back to prevent them from flowering and setting seed. In rain gardens that use native prairie vegetation, control of annual weeds can also be achieved in the first growing season through mowing, cutting vegetation to a height of 6- to 8-inches. A string trimmer may also be used to cut vegetation to this same height. Where vegetation growth is heavy, cuttings should be removed to prevent smothering of the desirable rain garden vegetation. Mowing should be conducted when the weed vegetation reaches a height of 12 to 15-inches and before any noxious weeds set seed.

Perennial weeds:

Perennial weeds should be hand pulled or spot treated with herbicide (by licensed applicator). Hand pulling should include the removal of all above ground and belowground stems, roots, and flower masses prior to the development of seeds. Care should be taken to disturb as little soil as possible during hand pulling to avoid exposure of additional weed seed in the soil layer, and to protect adjacent emerging seedlings. Care must be taking during herbicide spot treatment to avoid damaging surrounding vegetation.

After sufficient graminoid (grasses and sedges) development to provide an adequate fuel source in rain gardens with native prairie vegetation, annual burn management should be implemented. Burning dead plant material reduces weed growth, stimulates native grass and forb growth, and increases nutrients available to the plants. In rain gardens where burning is difficult or impossible, the vegetation should be mowed annually in fall or spring. To mimic the burn cycle all clippings and thatch must be removed after mowing. Please note that mowing does not provide the full benefit to native prairie vegetation that fire provides and will often result in a lower ratio of wildflowers (forbs) relative to the grasses.

Rain gardens planted with ornamental plants and/or non-native species may require cutting back and winter protection of individual species as part of winter preparations typical of any ornamental garden. These rain gardens may also require thinning of some plants to encourage the development of other species.

2. Debris removal:

In those systems where there is no burn regime, dead plant debris, trash, leaves and any other material that may obstruct infiltration or smother desired

vegetation should be removed. Dead plant stalks should be cut back or mowed each spring.

3. Sedimentation removal:

If the rain garden is properly designed and protected from sedimentation through use of an adequate pretreatment area, the rain garden basin is likely to maintain its effectiveness for many years (20+ years). The rain garden basin should be scraped and replanted when accumulated sedimentation is one-quarter of the basin depth.

The initial erosion and sediment control inspections should identify and initiate remediation of any early signs of erosion or sedimentation within the rain garden basin. Thereafter, annual inspections for sediment accumulation within the pretreatment area and basin should occur.

4. Rain garden easement protection:

The Village's ordinance requires that stormwater features (such as a rain garden) are protected by an easement. All rain garden areas that are part of the submitted and approved stormwater management system thus are required to be in an easement. If rain gardens are not part of the stormwater management system, such as a rain garden installed by a homeowner on his or her own accord, it is exempt from the easement requirement.

I. Specifications

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes the testing, mixing, and installation of topsoil material in conjunction with a rain garden installation.

1.3 RELATED DOCUMENTS

- A. AASHTO T 194 Standard Method of Test for Determination of Organic Matter in Soils by Wet Combustion.
- B. ASTM D 4972 Standard Test Method for pH of Soils.
- C. ASTM D 422-63 Standard Test Method for Particle-Size Analysis of Soils.
- D. ASTM D 698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
- E. ASTM D 1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- F. Solvita by Woods End Research: Guide to Solvita Testing for Compost Maturity Index.

1.4. QUALITY ASSURANCE

A. Field Control Tests:

1. Organic Content and pH measurement of amended soil mix shall be in accordance with AASHTO T 194 and ASTM D 4972, respectively.
2. Sand and clay content of amended soil mix shall be measured in accordance with ASTM D 422-63.
3. One test per 300 square feet of rain garden.

PART 2 – PRODUCTS

2.1. ON-SITE LOAMY SAND/SANDY LOAM TOPSOIL

- A. Topsoil for use in a rain garden shall be a sandy loam that conforms to the following specifications.

Proportion of Sand	70%
Proportion of Organic Material	8% - 10%
pH	$6.0 \leq \text{pH} < 8.0$
Maximum Clay Content	10%

- B. If the onsite topsoil does not conform to the above specifications, it may be amended with sand and/or organic material to create Amended Rain Garden Topsoil as described in Section 2.2.

2.2. AMENDED RAIN GARDEN TOPSOIL

- A. Sand: Shall be clean and free of toxic materials and shall be per IDOT specifications. Gradation shall conform to IDOT FA2. The sand mix constitutes approximately 70% of the rain garden amended soil mix.
- B. Silt-Clay-Loam Planting Soil: Planting soil shall be used to create amended soil, but after mixing of amended soil, clay shall not constitute more than 10% of the amended rain garden soil mix. Soils for use in the amended rain garden soil mix shall be obtained from A horizon soils without admixture of subsoil. Planting soil shall be fertile, friable, (i.e., not pulverized), free from subsoil, clay lumps, brush, litter, stones, weed propagules (seeds, rhizomes, and plants), roots, or similar objects larger than 1-inch in any dimension, or deleterious materials, including any toxic materials.
- C. Organic Matter: Organic matter shall constitute a minimum of 8% and maximum 10% of the amended rain garden soil mix. The organic matter shall be well-composted, stable, and weed-free with a pH range of 6.0 to 8.0. The organic matter or hereafter, referred to as the compost, shall also meet the following requirements:
1. The compost shall be derived of material that consists of chipped, shredded, or ground vegetation or clean, processed, recycled wood products.

2. The compost shall be processed or completed to reduce weed seeds, pathogens, and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides, or other chemical residues that would be harmful to plant or animal life. Other deleterious material, plastic, glass, metal, or rocks shall not exceed 0.1 percent by weight or volume.
 3. A minimum internal temperature of 57°C shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum of 5 times during the composting process and shall go through a minimum 90-day curing period after the 15-day thermophilic compost process has been completed. Compost shall be screened through a maximum 9.5-mm screen.
 4. The moisture content of the compost shall not exceed 35 percent. Compost products with a higher moisture content may be used provided the weight of the compost is increased to equal the compost with a moisture content of 35-40 percent.
 5. The compost shall measure a minimum of 6 on the maturity and stability scale by Solvita (Woods Research).
 6. Compost shall be tested for maturity and stability and a certificate shall be provided that indicates the organic material meets the specified requirements.
- D. The onsite and/or amended rain garden topsoil mix shall be friable, free of clumps of clay, brush, weed propagules (seeds, rhizomes, and plants) including but not limited to *Cirsium arvense*, *Arctium minus*, *Lythrum salicaria*, *Phalaris arundinacea*, *Phragmites australis*, *Typha latifolia*, and *Typha angustifolia*, roots, stones larger than 1", other extraneous or toxic matter harmful to plant growth.
- E. Erosion blanket, North American Green (NAG) S75, or equivalent, if rain garden execution is completed between April 1st and October 1st; or NAG S150, or equivalent, if work is completed after October 1st.

PART 3 – EXECUTION

3.1. AMENDED RAIN GARDEN SOIL PREPARATION

- A. Verify sand, clay, organic content, and pH measurement of amended soil mix via field control tests. Refer to Quality Assurance of this Section for required field control tests.
- B. If amended topsoil is placed over an infiltration trench, mixing of the amended soil must be done outside of the infiltration trench.

3.2. RAIN GARDEN EXCAVATION

- A. Excavation shall be achieved via backhoe or other similar excavation equipment that shall be situated outside the boundary of the rain garden. If the rain garden scale is too large to accommodate this requirement, use low ground pressure excavation equipment, which

shall be confined to a “one-track” alignment within the rain garden to accomplish the excavation, placement of the amended soil, or reapplication of topsoil into the rain garden basin.

3.3. EXAMINATION OF SUBGRADE

- A. Subgrade shall be examined by the Contractor prior to start of amended rain garden soil mixture placement and planting. All subgrade elevations shall be approved by the Construction Manager prior to placement of amended soil mix.
- B. Compaction Mitigation – If compaction occurs during basin excavation (within “one-track” area), a chisel plow or rotary device with the capability of reaching a depth of 12 inches below the surface shall be used within the compacted area.

3.4. AMENDED RAIN GARDEN SOIL PLACEMENT

- A. Installation of amended topsoil must be done in a manner that will ensure adequate infiltration. Place amended soil mix in 8” –12” lifts. Lifts shall not be compacted. Overfill above the proposed final grade to accommodate natural settlement to meet finish grades. Do not spread if amended soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Placement of amended soil should be sequenced with seed and erosion blanket installation to prevent traffic over amended soil mix lifts and final grading to prevent undesirable soil compaction.
 - 2. Seed installation shall be by method that minimizes compaction to soil.
- B. Light Compaction of Amended Rain Garden Soil. Avoid over compaction by allowing time for natural settlement and compaction. Amended Rain Garden Soil shall have a maximum dry density of 70% (ASTM D 1557) or 75% (ASTM D 698) after completion of the Rain Garden installation. If time does not allow for natural settlement of soil, light compaction methods as specified below, may be implemented; if needed, additional amended soil mix shall be placed as previously stated to meet final grades.
 - 1. Amended soil mix may be compacted by presoaking the placed soil until water flows from an underdrain (if present). Water for saturation shall be applied by spraying or sprinkling. Additional settlement may occur subsequent to the initial wetting.
 - 2. Roll the entire rain garden area with a hand roller weighing no more than 100 pounds per foot of width. During the rolling, all depressions caused by settlement of rolling shall be filled with additional amended rain garden soil mix and the surface shall be re-graded and rolled until a smooth and even finish to the required grade is achieved.
- C. If amended soil becomes contaminated by construction site runoff during the construction of the facility, the contaminated material shall

be removed and replaced with uncontaminated material at no additional cost to the Owner.

- D. Contractor shall place construction fencing or other approved barriers to prevent compaction of amended rain garden soil mix from vehicle, equipment, or foot traffic.

3.5. FINE GRADING

- A. Carefully prepare the amended rain garden soil bed by scarifying and hand raking after amended soil mix has been spread.

3.6. VEGETATION COVER

- A. Permanent seed matrix installation shall be conducted during installation seasons normally recognized in the job locality for the native species that are proposed, and shall be approved by the Design Professional.
- B. A cover crop shall be installed in conjunction with the seeding of the permanent vegetation if the timing of the installation is appropriate. Otherwise, a cover crop shall be installed immediately following fine grading and the permanent seed matrix shall be installed at the next installation season.
- C. Plant live material after seeding and placement of erosion control blanket. Contractor will be required to carefully slit installed erosion control blanket for plug installation. Contractor shall ensure minimal disturbance to the erosion control blanket.

3.7. MAINTENANCE

- A. Maintain and establish native vegetation by watering, weeding, mowing, trimming, reseeding, and other operations. Re-grade and replant bare or eroded areas.
- B. Dependent upon the timing of installation, a provision for watering for the establishment of the native species may be required. Water the seeded/planted areas a minimum rate of 1/2 inch per week for 8 weeks after installation, and thereafter as needed for successful establishment of native vegetation.
- C. During the first couple growing seasons, occasional mowing may be needed to reduce weed height to provide direct sunlight for the establishing native species. Mowing heights and dates should be adjusted to maximize weed control and minimize damage to native species. The mower blade height should be set at a minimum, to six (6) to eight (8) inches. For areas not accessible with mowing equipment, the rain garden may be cut to the minimum specified height with a string trimmer or equivalent.

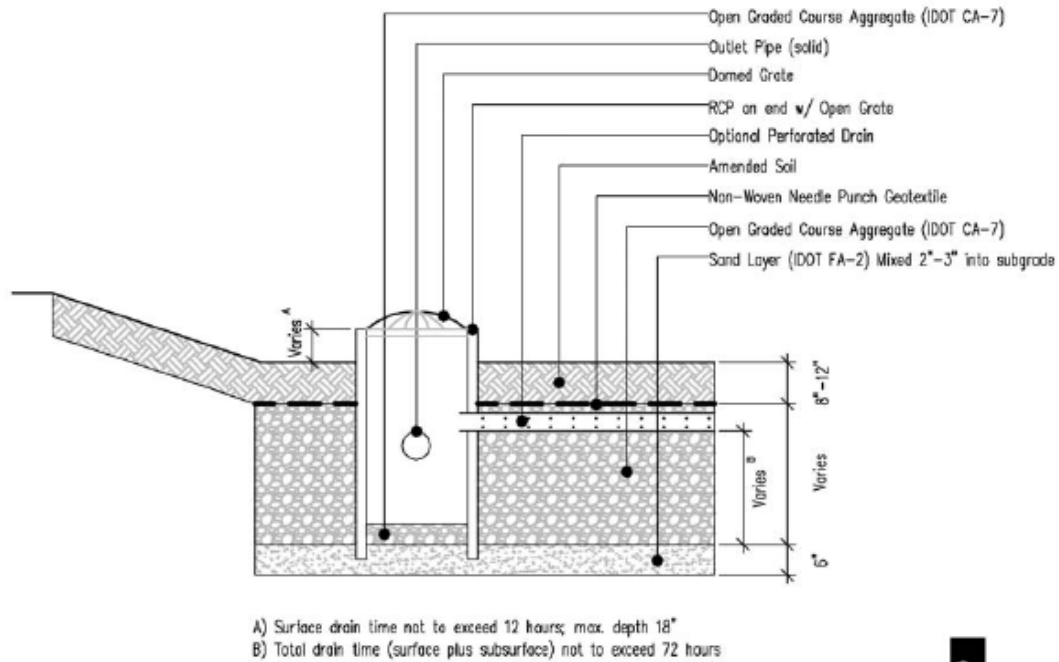
3.8. PERFORMANCE CRITERIA

- A. Satisfactory performance by the end of the first full growing season shall consist of the following criteria:

1. Complete vegetative cover. A minimum 95% cover shall be achieved and no area greater than one (1) square meter within the seeded/planted rain garden shall be devoid of vegetation.
2. At a minimum, 95% of the planted plugs and container-grown plants shall be alive and growing in a healthy condition.
3. No less than 25% occurrence of the seeded species shall be present within the rain garden.
4. None of the following shall be among the five most dominant plant species in the overall vegetative cover:
 - a. Common reed (*Phragmites australis*)
 - b. Sandbar willow (*Salix interior*)
 - c. Box elder (*Acer negundo*)
 - d. Giant ragweed (*Ambrosia trifida*)
 - e. Common ragweed (*Ambrosia artemisiifolia elatior*)
 - f. Non-native species

END OF SECTION

J. Typical Detail



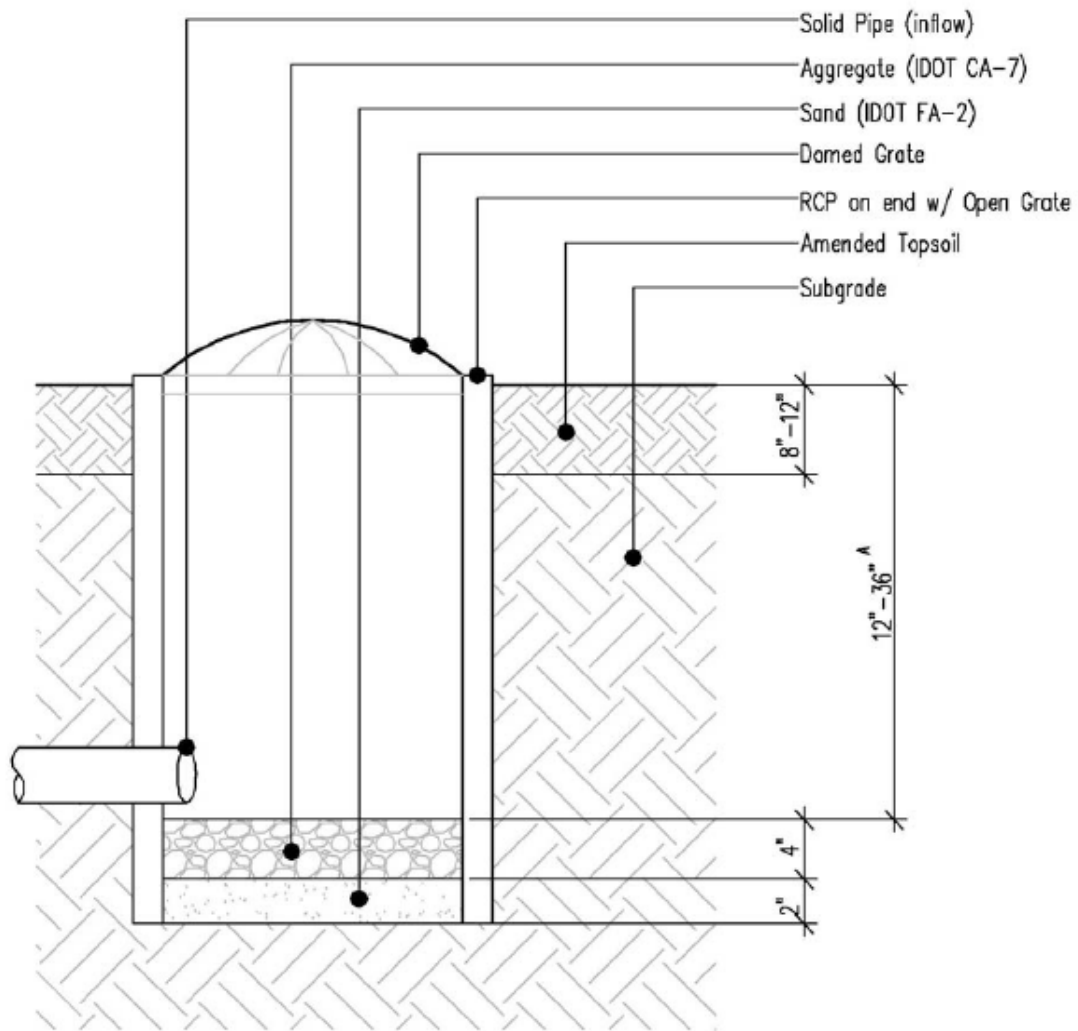
Raingarden Section with Infiltration Trench and Outlet Structure

Not to Scale



CONSERVATION DESIGN FORUM

Figure 6 – Rain Garden Section with Infiltration Trench (in profile) and Outlet Structure



A) Total drain time not to exceed 72 hours

Inflow Chamber

Not to Scale



CONSERVATION DESIGN FORUM

Figure 7 – Inflow Chamber Detail

¹ Barr Engineering Company (2001)

² Mahabadi (2001)

³ Barr Engineering Company (2001)

⁴ Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); MA Department of Environmental Protection (1997); Lowndes, M.A. (2000); Los Angeles County Department of Public Works (2002)

Barr Engineering Company (2001), Minnesota Urban Small Sites BMP Manual Stormwater Best Management Practices for Cold Climates, Metropolitan Council Environmental Services.

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Lowndes, M.A. (2000), The Wisconsin Storm Water Manual: Infiltration Basins and Trenches (G3691-3). Wisconsin Department of Natural Resources, Madison, Wisconsin.

Section 4.0 Infiltration Trenches

A. Definition

Infiltration trenches are excavations filled with open graded aggregate for temporary stormwater runoff storage. Although many stormwater manuals describe stand-alone infiltration trenches, within the Village, infiltration trenches must be overlain with rain gardens or vegetated swales constructed with amended topsoil. The vegetated amended topsoil media (see Section 3.0(G)(3)) filters the runoff, protecting the trench and subgrade soils from clogging with sediments. The soil filter must be amended to meet the specified permeability rate and be planted with native grasses and sedges to sustain soil organic carbon and hence the infiltration capacity.

Although the term “trench” implies a linear feature, the aggregate reservoir may occupy any shape.

The stored runoff in the aggregate reservoir must be partially or fully exfiltrated into the ground within 48 to 72-hours¹. The infiltration trench thus provides runoff volume control, recharges shallow ground water and helps to sustain base flows. In the case of partial exfiltration, excess runoff is collected through a perforated pipe or other drain and conveyed to additional BMP's downstream.

Infiltration trenches are combined with other BMP's in this guidance manual, such as rain gardens (see Section 3.0) to meet the Village's 0.75- inch extended detention standard.

B. Suitable Applications

Infiltration trenches are a suitable application where the 0.75-inch Village extended detention standard can not be met with rain gardens or vegetated swales alone. They improve the retention capacity by increasing the storage volume available for infiltration, increasing the allowable drain time, and may facilitate connection to a lower lying soil horizon that has a better infiltration capacity. In this case the infiltration trench will function as a linear dry well. It is critical, though, to insure that the invert of the infiltration trench has sufficient separation from the seasonal high water table to reduce the risk of ground water contamination (see also Section 4.0(E)(2)).

Infiltration trenches are ideal for residential, commercial and mixed-use developments. Their physical configuration allows integration into narrow areas, such as along parking lot edges and within parking lot islands and medians. The contributing area should not exceed five-acres².

C. Benefits

- Suitable for narrow and small spaces that cannot accommodate larger conventional treatments
- Good pollutant removal capabilities³
- Facilitates decentralization of the stormwater system, particularly when incorporating detention into the aggregate reservoir
- Potential increase in retention capacity through penetration of shallow soil horizons that have a low permeability rate
- Shallow and deep groundwater recharge and subsequent improved and sustained base flows to natural water bodies
- Reduction of the total runoff volume and subsequent reduction of potential flooding and associated bank and shoreline erosion in areas where stormwater discharges into wetlands, streams, and lakes
- Can be used to meet Village's 0.75-inch extended detention standard

D. Limitations

Infiltration trenches are subject to clogging by high sediment loads (even with an amended soil filter) and, therefore, are not suitable for areas such as construction sites, agricultural sites, or plant nurseries. In short, infiltration trenches should not be used if the sediment load in upstream areas cannot be controlled.

Infiltration trenches are not suitable for manufacturing and industrial sites, automobile service facilities, and other land uses with potential for high concentrations of pollutants due to accidental or other releases, or for sites that may receive high levels of pesticides or pathogens.

To minimize the risk of pollution, the invert of the infiltration trench must have adequate separation from the seasonal high ground water table (see also Section 4.0(E)(2)).

Infiltration trenches require a minimum separation of 100-feet from private wells⁴ and 1,200-feet from public wells⁵. It is further recommended that infiltration trenches be located at least 10-feet down-slope and 100-feet upslope from building foundations⁶ unless the invert of the trench is below the footing elevation, adequate waterproofing is provided and direct drainage to footing drains can be prevented.

The contributing watershed to the infiltration trenches should not exceed 2-acres⁷.

Infiltration devices should not be located adjacent to high and steep slopes where seepage could destabilize the slope.

Infiltration trenches should not be located on soil fill to avoid excessive settlement and loss of fill stability. However, the trench may be located on granular fill that will remain stable when saturated.

E. Required Design Data

1. Soil type and permeability:

The infiltration capacity of the subsoils under the infiltration trench will determine the volume of runoff that can be exfiltrated into the ground over a given period of time. The infiltration capacity, along with the porosity of the open graded aggregate fill, the required drain time, and contributing watershed will determine the infiltration trench dimensions (see Section 4.0(F)(7)).

The Will County Soil Survey provides some guidance with regard to soil permeability. In general terms, soils with a 30% or greater content of clay or 40% or greater content of silt and clay combined tend to have insufficient infiltration capacity⁸. Likewise, soils with an infiltration rate greater than 5-inches/hour or a combined silt/clay content less than 5% may not be suitable because of limited capacity to remove pollutants⁹.

It is recommended that a hydraulic conductivity test be performed at the location and elevation of the proposed infiltration trench invert to establish the site-specific permeability rate (double ring infiltrometer test per ASTM D3385, lab test per ASTM D2434 through a Shelby tube sample, or a Falling Head Percolation Test (described in Attachment A). A minimum of two soil investigations should be performed per infiltration trench. If the trench is longer than 100-feet, one additional sampling for each 100-foot increment is recommended¹⁰. On sites with cohesive soils the lowest recorded infiltration rate should be used for the sizing and design¹¹. On sites with varying soils (and varying hydraulic conductivity) the lowest recorded infiltration rate per soil type should be used. The data from the hydraulic conductivity test will allow for adequate sizing and design of the infiltration trench.

2. Seasonal high water table:

The invert of the infiltration trench should be at least three-feet¹² to above the seasonal high water table to reduce the potential for shallow ground water contamination.

3. Contributing drainage area:

It is recommended that the drainage area to the infiltration trench be limited to two acres¹³ to protect the device from excess sediment loads and high flow

rates at inflow points. A larger number of smaller devices are less likely to fail than a single facility treating a large area.

F. Infiltration Trench Design

Infiltration trenches should be combined with rain gardens and vegetated swales where these systems, by themselves, do not meet the 0.75-inch Village extended detention standard or where a higher degree of retention is desired.

Runoff to the rain gardens or vegetated swales passes through an amended top soil with high hydraulic conductivity into the top of the infiltration trench. This process improves the runoff quality entering the trench by removing suspended solids and pollutants from the runoff. When underlain with a geotextile it protects the infiltration trench from sediment accumulation and subsequent clogging (see also Section 4.0(F)(2)). The vegetated amended top soil must be designed to sustain its hydraulic conductivity over time¹⁴. It should generally conform to the following specifications to ensure adequate permeability (2- to 5-inches/hour) and growing conditions (see also Section 3.0(G)(3)):

- 70% medium to coarse sand (IDOT FA2)
- 8 to 10% organic content
- less than 10% clay
- compaction of 70% (modified) to 75% (standard) max. dry density

The following subsections describe the various key design elements.

1. Site selection:

The infiltration trench must be located down gradient from the contributing drainage area. The placement must further allow for overflow of excess runoff with a suitable outfall. Areas that become unstable under saturated conditions, such as locations close to cut or fill slopes, are unsuitable for infiltration trenches. Furthermore, infiltration trenches shall not be placed over fill, but must exfiltrate into natural, undisturbed soils with adequate infiltration capacity.

Soils:

The first step in the design process is to determine the suitability of the soils and their hydraulic conductivity. It is not uncommon to find very low infiltration rates in the A-horizon (either because of the soil type or compaction), while soils in the underlying horizons offer a higher infiltration capacity. Part of the design process is to seek permeable soil horizons that allow the infiltration trench to drain within the specified time. The elevation of the permeable horizon partially determines the depth of the infiltration trench. Other factors are adequate separation from the seasonal high water table and the

infiltration rate, which determines the volume that can be exfiltrated. The latter is further influenced by the surface area over which the exfiltration takes place – in other words – the surface area of the infiltration trench invert. As a general rule, the invert area of the trench must increase with lower permeability soils to achieve the retention standard without exceeding the allowable drain time. The trench invert should be flat to allow for uniform distribution and infiltration of the runoff.

Topography and access:

Infiltration trenches should not be located adjacent to steep slope where seepage could destabilize the slope. The placement of infiltration trenches should take into consideration the need for vehicular maintenance access.

Foundation protection:

Infiltration trenches should be placed at least 10-feet down-slope and 100-feet up-slope from building foundations¹⁵ unless the invert of the trench is below the elevation of the foundation. Another rule that can be applied to protect building basements is to set back the infiltration trench 1.5 times the distance of the building foundation depth¹⁶.

Groundwater protection:

To avoid contamination of shallow groundwater, infiltration trenches should not be applied on sites such as automobile service facilities and sites where there is potential for stormwater to come in contact with hazardous materials (see also Section 4.0(D)). The invert of the infiltration trench shall be at least 3-feet¹⁷ above the seasonal high water table.

To protect public water supplies, infiltration trenches require a minimum separation of 100-feet from private wells¹⁸ and 1,200-feet from public well¹⁹.

2. Permanent sedimentation control and protection:

Infiltration trench design requires provisions for sedimentation control to prevent failure through clogging. Any design that incorporates infiltration trenches must have an erosion and sedimentation control plan in place and the practices must be maintained. It is imperative that stormwater bypass the infiltration trench area during construction until the contributing watershed is fully stabilized.

If a temporary sedimentation pond is placed in the area of the planned infiltration trench, a minimum 12-inches separation between the bottom of the sedimentation pond and the final invert of the infiltration trench is necessary²⁰.

To protect the infiltration trench from clogging over its lifetime, there can be no direct discharge of runoff into the trench. Instead, the runoff must be filtered through vegetated amended top soil (see also Section 3.0).

3. Infiltration trench drain time:

The duration of ponding within an infiltration trench should not exceed 72-hours to ensure that the volume is available for subsequent events and to avoid sealing of the subgrade soils due to growth of biological slimes. The duration that water will be contained within in the trench is approximately equal to the storm duration plus the drain time. (Drain time is equal to the time required to drain the trench from full assuming no inflows.) For a 24-hour storm duration, the drain time should be limited to 48-hours.

The maximum allowable drain time, along with the subgrade permeability will control the maximum depth of the infiltration trench. (see Section 4.0(F)(8) for more information on maximum depth and drain time.)

4. Overflow and subsurface drainage design:

To assure safe bypass for excess runoff flows, infiltration trenches require an overflow.

Infiltration trenches in combination with vegetated swales or rain gardens may or may not require a subsurface drainage mechanism to dispose of excess water when the retention storage capacity is exceeded.

If the infiltration trench is combined with a vegetated swale and sized for the 0.75-inch extended detention standard only, no subsurface drain structure is needed. The trench can be allowed to fill up through the vegetated amended top soil, where excess runoff is drained through surface conveyance in the vegetated swale. If the infiltration trench is sized for both retention and detention, a perforated drain pipe must be placed above the retention volume elevation to provide drainage for the detention volume.

If the infiltration trench is combined with a rain garden and sized to drain the 0.75-inch extended detention standard within the required time frame, no subsurface drain structure is needed since the excess runoff can drain through the rain garden overflow. If the infiltration trench is sized for both retention and detention, a perforated drain pipe must be placed above the retention volume elevation.

The outfall of any subsurface drainage system must be designed to prevent erosion, scour and concentrated flows.

A backflow prevention flap valve may be necessary to prevent sediment laden runoff from entering the system.²¹

5. Observation wells and clean outs:

It is recommended that all infiltration trenches be outfitted with an observation well (four to six-inch perforated pipe with a cap on an anchor plate) located in the center of the trench.

Infiltration trenches with subsurface drainage structures (perforated pipes) should have a cleanout at each end, which can also be modified to serve as observation wells. Cleanouts should also be provided at each significant change in direction. Another function of the observation wells and cleanouts is to provide air vents while the trench fills with runoff²².

6. Materials:

The infiltration trench should be lined with a 6-inch sand layer (IDOT FA2) at the bottom²³. The sand will act as a filter layer and prevent compaction of the trench invert during the aggregate fill placement. The bottom 2-inches of the sand should be vertically mixed 2-inches into the subgrade²⁴.

The aggregate fill shall consist of open graded IDOT CA1 or CA7, preferably washed to prevent the introduction of remaining fines. The porosity for these open graded aggregates is approximately 0.40. Rigid perforated pipes or storm chambers can be integrated into the infiltration trench to reduce the amount of gravel and increase the trench storage.

The vertical sides of the infiltration trench should be lined with a non-woven needle punch geotextile to prevent migration of the adjacent soils into the open graded aggregate. A separate piece of non-woven needle punched geotextile should be placed on top of the open graded aggregate fill as a filter and sediment barrier. It is further recommended to place a one-inch sand layer (IDOT FA2) on top of the geotextile, prior to the placement of the amended top soil. The sand layer will reduce the risk of “blinding” the geotextile and sustain the capacity to pass runoff into the infiltration trench²⁵.

7. Infiltration trench sizing:

To meet the Village’s extended detention standards, infiltration trenches should be sized for 0.75-inches of runoff over the impervious area draining to the trench. Trenches may also be sized for larger events to increase retention and reduce downstream detention needs.

Trenches may also be used for detention where the retention volume is located below a perforated drain pipe and the detention volume is located above the drain. As with the retention-only trench, the total duration of ponding for both the retention and detention portions should not exceed 72-hours. The drain pipe can be fitted with a restrictor for controlled and slow

release. The restrictor shall be located at a cleanout or manhole for easy maintenance access.

This combination of retention and detention volumes effectively decentralizes the stormwater management system and allows for downsizing of detention facilities downstream. Infiltration trench sizing is described further under Section 4.0(F)(8).

8. Hydrologic analysis:

There are two components to the hydrologic analysis: the required size to meet the Village's extended detention standard and the impact of the infiltration trench on downstream detention requirements.

Retention standard:

The Village's extended detention standard states that 0.75-inches over the impervious area must be retained. To ensure that the retention standard is met for all storm durations, a one-hour design storm should be used to size the infiltration trench. Except on soils with very high permeability, the volume of water infiltrated during a 1-hour event will be small. Thus, the required runoff storage volume (V_r) is:

$$V_R = 0.75 * A_i * 0.083$$

Where:

V_R = extended detention storage volume in acre-feet

0.75 = extended detention volume standard in inches

0.083 = conversion from acre-inches to acre-feet

Because the infiltration trench is backfilled with gravel, the excavation volume must be increased to accommodate the storage lost to the aggregate material. Thus, the volume of the trench (V_t) must be:

$$V_t = \frac{V_r}{n}$$

Where:

V_t = volume of trench or excavation required to provide V_r

V_r = retention storage volume

n = the volume of the voids divided by the total volume of the aggregate material. For clean, open aggregate materials such as IDOT CA1 or CA7 the porosity is typically 0.40.

As described in Section 4.0(F)(3) the drain time for the infiltration trench should not exceed 48-hours and this limitation will determine the maximum

depth of the infiltration trench. For example, if the infiltration capacity of the soils is 1-inch/hour and the porosity of the aggregate in the trench is 40%, the maximum depth would be 120-inches, if the infiltration capacity is 0.5-inches/hour, the maximum depth would be 60-inches.

Impact on downstream detention sizing:

The critical duration for detention sizing is typically 24-hours. Thus, the volume of runoff infiltrated within an infiltration trench during a 24-hour detention design storm will often be significant. For example, with a watershed to infiltration trench area ratio of 8:1 and soil permeability equal to 0.5-in/hr, a properly sized infiltration trench, designed according to these guidelines (volume equal to 0.75-inches/impervious acre) can reduce the runoff volume associated with the 2-year event by more than 50% and the runoff volume associated with the 100-year event by over 20%. For the same 8:1 drainage area ratio and 0.5-in/hr infiltration capacity, an infiltration trench sized to make full use of a 48-hour drain time, could eliminate surface runoff for the 2-year event and reduce the surface runoff volume associated with the 100-year event by over 60%.

In addition to the retention storage, detention can be included within the trench through use of a perforated drain pipe located above the retention volume. The outlet of the drain can be outfitted with an orifice(s) to control the rate of drainage and maximize utilization of the detention volume.

Infiltration trenches can be modeled as storage reservoirs in standard hydrologic models such as TR20 or HEC-1. The rate of infiltration Q_i is equal to:

$$Q_i = i * A_t$$

Where:

Q_i = the volumetric flow rate through the infiltration trench subgrade in cubic feet per second (cfs)

i = infiltration capacity of subgrade soils in inches/hour

A_t = bottom area of the infiltration trench in acres

For models that allow multiple outlets, infiltration outflow can be treated as a separate outlet that does not contribute downstream. For models that only allow a single outlet, the total rain garden outflow is equal to the infiltration outflow plus the surface outflow through the perforated drain (if any). The infiltration outflow rate can then be diverted out of the system so that it does not contribute to the downstream detention facility.

Infiltration Modeling

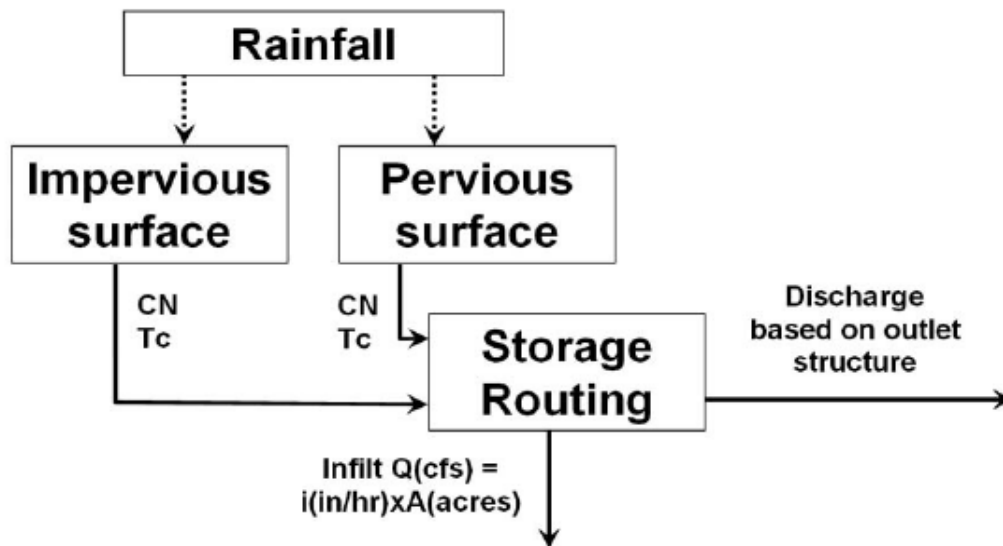


Figure 8 – Infiltration Trench Modeling Diagram

G. Construction considerations:

The area set aside for infiltration trenches should be protected with construction fencing during grading operations to protect it from construction traffic and compaction²⁶.

Sedimentation control:

Construction of the infiltration trench should not start until all erosion and sedimentation control measures are in place or the contributing watershed is stabilized and/or runoff diverted from the infiltration trench site. It is imperative that stormwater bypass the infiltration trench area during construction until the contributing watershed is fully stabilized. Furthermore, the infiltration trench should not go into service until the entire contributing watershed is stabilized and the risk of erosion and sedimentation eliminated.

An excavated infiltration trench should never be used as a temporary sediment trap for construction site runoff²⁷. If a temporary sedimentation pond is placed in the area of the planned infiltration trench prior to excavation, a minimum of 12-inches of undisturbed soil between the bottom of the sedimentation pond and the final invert of the infiltration trench are necessary²⁸.

Excavation:

To preserve the infiltration capacity of the infiltration trench, it is imperative that the invert is not compacted or smeared during the excavation process.

Suitable excavation equipment is backhoes (with toothed buckets) or similar equipment that can be staged outside the infiltration trench area. Bulldozers or front end loaders are not suitable for infiltration trench excavation.

The excavated material should be placed 10-feet away and to the downstream side of the trench to prevent re-deposition during storm events²⁹. Larger tree roots should be cut flush with the walls to protect the geotextile from puncturing and tearing during placement and filling of the infiltration trench.

Geotextile placement:

The vertical infiltration trench walls should be lined with a non-woven needle punch geotextile. The geotextile must be installed flush with the vertical trench walls. It is recommended to cut the geotextile to the appropriate dimensions prior to placement. Allow for six inch overlap at the top of the trench. The overlap between two ends should be at least two feet, where the upstream section must overlap the downstream section³⁰ (shingle effect). A separate precut geotextile should be placed horizontally over the aggregate prior to covering the infiltration trench with torpedo sand and amended top soil layers. The horizontally placed geotextile must be installed as an individual unit to allow for easy removal in case of remedial maintenance (see Figure 9 – Infiltration Trench Detail).

It is imperative that the geotextile is placed properly, with the indicated overlaps to prevent immediate and future sedimentation and subsequent clogging of the infiltration trench.

Filling of infiltration trench:

It is recommended to line with infiltration trench with a 6-inch torpedo sand layer (IDOT FA2) at the bottom³¹. The sand will act as a filter layer and reduce the risk of compaction of the trench invert during the aggregate fill placement. In case of a very broad trench, all sand must be placed ahead of the loader to prevent compaction and smearing of the trench invert. The first three inches of sand should be vertically mixed with the subgrade soils to a minimum depth of 2-inches prior to placing the remaining three inches.

As with the sand, the aggregate should be placed with a low ground pressure backhoe or front loader and the gravel should be placed ahead of the equipment to minimize compaction. The aggregate should be placed in lifts of 12-inches and compacted lightly with plate compactor.

All aggregate must be kept clean and uncontaminated at all times. Materials contaminated with soil, silt, or sediments must be removed and replaced.

H. Operation and Maintenance

Once the infiltration trench is online, it should be inspected several times after rain events to assure proper functioning and drain times. Routine maintenance inspections should be conducted on an annual basis³², preferably after a significant rain event. The observation well should be inspected for proper drainage and the surface should be inspected for sediment accumulation, vegetation health, and proper drainage through the amended top soil.

If the subsurface trench is continuing to hold water long after the design drain time, the trench bottom has likely become clogged with sediments. Provided that the trench was properly installed and protected from construction site runoff, this is a very unlikely scenario. However, if clogging occurs the infiltration trench will need to be reconstructed to remove the sediments and restore the exfiltration capacity.

If water is ponding for extended periods on top of the amended topsoil (but not within the subsurface trench), there two are likely causes:

If water is found ponding on top of the amended top soil, whereas the bottom of the amended top soil does not seem as saturated (as determined with a soil probe), it is likely that sediment accumulation on top of the amended top soil has clogged the soil. Removal of the sediments and replacement of the top inch of the amended top soil may suffice to restore the infiltration rate.

If water is ponded and the amended topsoil is saturated throughout its profile (as determined using a soil probe), it is likely that the geotextile on top of the infiltration trench is clogged. This will require replacement of the geotextile and reapplication of the amended top soil and vegetation. The placement of a one-inch torpedo sand layer (IDOT FA2) on top of the geotextile, prior to the placement of the amended top soil will reduce the risk of blinding the geotextile and sustain its capacity to pass runoff through to the infiltration trench³³.

For vegetation maintenance refer to (Section 3.0(H)).

I. Infiltration Trench Easement

The Village's stormwater ordinances require that stormwater features (such as infiltration trenches) be protected by an easement. Thus, all infiltration trenches that are part of the submitted and approved stormwater management system are required to be in an easement. If infiltration trenches are not part of the stormwater management system, such as a trench installed by a homeowner on his or her own accord, it is exempt from the easement requirement.

J. Infiltration Trench Specifications

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes the installation of infiltration trench materials.

1.2 RELATED SECTIONS

- A. Section [____ - ____]: Open-graded base materials.
- B. Section [____ - ____]: Drainage pipes and appurtenances.
- C. Section [____ - ____]: Earthworks/excavation/soil compaction.
- D. Section [____ - ____]: Rain Garden.

1.3 RELATED DOCUMENTS

- A. ASTM C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D 2239 Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
- C. ASTM D 3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method.
- D. ASTM D 4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
- E. ASTM D 4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- F. ASTM D 4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
- G. ASTM D 4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- H. ASTM D 4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

1.4 SUBMITTALS

- A. Product Data: For Geotextile.
- B. Sieve Analyses: For sand and open graded aggregate according to ASTM C 136.
- C. Samples for Verification:
 - 1. Four by four-inch sample of geotextile

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

- B. Geotextiles labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.
- C. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
- D. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical property values of the geotextile.

PART 2 – PRODUCTS

2.1 AGGREGATES

- A. Coarse sand: Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 1003.01 (c) FA-2.
- B. Open graded aggregate: Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 1004.01 (c) CA-7.

2.2 NON-WOVEN NEEDLE PUNCHED GEOTEXTILE

- A. Mechanical properties:
 - 1. Grab Tensile Strength (ASTM D 4632)
 - a. Strength at ultimate (lbs) 205
 - b. Elongation at ultimate (%) 50
 - 2. Mullen Burst Strength (ASTM D 3786) (psi) 380
 - 3. Trapezoidal Tear Strength (ASTM D 4833) (lbs) 80
 - 4. Puncture Strength (ASTM D4833) (lbs) 130
 - 5. UV Resistance after 500 hrs. (ASTM D 4355) (%) 70
- B. Hydraulic properties:
 - 1. Apparent Opening Size (ASTM D 4751) (US sieve #) 80
 - 2. Permittivity (ASTM D 4491) (sec-1) 1.2
 - 3. Flow Rate (ASTM D 4491) (gal/min/ft²) 95
- C. Selected non-woven needle punched Geotextile shall be approved by Engineer or Construction Manager.

2.3 PIPES

- A. Perforated HDPE distribution pipes shall conform to ASTM D 2239. The perforated pipe should have ½ inch slot openings, 6 inches center to center, along two to three longitudinal rows.

2.4 CLEAN OUTS

- A. The clean out/observation well is to consist of 6-inch diameter rigid HDPE pipe and conform to ASTM D 2239. A rigid perforated 6-inch diameter HDPE pipe that conforms to ASTM D 2239PVC shall be provided and placed vertically within the gravel portion of the infiltration trench.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. The infiltration trench systems may not receive run-off until the entire contributing drainage area to the infiltration system has received final stabilization.
- B. Heavy equipment and traffic shall be restricted from traveling over the location of the infiltration trench to minimize compaction of the soil.

3.2 EXCAVATION

- A. Excavate the infiltration trench to the design dimensions and elevations. Excavated materials shall be located a minimum 10-feet away and to the downstream side of the trench to prevent redeposition of excavated soils during storm events and to enhance trench wall stability. Large tree roots shall be trimmed flush with the trench sides in order to prevent fabric puncturing or tearing of the filter fabric during subsequent installation procedures. The side walls of the trench shall be roughened where smeared and sealed during excavation.

3.3 COARSE SAND PLACEMENT

- A. Place 6-inch sand filter layer (IDOT FA-2) at the bottom of the infiltration trench.
- B. First 3-inches of sand shall be vertically mixed with the subgrade soils to a minimum depth of 2-inches prior to placing the remaining 3-inches.

3.4 GEOTEXTILE PLACEMENT

- A. The width of the geotextile must include sufficient material to conform to trench perimeter irregularities and for a 6-inch minimum top overlap. The filter fabric shall reach to the sand layer on the bottom of the infiltration trench. Stones or other anchoring objects should be placed on the fabric at the edge of the trench to keep the fabric in place during construction. When overlaps are required between rolls, the uphill roll shall lap a minimum of 2-feet over the downhill roll in order to provide a shingled effect.
- B. Following the stone aggregate placement, the filter fabric shall be folded over the stone aggregate to form a 6-inch minimum longitudinal lap.

- C. A separate precut geotextile shall be placed horizontally over the aggregate prior to covering the infiltration trench with sand and amended top soil layers. The horizontally placed geotextile shall be installed as an individual unit to allow for easy removal in case of remedial maintenance.

3.5 PIPES

- A. Perforated pipe shall be provided as indicated in the drawings and shall terminate 1-foot short of the infiltration trench end wall. Free ends of perforated pipe, where no clean-outs are specified, shall be capped.

3.6 CLEAN OUTS

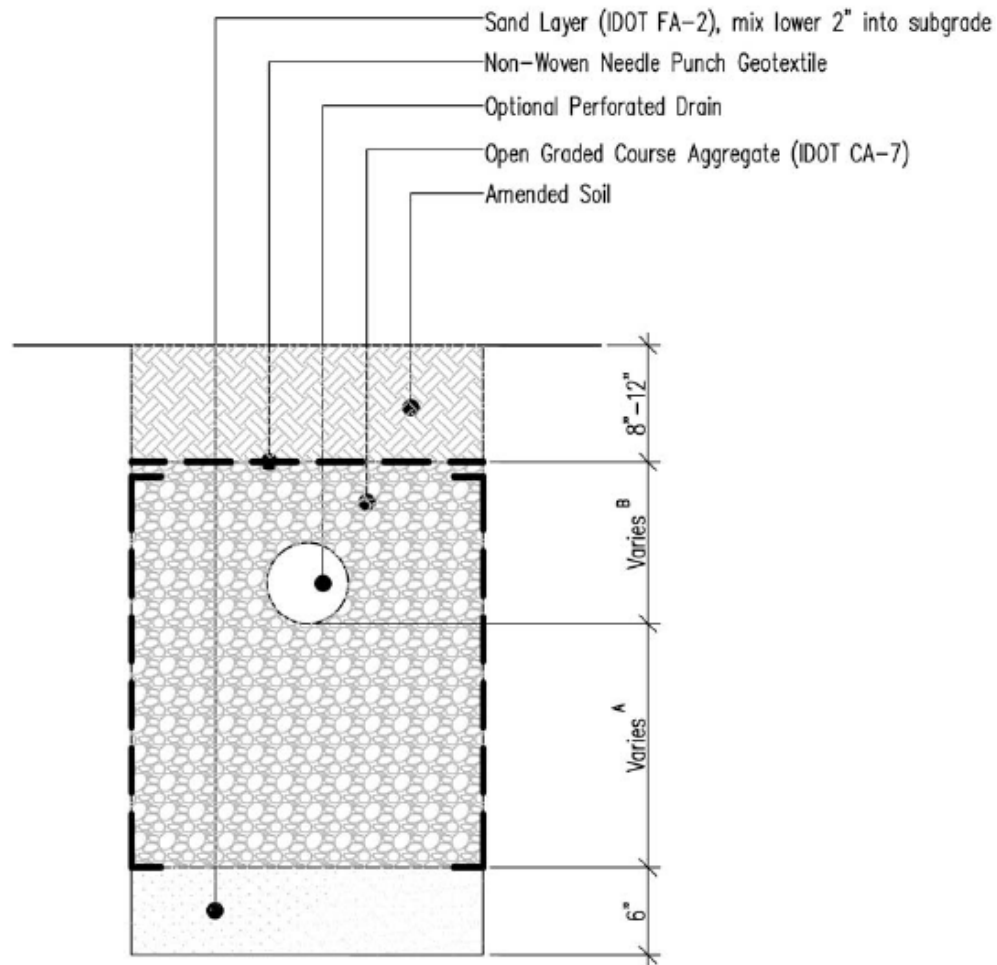
- A. The clean out/observation well shall be fitted with a cap set 6-inches above ground level and located near the lateral center of the infiltration trench as indicated in the drawings. The pipe shall have a plastic collar or ribs to prevent lifting when removing cap. The screw top lid of the cleanout/observation well shall be fitted with a locking mechanism or special bolt to discourage vandalism. The cap shall be open or closed as indicated on the drawings. The pipe shall have a cap at the bottom of the pipe. The bottom of the cap shall rest on the infiltration trench bottom.

3.7 AGGREGATE PLACEMENT

- A. The stone aggregate (IDOT CA-7) shall be placed in lifts and lightly compacted using plate compactors. The maximum loose lift thickness is 12-inches.
- B. All aggregates must be kept clean and uncontaminated at all times. All contaminated aggregates shall be removed and replaced with uncontaminated aggregates (IDOT CA-7).

END OF SECTION

K. Typical Detail



A) Retention volume (exfiltrated into soils)

B) Detention volume (drained through perforated pipe)

Note: Duration of ponding shall not exceed 72 hours

Infiltration trench

Not to Scale



CONSERVATION DESIGN FORUM

Figure 9 – Infiltration Trench Detail

¹ Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); MA Department of Environmental Protection (1997); Lowndes (2000); Los Angeles County Department of Public Works (2002)

² Schueler (1987); Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); Schueler *et al.* (1992)

³ Schueler (1987)

⁴ Schueler (1987); Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); Lowndes (2000)

⁵ Lowndes, M.A. (2000)

⁶ Schueler (1987); Lowndes (2000)

⁷ WDNR (2004b)

⁸ MA Department of Environmental Protection (1997); Lowndes (2000)

⁹ Lowndes, M.A. (2000)

¹⁰ WDNR (2004a)

¹¹ MA Department of Environmental Protection (1997)

¹² Schueler (1987); Horner et al. (1994); EPA (1998); Barr Engineering Company (2001)

¹³ WDNR (2004b)

¹⁴ Mahabadi (2001)

¹⁵ Schueler (1987); Lowndes (2000)

¹⁶ Mahabadi (2001)

¹⁷ Schueler (1987); Horner et al. (1994); EPA (1998); Barr Engineering Company (2001)

¹⁸ Schueler (1987); Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); Lowndes (2000)

¹⁹ Lowndes, M.A. (2000)

²⁰ Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992)

²¹ Mahabadi (2001)

²² Mahabadi (2001)

²³ Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); MA Department of Environmental Protection (1997); Los Angeles County Department of Public Works (2002); WDNR (2004b)

²⁴ WDNR (2004b)

²⁵ Mahabadi (2001)

²⁶ MA Department of Environmental Protection (1997)

²⁷ MA Department of Environmental Protection (1997)

²⁸ Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992)

²⁹ Lowndes (2000)

³⁰ Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992)

³¹ Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); MA Department of Environmental Protection (1997); Los Angeles County Department of Public Works (2002)

³² Lowndes (2000)

³³ Mahabadi (2001)

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Section 5.0 Level Spreader and Filter Strips

A. Definition

Level spreaders and filter strips represent two separate BMP's that have been combined for more effective stormwater management treatment. The effectiveness of filter strips alone in urban applications is often compromised by concentration of runoff that causes erosion. This problem can be resolved through use of a level spreader that directs runoff evenly over the filter strip¹. Level spreaders and filter strips can also be combined with other BMP's. They can, for instance, receive discharge from rain gardens, porous pavement areas, and naturalized detention for further treatment, infiltration, and de-concentration of flow.

Level spreader:

A level spreader is a device used to dissipate concentrated runoff into uniform surface sheet flow. The concentrated runoff may be received through subsurface structures (such as perforated pipes) or surface structures (such as parking lot curb cuts). The conversion of concentrated flow into sheet flow greatly reduces the risk of erosion and scouring and creates conditions for proper filter strip function. The uniform sheet flow from the level spreader is released to an adjacent filter strip on the downstream side.

Filter strip:

The filter strip receives evenly distributed overland sheet flow, typically from either a level spreader or a level pavement edge. The filter strip is sloped such that the overland runoff drains slowly, providing an opportunity for runoff treatment (pollutant removal) and infiltration (surface ground water recharge)². Preferably, filter strips are vegetated with native prairie grasses and forbs that will improve the water quality and infiltration performance of the strip. However, filter strips can be vegetated with turf and still provide a benefit. (Where filter strips are used to offset hydraulically impervious area for the Village's ordinance, they must be vegetated with native species.)

B. Suitable Applications

Filter strips can be applied to a variety of urban land uses. They are particularly well suited for residential developments³ and campus type commercial and industrial developments. Since these developments usually have large expanses of areas that can readily be planted with native vegetation and used to accept runoff from impervious surfaces or other BMP's. The strips can easily be incorporated into the site layout and landscape designs. However, smaller filter strips can also be used to treat runoff from almost any parking lot.⁴

Vegetated filter strips function best on gradual slopes, ideally less than 5%. Slopes steeper than 15% should be avoided⁵. Only smaller drainage areas (e.g. roadway pavement draining across a vegetated embankment) should be connected to filter strips with slopes of 5% to 15% to prevent erosion and scour of the filter strip.

Urban stormwater systems often produce concentrated discharges that require a level spreader to disperse flows to the filter strip⁶. The level spreader can be applied as a flow interceptor device at small culverts or other surface discharges to redistribute the flow. Another application is within a filter strip (mid slope) where re-concentrated runoff can be intercepted and redistributed (see also Section 5.0(G) and Section 5.0(G)(3)).

In other applications, concentrated runoff is discharged to a perforated distribution pipe within the level spreader trench. The perforated pipe distributes the runoff over the length of the level spreader and the flow wells up out of the trench over the length of the spreader. In many cases, impervious surfaces, such as small parking lots and roads that produce unconcentrated sheet flow can drain directly onto the filter strip with no level spreader⁷.

C. Benefits

In addition to dissipating energy and distributing the runoff, level spreaders provide cooling of the first flush runoff from high temperature paved or roof surfaces. Filter strips also help to reduce runoff temperature⁸ prior to the introduction of excess runoff into local waterways.

The uniform sheet flow of level spreaders and filter strips can provide effective infiltration and filtration. Filter strips with native vegetation serve as effective buffers between developments and sensitive features such as streams, lakes, and wetlands⁹.

Level spreaders and filter strips can reduce both the rate and volume of stormwater runoff on a site. In addition to dispersing concentrated flows, level spreaders can also serve as infiltration trenches (without the vegetated cover), if sized accordingly. The majority of smaller rain events are exfiltrated through the bottom of the trench, whereas larger flows are discharged as sheet flow onto the filter strip. However, it should be recognized that the infiltration performance of level spreaders may be lost over time due to the lack of sediment filtration prior to introducing runoff into the trench.

Filter strips provide a level of rate control by increasing the length of flow paths and reducing the velocity to the primary drainage system¹⁰. This can reduce runoff volumes by providing greater opportunity for infiltration of runoff into the soil¹¹. Well maintained filter strips can be very effective in reducing runoff volumes, particularly when the impervious drainage area is less than two to three

times the filter strip area¹². NIPC¹³ found that annual storm runoff volumes could be reduced by up to 40 to 45% with conservatively designed and maintained filter strips¹⁴.

Filter strips can be used to meet the 0.75-inch Village extended detention standard since hydraulically connected impervious surfaces can be reduced by the area of filter strips planted with native vegetation.

Level spreaders, and even more so filter strips, are low cost BMP's. Filter strips further provide cost savings through ease of maintenance compared to other conventional landscape treatments such as turf grass.

D. Limitations

Impervious areas connected to the filter strip should be no more than two or three times the filter strip area to assure runoff filtering and volume reduction unless the flow rates are controlled upstream of the filter. The length of the impervious area (parallel to the flow) should not exceed 200-feet¹⁵.

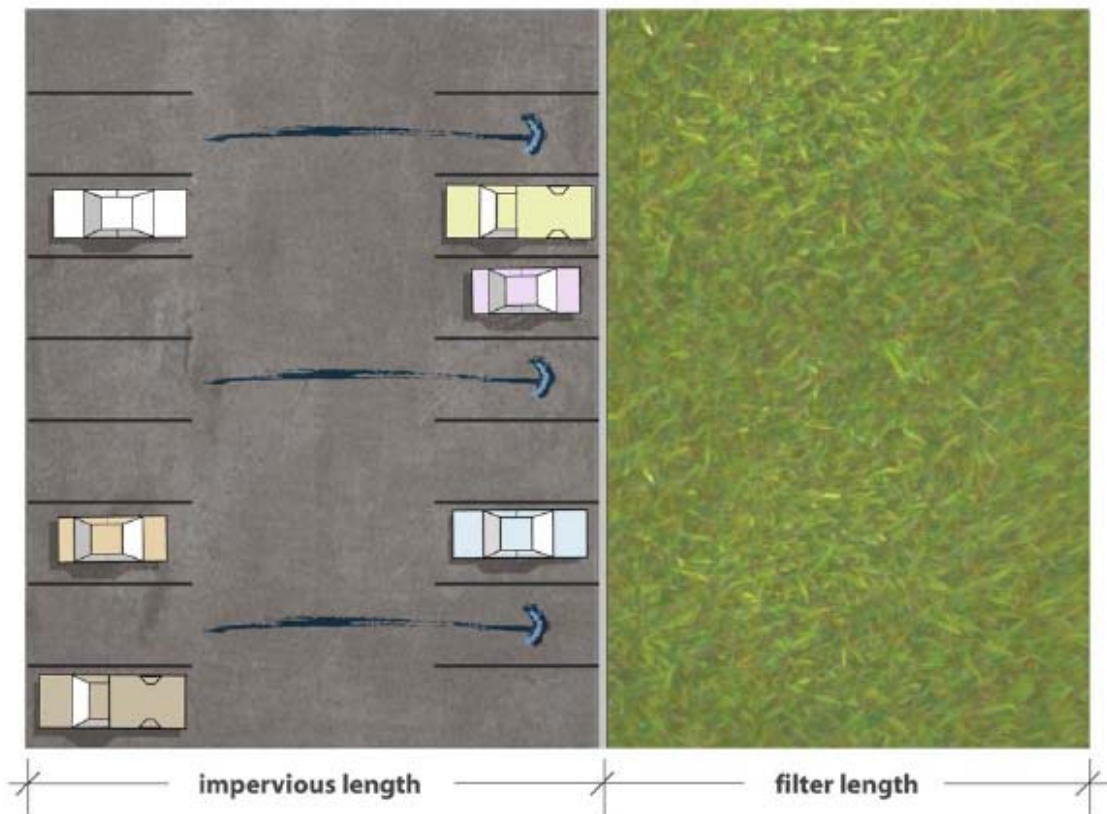


Figure 10 – Filter strip schematic

Filter strips should be located such that they do not conflict with the project site programming and are protected from heavy foot or any vehicular traffic.

This will protect the native vegetation and prevents soil compaction¹⁶.

Filter strips are not suitable for hilly or highly paved areas because of high runoff velocities¹⁷. Some topographic challenges, however, may be resolved with frequent level spreader placement within the filter strip to intercept concentrated flows. The area considered for the filter strip application must be free of gullies and rills¹⁸.

Areas considered for a filter strip application that will be subject to applications of fertilizers and pesticides are not suitable as filter strips¹⁹.

Level spreaders and filter strips may not be economically suitable for dense developments with high land values due to the limited availability of space for the filter strip.

E. Required Design Data

The ultimate design objective is to maintain evenly distributed sheet flow and very low runoff velocities. Design parameters are the length and slope of the filter, surface area and nature of the drainage area, existing soil types, type of planned vegetation cover, and runoff velocity²⁰. The following data should be collected to inform the design process:

- Character, geometry, and size of the impervious area tributary to the level spreader and filter strip.
- Topographic information, including slopes, for the planned filter strip area.
- Soil type information, from county soil survey to assess erosion risk and type composition of native vegetation mix.

F. Level Spreader Design

Level spreaders are similar to infiltration trenches (see also Section 4.0). Typical differences include the trench size (level spreaders tend to be smaller) and the trench cover. Level spreaders are not covered with a vegetated amended top soil, but rather with an open graded aggregate (IDOT CA 7).

The primary performance objective of level spreaders is to convert concentrated flows into uniform overland sheet flows. They may further provide nominal retention through runoff exfiltration through the trench bottom.

Level spreader function can, however, be combined with infiltration trench function and sized for retention. With this combination, only excess runoff that exceeds the capacity of the infiltration/level spreader trench is released into the adjacent filter strip. For infiltration trench details refer to Section 4.0(K). It should be recognized that since level spreaders are not protected from sediment by a topsoil filter as recommended in Section 4.0(F), they will be more prone to

subgrade clogging and the infiltration benefit of the level spreader will be reduced over time.

The minimum depth of the level spreader should be 6-inches²¹ when there is no distribution pipe, and the minimum width should be 6- to 12-inches or greater. The level spreader will need to be deeper and wider when it includes a distribution pipe. The bottom of the level spreader trench should be lined with 2- to 4-inches of torpedo sand (IDOT FA 2) vertically mixed into the subgrade. The vertical infiltration trench walls should be lined with a nonwoven needle punch geotextile to prevent migration of the adjacent soils into the open graded aggregate. The overlap between two ends of the fabric should be at least two feet (shingle effect). The level spreader is filled to 2-inches above the surrounding grade and the gravel should extend a minimum 6-inches downstream of the trench to protect the downstream lip of the trench from erosion. The trench should be filled with open graded, preferably washed, aggregated (IDOT CA7). A separate piece of non-woven needle punched geotextile should be placed near the top of the open graded aggregate fill but below the top of the trench as a filter and sediment barrier. This piece can be removed and replaced as part of remedial maintenance if necessary. The remaining depth of the level spreader is filled with the same aggregate (IDOT CA7) as in the lower trench portion.

Runoff can be conveyed into the level spreader through surface flow, or a perforated distribution pipe.

1. Level spreader surface inflow design:

Parking lots without curbs or with curb cuts and small culverts (see also Section 5.0(B)) are examples of surface discharge option into a level spreader. Parking lots with a level edge and flush curb should not need a level spreader. The surface flow runoff into the level spreader should be free of sediments to prevent clogging of the trench and premature failure. Another surface inflow application is within a filter strip (mid-slope) where reconcentrated runoff is intercepted and redistributed.

2. Level spreader subsurface inflow design:

Runoff is conveyed to the level spreader through a stormwater sewer pipe that connects to a standard perforated pipe or slot drain in the level spreader. A standard perforated pipe allows runoff to uniformly fill the level spreader trench and overflow at the downstream edge onto the filter strip. A slot drain will drain water out of the slot. The base of the slot drain should be perforated to allow drainage between events. The discharge to the level spreader should be free of sediments to prevent clogging of the trench and premature failure.

It is essential that the level spreader be surveyed level. If a slot drain is used, the rim of the slot that must be level. If a slot drain is not used, the downstream lip of the level spreader trench and the low gravel mound must be level. If grades are such that the full length of the spreader cannot be installed on the same contour, the spreader should be broken into multiple reaches with each reach located on its own contour.

The first pipe reach of level spreader pipe from the inflow pipe (minimum of five pipe diameters or five feet, whichever is less) should be solid pipe with no slot drain. This is necessary to prevent excessive surface discharge at an elbow or Tee where there may be significant headloss associated with the change in direction in flow.

Slot drains or perforated pipes within the level spreader should include cleanouts at the ends and at significant changes in direction to allow for maintenance. Cleanouts may also be required at intermediate points for long level spreader lengths. The cleanout covers should be located at a higher elevation than the rim of the level spreader such that hydraulic head will not lift the cap.

3. Level spreader discharge:

The pipe within the level spreader (slot drain or standard perforated pipe) should be sized for less than 0.1-foot of headloss from the inflow to the end of the pipe under the design flow. If there is greater headloss, the runoff will discharge from less than the full length of the level spreader. Level spreaders should not be constructed on a slope to compensate for a smaller pipe as this will cause most of the flow to discharge at the far end of the spreader during events less than the design event.

The allowable flow rate per foot of level spreader is determined by the downstream slope, the allowable flow velocity on the slope, and the allowable depth of flow on the slope. The flow should not exceed 1-inch²² in depth during the design event under full vegetative cover, which translates roughly into 0.01 to 0.02 cfs per linear foot of level spreader, depending on slope. Also, to prevent scour, the velocity should not exceed the allowable velocity for the soil type, vegetation, and slope, assuming dormant season vegetative cover.

G. Filter Strip Design

The most important design factors for a filter strip are the drainage area tributary to the filter strip, width, length, and slope of the filter, and the permeability of the soils. Filter strips should be designed to promote shallow, slow velocity, sheet flow (see also Section 5.0(F) and Section 5.0(H)) through the filter to allow for

settling and infiltration. The health and density of the vegetation will also significantly affect the in-situ performance of the filter strip²³.

During growing season storm events, velocities across the strip will be very low which will promote settling and infiltration. However, during the dormant season, when vegetative cover may be less dense and lower height, velocities may be greater but must not exceed the maximum permissible velocity for the soil and vegetation being used on the filter strip (see also Section 5.0(F)(3), Section 5.0(H), and Table 7)²⁴.

If at least temporary vegetative cover cannot be established prior to discharge of runoff to the level spreader, erosion control blanket should be applied over the area of the filter strip.

Longitudinal slopes up to 5% are ideal for level spreaders. Such slopes reduce the risk of re-concentrating flows and erosion and gully formation²⁵. Slopes of 5% to maximum 15% may be acceptable for shorter flow lengths. Flow lengths can be reduced through placement of additional level spreaders within the filter strip.

1. Vegetation:

Native prairie grasses, sedges, and forbs that achieve a good, dense stand at the soil interface are preferred over turf grass and should be the first choice for vegetate filter strips. Prairie vegetation has the distinct advantage of a deep fibrous root system that can significantly enhance infiltration²⁶. Native vegetation further reduces maintenance needs compared to turf vegetation and eliminates the introduction of pollutants through turf pesticides and fertilizers.

Furthermore, when the drainage area is relatively large, slopes flatter than 2% could lead to periods of prolonged inundation and difficulty in maintaining healthy turf²⁷. Slope concerns are less critical for filter strips planted with prairie vegetation tolerant to temporarily saturated soil conditions²⁸.

The filter strip vegetation should be fully stabilized with cover crop and erosion blanket before the contributing impervious surface is created and its runoff directed onto the filter strip²⁹.

For further information on vegetation design, refer to Section 3.0 and the Species Guide in Attachment B.

2. Filter strip area:

Filter strips can be used to reduce the hydraulically connected impervious area that must meet the 0.75- inch extended detention standard. To eliminate

the need for the 0.75-inch extended detention volume, the area of the filter strip must equal the area of impervious cover tributary to it. However, filter strips with less area can still be effective in removing sediments and other pollutants and reducing annual runoff volumes.

Filter strips whose area is 50% or more of the tributary impervious area, should remove up to 80% of the total suspended solids load and reduce annual runoff volumes by 40% to 45%³⁰.

3. Filter strip length:

The required filter strip area and the limitations on flow rates (see Section 5.0(H)) will generally determine the length of the filter strip. However, the maximum length of the filter will be determined by the length over which sheet flow can be maintained. Level spreaders should be installed every 50-feet of filter strip length on slopes greater than 5% and every 100-feet of filter strip length on slopes 5% or less³¹. Filter strips exceeding 100- to 150-feet without any flow interception and redistribution should be avoided to prevent concentration of flow that naturally occurs as the length of flow increases³².

H. Hydraulic and Hydrologic Analysis

Depth of flow:

The depth of flow within filter strips should not exceed approximately one inch under full vegetative cover to prevent re-concentration of flow and submergence of the vegetation, which will lead to reduced filter strip effectiveness. The depth of flow within the filter strip will depend on the slope, vegetation, and discharge rate within the filter strip. Because flow depths will be very shallow, retardance should be used to determine the appropriate n-value (see also Table 6 and Figure 11). For shallow flow, under native vegetative cover, retardance A or B should be used, which translates into an n-value of 0.30 or higher for determining the depth of flow.

Level spreader pipe size:

The perforated pipe located within the level spreaders is intended to distribute the inflow over the length of the level spreader, ensuring uniform discharge over the length of the level spreader. The perforated pipe must be adequately sized such that the headloss from the upstream to the downstream end of the pipe is less than 0.1-feet to avoid concentration of flow at the upstream end.

Growing Season Retardance Factors for Vegetated Swales ¹		
Retardance	Cover	Conditions
A Very High	Cattail Smooth Brome River Bulrush Hard-stem Bulrush	Excellent stand, tall Excellent stand, tall (avg. 30") Excellent stand, tall Excellent stand, tall
B High	Smooth Brome Tall Fescue Alfalfa Native grasses	Good stand, mowed (avg. 12–15") Good stand, unmowed (avg. 18") Good stand, uncut (avg. 15") Good stand, unmowed
C Moderate	Kentucky Blue Grass Red Fescue Redtop Smooth Brome	Good stand, headed (12–18") Good stand, headed (12–18") Good stand, headed (15–20") Good stand, mowed (6–8")
D Low	Kentucky Blue Grass Red Fescue Redtop Smooth Brome	Good stand, mowed (3–4") Good stand, mowed (3–4") Good stand, mowed (3–4") Good stand, mowed (3–4")
E Very Low	Kentucky Blue Grass	Good stand, cut (2" or less)
¹ For turf and other low growing grasses, a dormant season retardance factor one less than the growing season factor should be used. For native vegetation and other tall growing vegetation <u>mowed or burned in the fall</u> , a dormant season factor two less than the growing season factor should be used. Adapted from Natural Resource Conservation Service (NRCS)		

Table 6 – Growing Season Retardance Factors for Vegetated Swales

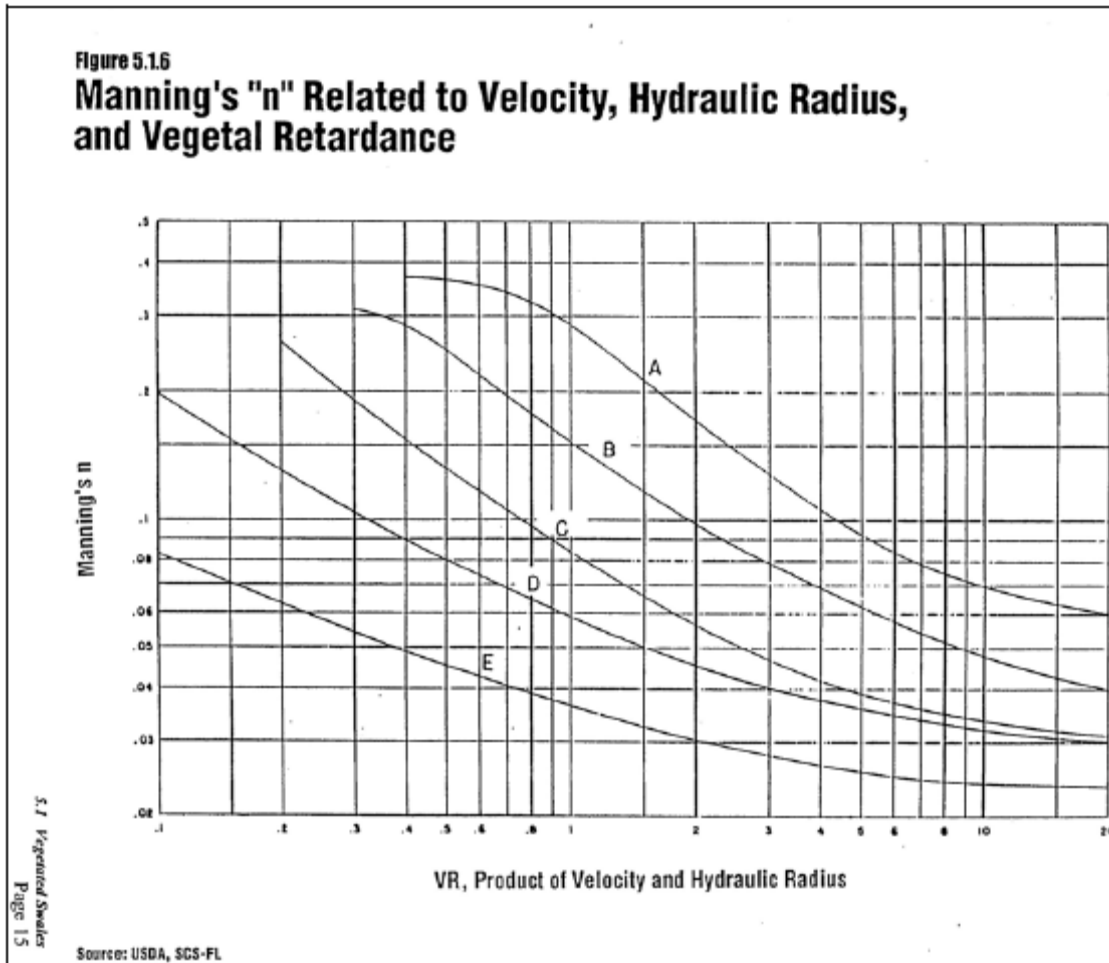


Figure 11 – Manning's "n" Related to Velocity, Hydraulic Radius, and Vegetal Retardance

Maximum permissible velocity:

To avoid scour within the filter strip, the velocity should not exceed the maximum permissible velocity for the slope, vegetation, and soils of the filter strip (see Table 7). For native landscapes, the dormant season, after burn management has occurred, will be the conditions under which retardance will be lowest and the potential for exceeding permissible velocities will be the greatest. Under these conditions, retardance E should be used, which translates into a Manning's n value of 0.08 to 0.10 for shallow flow.

Permissible Velocities for Channels Lined with Vegetation ¹		
Channel Slope ²	Lining	Permissible Velocity (ft/sec) ³
0 to 5%	Tall Fescue Kentucky Blue Grass Smooth Brome	4
	Grass-legume mixture Native grass mixture	3
	Red Fescue Redtop	2.5
	Small grains ⁴	2
5 to 10%	Tall Fescue	4
	Kentucky Blue Grass Smooth Brome	3
	Grass-legume mixture Native grass mixture	2.5
Greater than 10%	Tall Fescue Kentucky Blue Grass Smooth Brome	2.5
¹ Use velocities exceeding 4 to 5 ft/s only where good cover and proper maintenance can be assured. ² Slopes greater than 10% should be avoided unless it is for a short distance or the flow rate is low. ³ Cohesive (clayey) fine-grained soils and coarse grained soils with cohesive fines and a plasticity index of 10 to 40 (CL, CH, SC, and GC) are erosion resistant. Soils that do not meet this criteria should be considered easily erodible. ⁴ For temporary seedings. Source: IL Natural Resource Conservation Service (NRCS)		

Table 7 – Permissible Velocities for Channels Lined with Vegetation

Maximum flow rate:

The maximum flow rate will typically be determined by the allowable maximum depth, slope, and vegetation of the filter strip. However, under some conditions, maximum permissible velocity may control. For native vegetation cover with a Manning's n of 0.30 and an allowable flow depth of one inch, the flow rate would be 0.01 to 0.02 cfs/foot of level spreader, depending on filter strip slope.

Impact on downstream detention sizing:

Filter strips can be used to meet the 0.75-inch Village extended detention standard since hydraulically connected impervious surfaces can be reduced by the area of filter strips planted with native vegetation.

Because filter strips contain no storage and runoff spends relatively little time on the filter strip, the runoff volume reduction for the 100-year detention design storm may be relatively small. However, the increase in time of concentration due to the low velocity may serve to reduce detention requirements to some degree.

Typically, the combined impervious and filter strip area would be represented by a composite curve number and a relatively long time of concentration based on the travel time through the filter strip.

A filter strip can also be modeled as a storage reservoir. In this case, the total tributary area, including the area of the filter strip itself would discharge to the “reservoir”. The surface discharge-elevation rating curve for the reservoir would be determined by slope, roughness, and width of the filter strip. The volume-elevation rating curve for the reservoir would be based on the area of the filter strip (length and width) and depth of flow. The subsurface (infiltration) discharge from the “reservoir” would be based on the saturated hydraulic conductivity of the filter strip soils. Only the surface discharge would be routed to the downstream detention basin. Also see Section 4.0(F)(8) for a discussion of modeling infiltration practices.

I. Construction Considerations

Sediment laden construction site runoff should not be discharged to the level spreader as it will clog the gravel trench and cause premature failure. For additional construction considerations on level spreader trenches, refer to Section 4.0(G).

Areas where level spreaders and filter strips are to be located should be protected from construction traffic using construction fencing or other barriers to prevent compaction. Maintenance of the soil permeability will both protect the infiltration potential and facilitate the establishment and maintenance of a dense, deep-rooted vegetative cover³³.

Filter strips should be cleared of stumps, brush, rocks and similar obstacles that may lead to runoff flow concentration. Machinery used to work on the filter strip and level spreaders should be low ground pressure equipment.

Vegetation must be established on the filter strip as soon as possible to prevent erosion and scour. Filter strips should be graded and vegetated early in the construction schedule, preferably before paving increases the rate of runoff. If the

latter is impossible, runoff from the hydraulically connected area must bypass the level spreader and filter strip until they are fully stabilized with cover crop and erosion blanket.

J. Operation and Maintenance

Proper maintenance of the filter strip to prevent loss of vegetation and erosion of the strip may be as important as the initial design. Vegetation should be inspected and replaced as necessary during the first year after construction³⁴.

Filter strips and level spreaders should further be inspected for proper distribution of flows and signs of rilling and other erosion during and after major storm events, particularly during the first one or two years. After the first one or two years, the strip and spreader may be inspected annually. If erosion is discovered, the eroded areas should be filled, reseeded, and mulched. Then the causes for the erosion should be determined and prevented from recurring³⁵.

After sufficient graminoid (grasses and sedges) development to provide an adequate fuel source on the filter strip with native prairie vegetation, annual burn management should be implemented. Burning dead plant material reduces weed growth, stimulates native grass and forb growth, and increases nutrients available to the plants. On filter strips where burning is difficult or impossible, the vegetation should be mowed annually in fall or spring. To mimic the burn cycle all clippings and thatch must be removed after mowing. If the filter strip is mown, low ground pressure equipment should be used to prevent compaction. Mowing should not be conducted under saturated soil conditions to prevent rutting. Note that mowing does not provide the full benefit to native prairie vegetation that fire provides and will often result in a lower ratio of wildflowers (forbs) relative to the grasses.

For further operation and maintenance guidance refer to Section 3.0(H) and the Species Guide in Attachment B.

K. Easement

The Village's Stormwater Ordinance requires that stormwater features (such as level spreaders and filter strips) be protected by an easement. All level spreader and filter strip areas that are part of the submitted and approved stormwater management system thus are required to be in an easement. If level spreaders and filter strips are not part of the permitted stormwater management system, such as those installed by a homeowner on his or her own accord, they are exempt from the easement requirement.

L. Specifications

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes the installation of level spreader materials.

1.2 RELATED SECTIONS

- A. Section [____ - ____]: Open-graded base materials.
- B. Section [____ - ____]: Drainage pipes and appurtenances.
- C. Section [____ - ____]: Earthworks/excavation/soil compaction.
- D. Section [____ - ____]: Rain Garden

1.3 RELATED DOCUMENTS

- A. AASHTO M252 Corrugated Polyethylene Drainage Pipe.
- B. AASHTO M294 Corrugated Polyethylene Pipe, 300- to 1200-mm Diameter.
- C. ASTM D 1117 Standard Guide for Evaluating Nonwoven Fabrics.
- D. ASTM C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- E. ASTM D1388 Standard Test Method for Stiffness of Fabrics.
- F. ASTM D 2239 Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
- G. ASTM D 3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method.
- H. ASTM D 4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
- I. ASTM D 4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- J. ASTM D 4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
- K. ASTM D 4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- L. ASTM D 4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
- M. ASTM D5035 Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method).
- N. ASTM D 6475 Standard Test Method for Measuring Mass Per Unit Area of Erosion Control Blankets.
- O. ASTM D 6525 Standard Test Method for Measuring Nominal Thickness of Permanent Rolled Erosion Control Products.
- P. ASTM F 405 Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
- Q. Erosion Control Technology Council (ECTC) Guidelines.

1.4 SUBMITTALS

- A. Product Data:
 - 1. For Geotextile.
 - 2. Slot drain with perforated base pipe or perforated pipe.
- B. Sieve Analyses: For sand and open graded aggregate according to ASTM C 136.
- C. Samples for Verification:
 - 1. Four by four-inch sample of geotextile.
 - 2. One-foot section of slot drain with perforated base or perforated pipe.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- B. Geotextiles labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.
- C. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.
- D. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical property values of the geotextile.

PART 2 – PRODUCTS

2.1 AGGREGATES

- A. Coarse sand: Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 1003.01 (c) FA-2.
- B. Open graded aggregate: Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 1004.01 (c) CA-7.

2.2 NON-WOVEN NEEDLE PUNCHED GEOTEXTILE

- A. Mechanical properties:
 - 1. Grab Tensile Strength (ASTM D 4632)

- a. Strength at ultimate (lbs) 205
 - b. Elongation at ultimate (%) 50
- 2. Mullen Burst Strength (ASTM D 3786) (psi) 380
- 3. Trapezoidal Tear Strength (ASTM D 4833) (lbs) 80
- 4. Puncture Strength (ASTM D4833) (lbs) 130
- 5. UV Resistance after 500 hrs. (ASTM D 4355) (%) 70
- B. Hydraulic properties:
 - 1. Apparent Opening Size (ASTM D 4751) (US sieve #) 80
 - 2. Permittivity (ASTM D 4491) (sec-1) 1.2
 - 3. Flow Rate (ASTM D 4491) (gal/min/ft²) 95
- C. Selected non-woven needle punched Geotextile shall be approved by Engineer or Construction Manager.

2.3 PIPES

- A. HDPE Solid pipe: Pipe shall meet AASHTO Type S specifications, with soil-tight couplings. Fittings and couplers shall be fabricated HDPE with fitting and coupling hardware as supplied by pipe manufacturer. Perforated and solid piping shall be provided of the size and locations as shown on the drawings.
- B. Slot drain: Manufactured from corrugated polyethylene pipe with a smooth interior wall, pipe and fittings conforming to AASHTO M252 and/or M294. A grate frame that forms a slot shall be mounted in the pipe so as to provide a linear outlet to the top of the pipe to distribute sheet flow. The slot shall be manufactured from 0.063 tempered commercial aluminum and shall have two parallel plates separated by vertical spacers spanning the slot on 6-inch centers. The grating within the slot opening shall be 1/2 - #13 galvanized steel. The slot shall be painted with a zinc chromate primer to protect the aluminum when installed in concrete. The flange at the bottom of the slot shall be riveted to the pipe with a minimum of two rivets per linear foot. The pipe shall have a section removed to accept the slot so as to maintain the original diameter, providing ease in transition to conventional systems. The pipe should have 0.5-inch slot openings, 6-inches center to center, along two to three longitudinal rows.
 - 1. Size and dimensions:
 - a. Pipe diameter: refer to drawings
 - b. Slot height: 2 1/2-inch or 6-inches
 - c. Slot opening: 1 1/4-inch wide for 4-inch pipe, 1 3/4-inch wide for 6 and 8-inch diameter pipe
- C. Perforate pipe: Perforated HDPE distribution pipes shall conform to ASTM F 405, AASHTO M252, and AASHTO M252 and/or M294. The perforated pipe should have 1/2 inch slot openings, 6 inches center to center, along two to three longitudinal rows.
 - 1. Roughness (Manning's "n") shall not exceed the following values
 - a. 3"-6" 0.015
 - b. 8" 0.016

- c. 10" 0.017
- d. 12"-15" 0.018
- e. 18"-24" 0.020

2.4 CLEAN OUTS

- A. Clean outs shall consist of 6-inch diameter rigid HDPE pipe and conform to ASTM D 2239.

2.5 EROSION CONTROL BLANKET

- A. Straw erosion control blanket constructed with 100% agricultural straw fiber matrix and a functional longevity of approximately 12 months. The straw fiber shall be evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom with a lightweight photodegradable polypropylene net having an approximate 0.20 x 0.50 inch mesh size. The blanket shall be sewn together on 1.50 inch centers with degradable thread.
 - 1. Thickness - ASTM D6525 - 0.32 inch (8.13 mm)
 - 2. Resilience - ECTC Guidelines - 80.50%
 - 3. Mass per Unit Area - ASTM D6475 - 7.59 oz/square yard (257 g/square meter)
 - 4. Water Absorption - ASTM D1117/ECTC - 327%
 - 5. Swell - ECTC Guidelines - 14.90%
 - 6. Stiffness/Flexibility - ASTM D1388/ECTC - 6.06 oz-inch (67.699 mg-cm)
 - 7. Ground Cover - ECTC Guidelines - 89%
 - 8. Smolder Resistance - ECTC Guidelines - Yes (according to ECTC test)
 - 9. MD Tensile Strength - ASTM D5035 - 156 lbs/ft (2.27 kN/m)
 - 10. MD Elongation - ASTM D5035 - 23%
 - 11. TD Tensile Strength - ASTM D5035 - 108 lbs/ft (1.57 kN/m)
 - 12. TD Elongation - ASTM D5035 - 22%
- (MD – Machine direction)
(TD – Traverse direction)

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. The level spreader and filter strip systems may not receive run-off until the entire contributing drainage area to the level spreader and filter strip system has received final stabilization.
- B. Heavy equipment and traffic shall be restricted from traveling over the location of the level spreader and filter strip to minimize compaction of the soil.

3.2 EXCAVATION

- A. Excavate the level spreader trench to the design dimensions and elevations. Excavated materials shall be located a minimum 10-feet away and to the downstream side of the trench to prevent redeposition of excavated soils during storm events and to enhance trench wall stability. Large tree roots shall be trimmed flush with the trench sides in order to prevent fabric puncturing or tearing of the filter fabric during subsequent installation procedures. The side walls of the trench shall be roughened where smeared and sealed during excavation.

3.3 COARSE SAND PLACEMENT

- A. Place 4-inch sand filter layer (IDOT FA-2) at the bottom of the infiltration trench.
- B. First two-inches of sand shall be vertically mixed with the subgrade soils to a minimum depth of 2-inches prior to placing the remaining 2-inches.

3.4 GEOTEXTILE PLACEMENT

- A. The width of the geotextile must include sufficient material to conform to trench perimeter irregularities and for a 6-inch minimum top overlap. The filter fabric shall reach to the sand layer on the bottom of the level spreader trench. Stones or other anchoring objects should be placed on the fabric at the edge of the trench to keep the fabric in place during construction. When overlaps are required between rolls, the uphill roll shall lap a minimum of 2-feet over the downhill roll in order to provide a shingled effect.
- B. Following the stone aggregate placement, the filter fabric shall be folded over the stone aggregate to form a 6-inch minimum longitudinal lap.
- C. A separate precut geotextile shall be placed horizontally over the aggregate prior to covering the level spreader trench with the final aggregate layer. The horizontally placed geotextile shall be installed as an individual unit to allow for easy removal in case of remedial maintenance.

3.5 PIPES / SLOT DRAINS

- A. Perforated pipe / slot drain shall be provided as indicated in the drawings and shall terminate 1-foot short of the level spreader trench end wall. Free ends of perforated pipe, where no clean-outs are specified, shall be capped.
 - 1. Use of slot drain: The grate of the slot drain shall be installed level along one elevation for the entire continuous length of the level spreader.
 - 2. Use of perforated pipe: The downstream lip of the level spreader trench shall be installed level along one elevation for the entire continuous length of the level spreader.

3.6 CLEAN OUTS

- A. The clean outs shall be fitted with a cap located near the lateral center of the level spreader trench, and located at the ends of the distribution pipe as indicated on drawings. The pipe shall have a plastic collar or ribs to prevent lifting when removing cap. It shall withstand water head pressure of 10-feet and be manufactured with Hostalloy 731™ high density polyethylene. The screw top lid shall contain a magnet capable of being detected with a standard magnetic pipe and cable locator. The top shall include a locking mechanism or special bolt to discourage vandalism. The cap shall be open or closed as indicated on the drawings.

3.7 AGGREGATE PLACEMENT

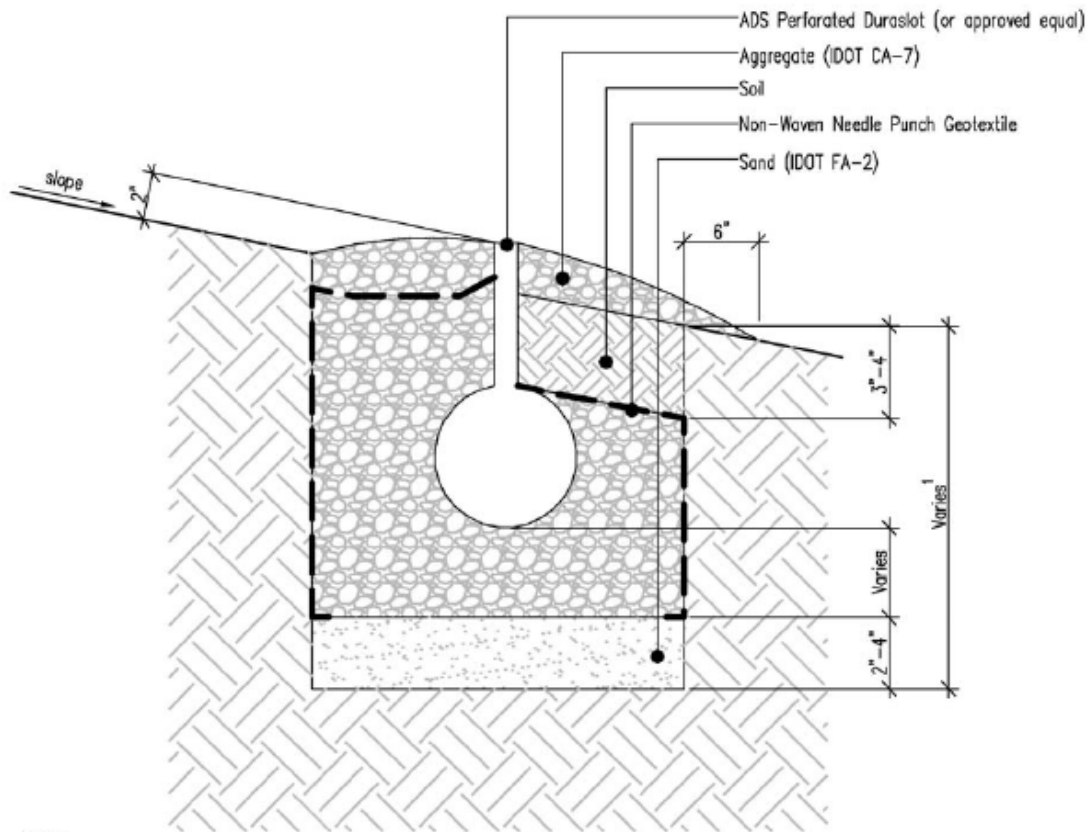
- A. The stone aggregate (IDOT CA-7) shall be placed in lifts and lightly compacted using plate compactors without damaging the distribution pipe. The maximum loose lift thickness is 12-inches.
- B. Aggregate shall extend a minimum of six inches beyond the edge of the trench, on the downstream side and shall mound a minimum of 2-inches above the prevailing slope such that it will intercept runoff from upslope.
- C. All aggregates must be kept clean and uncontaminated at all times. All contaminated aggregates shall be removed and replaced with uncontaminated aggregates (IDOT CA-7).

3.8 EROSION CONTROL BLANKET

- A. Immediately following seed installation on the filter strip adjacent to the level spreader, install specified erosion control blanket as indicated on plan documents following manufacturer's specifications and installation procedures for areas as indicated on the plan documents. Erosion blanket shall be maintained as specified by manufacturer and as necessary for compliance with Village soil erosion and sediment control standards.
- B. Uphill edge of erosion blanket shall be keyed into infiltration trench.

END OF SECTION

M. Typical Detail



Notes:

1. Depth shall not exceed that which will drain in 72 hours.

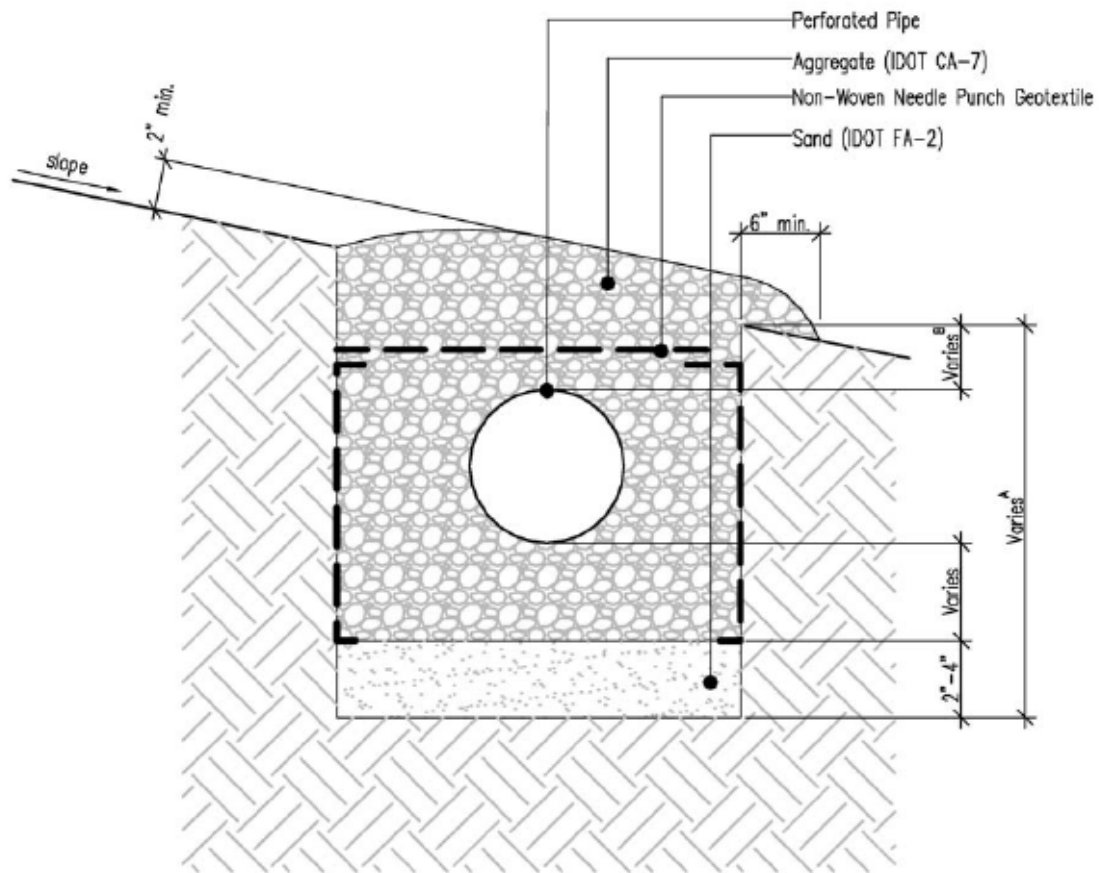
Level Spreader with Slot Drain

Not to Scale



CONSERVATION DESIGN FORUM

Figure 12 – Level Spreader Detail (with slot drain)



- A) Depth shall not exceed that which will drain in 72 hours.
 B) Perforated Pipe located minimum of one pipe diameter below grade.

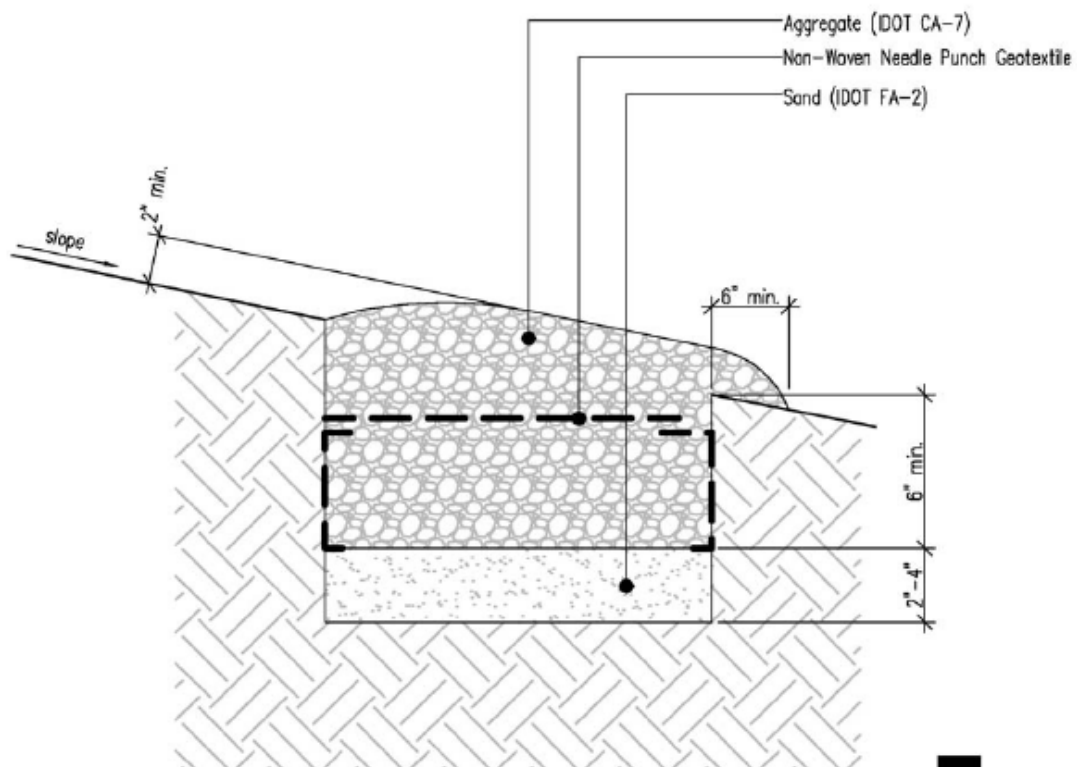
Level Spreader with Perforated Pipe

Not to Scale



CONSERVATION DESIGN FORUM

Figure 13 – Level Spreader Detail (with perforated pipe)



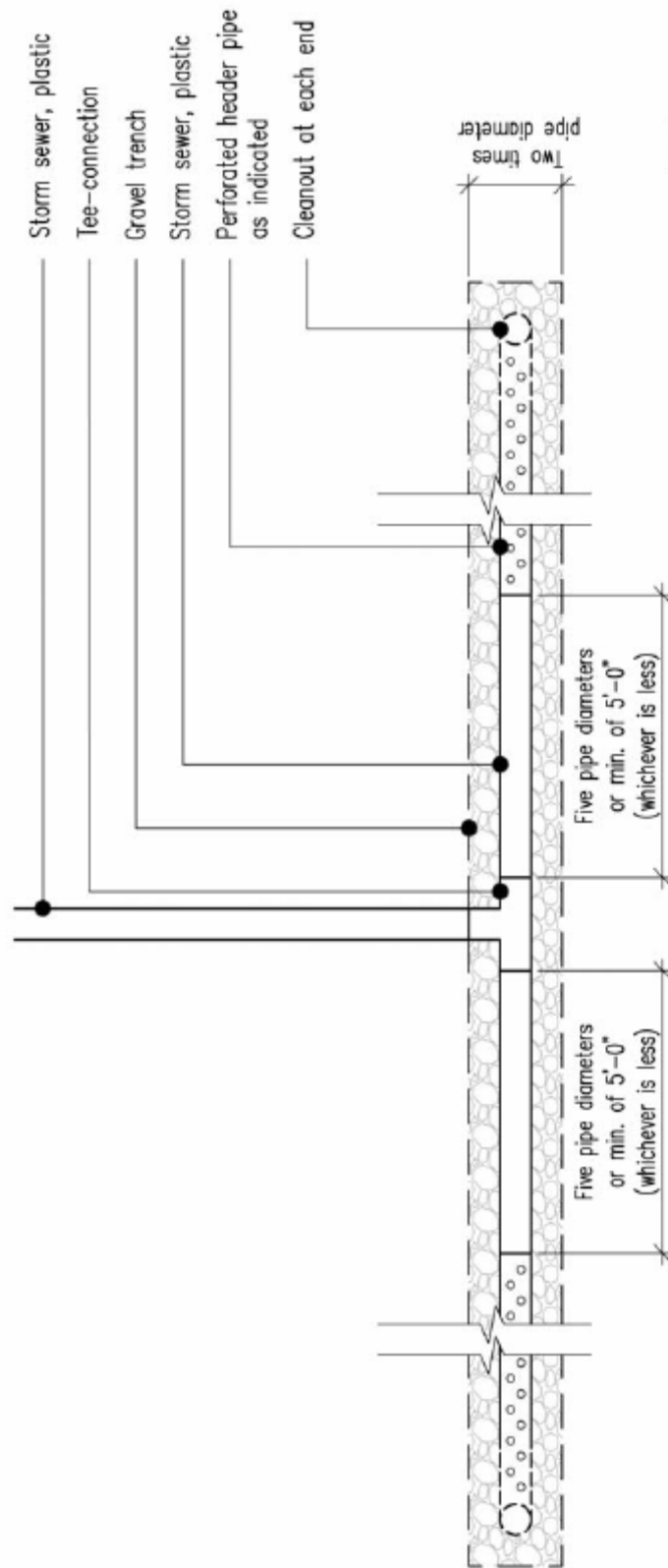
Level Spreader (Flow Interceptor within Filter Strip)

Not to Scale



CONSERVATION DESIGN FORUM

Figure 14 – Level Spreader Detail (within filter strip (mid-slope))



Level Spreader Plan

Not to Scale

CONSERVATION DESIGN FORUM

Figure 15 – Level spreader plan view

- ¹ Yu *et al.* (1992)
- ² Schueler (1987); Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); Lowndes (2000)
- ³ Lowndes (2000)
- ⁴ Price *et al.* (1998)
- ⁵ Horner (1993); NRCS-II (2001); Los Angeles County Department of Public Works (2002)
- ⁶ Price *et al.* (1998); NRCS-II (2001)
- ⁷ Price *et al.* (1998)
- ⁸ USDA (1994)
- ⁹ Schueler *et al.* (1992); Price *et al.* (1998)
- ¹⁰ Price *et al.* (1998); Lowndes (2000)
- ¹¹ Schueler (1987); NRCS-II (2001)
- ¹² Price *et al.* (1998)
- ¹³ Price *et al.* (1994)
- ¹⁴ Price *et al.* (1998)
- ¹⁵ Price *et al.* (1998)
- ¹⁶ Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992); NRCS-II (2001)
- ¹⁷ USDA (1994)
- ¹⁸ Schueler (1987)
- ¹⁹ Northern Virginia Planning Commission and Engineers and Surveyors Institute (1992)
- ²⁰ Lowndes (2000)
- ²¹ NRCS-II (2001)
- ²² Minton (2005)
- ²³ Price *et al.* (1998)
- ²⁴ Price *et al.* (1998)
- ²⁵ Md DNR ((1984)
- ²⁶ Price *et al.* (1998)
- ²⁷ Price *et al.* (1998)
- ²⁸ NRCS-II (2001)
- ²⁹ NRCS-II (2001)
- ³⁰ Price *et al.* (1998)
- ³¹ NRCS-II (2001)
- ³² Price *et al.* (1998)
- ³³ Price *et al.* (1998)
- ³⁴ Price *et al.* (1998)
- ³⁵ Price *et al.* (1998)

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Section 6.0 Naturalized Stormwater Basins

A. Definition

Naturalized stormwater basins, for purposes of this technical manual, are wet detention basins or constructed wetland systems designed to provide greater water quality and habitat benefits relative to standard detention basin designs. Naturalized stormwater basins incorporate native vegetation on shallow emergent shelves as well as the side slopes of the basin. Appropriate native vegetation used within a naturalized basin can tolerate inundation and modest water level fluctuations, has deeper root systems to better stabilize side slopes, and typically deters usage of upland areas by geese.

Two basic naturalized basin designs will be discussed: wet basins that consist primarily of open water with shallow emergent wetland shelves around the perimeter of the open water habitat; and constructed wetland systems that consist of a shallow marsh habitat. Naturalized stormwater basins can also be designed as variations on these two basic designs (e.g., open water interspersed with shallow emergent marsh, combination of pond and shallow marsh habitat as separate zones, etc.).

Naturalized stormwater basins can and should be combined with other BMP's in this guidance manual, such as rain gardens, infiltration trenches, and filter strips as pretreatment measures to reduce sediment loads and water level fluctuations within the basin. Level spreaders and filter strips can also be located downstream of the naturalized basin to deconcentrate runoff prior to discharge to a stream or wetland buffer.

B. Suitable Applications

Stormwater detention basins have been used for stormwater management for decades in Will County and Northeastern Illinois. Naturalized stormwater basins are essentially just a variation on the basic detention basin. As such, naturalized basins can be applied virtually anywhere that standard basins can be applied. When drainage areas are small, it may be difficult to maintain permanent water and therefore the vegetation may need to be adjusted for small drainage areas and/or for more permeable soils. Since on-stream detention basins are generally not allowed per the Village's ordinance, this will tend to limit the maximum drainage area to detention basins.

Naturalized stormwater basins are appropriate for residential, commercial and mixed-use developments. The naturalized aspect of these basins is most suitable for an overall landscape plan that is less formal. However, due to their relatively large size, naturalized basins are often located within more formalized landscape plans as well.

C. Benefits

- Enhancement of vegetation diversity and wildlife habitat in urban settings¹.
- Increased pollutant removal efficiencies due to settling of particulate pollutants and biological uptake by wetland plants²; wet basins are better able to prevent settled pollutants from resuspending and washing out of the basin during subsequent storms³.
- Downstream environmental benefits include improved water quality, attenuation of runoff rates, and prevention of increased downstream flooding associated with development.
- Improved aesthetics; can provide value to community open space.
- Passive recreation opportunities.
- Relatively low maintenance costs.

D. Limitations

- Large land area requirement for generally single purpose facility (stormwater management).
- Can be expensive when land costs are considered since detention basins are not as readily integrated into site plans as other BMPs such as permeable paving, rain gardens, and infiltration trenches that typically do not displace developable land.
- Pollutant removal efficiencies are limited until vegetation is established⁴.
- Less pollutant removal/assimilation during non-growing season⁵.
- Potential habitation by undesirable vegetative species if pollutant load and water level fluctuations are not controlled⁶.
- Naturalized stormwater basins and other urban stormwater BMPs are typically not intended to address runoff with very high sediment concentrations, such as construction sites, agricultural fields or plant nurseries. However, sediment basins used to address construction site runoff can often be converted to naturalized stormwater basins once the site is stabilized.
- Naturalized stormwater basins are not a substitute for adequate source controls on manufacturing, industrial, refueling, and other sites where toxic and other pollutants are used or stored.

E. Required Design Data

1. Soil type:

Determine on-site soils within area proposed for naturalized stormwater basin. If soils are relatively permeable or well drained, such as soil types A and B, it may be difficult to maintain a permanent pool. Usage of a clay liner or adequate compaction of bottom soils may be necessary⁷. A preferred option may be to construct the detention basin as a combined retention and

detention facility that infiltrates a portion of the runoff and releases the remaining runoff (see also Section 3.0).

2. Contributing drainage area:

The contributing drainage area and level of imperviousness will determine size requirements to meet the Village's allowable release rate of 0.15 cfs/acre for the 100-year, 24-hour storm. The drainage area will also partially determine the ability to maintain a permanent pool of water.

3. Placement of naturalized stormwater basin in landscape:

If a naturalized stormwater basin is to be located in close proximity to a natural wetland, a hydrologic evaluation of the existing wetland system should be performed to ensure that placement of the naturalized stormwater basin will not significantly increase or decrease the water balance of the natural wetland.

F. Naturalized Stormwater Basin Design

As previously mentioned, a naturalized stormwater basin can have many variations to its design. The primary features or characteristics that all naturalized basins should include are:

- some type of settling feature that also dissipates the energy of incoming flows, such as a forebay, settling basin, or open water area;
- slopes (above and below water) that are more gradual than standard detention basins to create greater habitat opportunities;
- pool depths that encourage particulate pollutant removal and prevent resuspension;
- pool depths that vary to provide a range of habitat opportunities;
- native vegetation that is tolerant of the designed hydrologic conditions (depth and duration).

These primary naturalized stormwater basin design features, as well as other design considerations, are further discussed in the following sections.

1. Site selection:

Naturalized stormwater basins should not be located within existing wetland habitat nor negatively affect the hydrologic regime of an existing wetland.

Wetland basins should also not be located on-stream such that they cause impoundment of flowing water and change the basic character of the stream habitat.

If a permanent pool is to be maintained, the drainage area should be sufficient to support the pool against evaporation and infiltration losses. Wet detention basins can be lined to prevent infiltration, if necessary.

2. Release rate:

The design release rate should meet the local criteria and requirements for flood prevention. In the Village, the maximum allowable release rate for the 100-year, 24-hour design event is 0.15 cfs/acre.

3. Storage volume:

Sizing of the naturalized stormwater basin to meet the release rate requirements should follow standard detention design techniques as outlined in S T203(c), (e.g. TR55, TR20, HEC-1, etc.).

4. Water level fluctuation and flow velocity:

Although the Village's Stormwater Ordinance places no restriction on the amount of water level fluctuation within detention basins, it is recommended that stormwater basins be designed with a 100-year stage less than 4-feet above the normal water level (NWL) and 2-year stage less than 2-feet above NWL.

It is also recommended that the 0.75-inch Village runoff extended detention standard be located upstream of the detention facility, distributed throughout the watershed via rain gardens, porous pavement, infiltration trenches, etc. If it is necessary to incorporate the 0.75-inch runoff volume within the detention facility, the water level fluctuation within the retention zone should be designed to be 6-inches or less. Water fluctuations that are greater than these may result in poor vegetation establishment and/or persistence and low vegetation and habitat diversity.

The flow velocity through a shallow constructed wetland marsh system can be high at the beginning of the event before there is a pool of water to slow the flow. Flow velocities through a shallow marsh should not exceed 1.5 ft/s, and, ideally, should be 0.6 ft/s or less during the beginning portion of the event before the basin begins to significantly fill⁸. High velocities can stress and potentially dislodge rooted vegetation and scour previously deposited sediments.

5. Pretreatment/energy dissipation:

Pre-treatment and/or energy dissipation should be provided at all concentrated discharges to detention basins. An open water forebay provides both energy dissipation and provides an opportunity for settling of the heaviest sediment in an easily maintainable location. A separate forebay is not necessary for a wet basin. However, to concentrate the settled material within one area for ease of clean out, an underwater berm may be constructed to create a “forebay” near the inlet. Constructed wetland systems that consist only of shallow marsh, however, will require a forebay to prevent scour at the inlet and to minimize disturbance of established vegetation during dredging of accumulated sediments. The forebay should be designed following recommendations for settling basins. The NIPC recommendations state that the forebay should be designed with both active storage and a permanent pool. The permanent pool volume should include both treatment volume and sediment storage⁹. In general, the forebay should have the following features:

- Inlet stabilization, such as rip rap, to prevent scour.
- Length to width ratio that provides a flow path length of at least two to three times the width of the forebay.
- Side slopes from 6-inches below the NWL to 6-inches above NWL should be 5:1 or flatter to facilitate the establishment of emergent vegetation. Side slopes below this zone should be no greater than 4:1 to prevent potential slope failure and improve safety.
- The forebay should be located for easy access by sediment removal equipment.
- The permanent pool volume within the forebay should be sized for treatment as well as sediment storage.
 - The treatment volume should be a minimum 500 cubic feet/impervious acre.
 - The sediment storage volume should be a minimum 100 cubic feet/impervious acre. For a stabilized watershed, this should provide for approximately 10-years of sediment storage.
- The forebay should be designed with a minimum depth of 3-feet to prevent resuspension of sediments.
- To distribute discharge from the forebay, a 1-foot high berm of rip rap should be installed between the forebay and the constructed wetland to create a small amount of active storage. The low berm will prevent scour and act as a level spreader (see also Section 5.0).

6. Basin/marsh depths (below normal water level):

The basin/marsh permanent pool depth can vary based on the desired appearance of the stormwater facility. In general, a basin with permanent pool depths of 2- to 3-foot may be populated by rooted aquatic vegetation. Deeper

open water design with greater than 6-foot depths will deter establishment of rooted aquatics and will tend to provide less structure for aquatic habitat. A mixture of emergent, rooted aquatic, and open water zones will provide the greatest habitat and visual diversity.

7. Naturalized stormwater basin configuration:

To minimize short circuiting between the basin inlet(s) and outlet, the basin inflow point(s) should be as far from the outlet structure as possible and the configuration of the naturalized stormwater basin should provide a flow path at least 3 times longer than the average basin width. This can be accomplished by a basin length to width ratio of 3:1, and/or through the addition of design features such as shallow berms. This will ensure that inflow runoff is distributed throughout the basin and there are no stagnant zones. For example, wet basins may include underwater berms that can be designed as emergent shelves and positioned to increase the flow path length. In addition to preventing short circuiting, these emergent shelves can provide habitat opportunities. Increasing emergent shelf area also increases runoff water/soil substrate contact area, improving water quality.

8. Slopes:

The side slopes at the shoreline, from 0.5- to 1.0-foot above to 1.0-foot below NWL, should be no steeper than 10:1. The flatter the slope is graded, the greater the potential for vegetation establishment and habitat opportunities. The side slopes above the shoreline should be 5:1 to facilitate establishment of native vegetation, prevent slumping during drawdown, improve safety, and improve maintainability (e.g. mow management along slope during early stages of plant establishment). Where space is constrained or due to site topography, a 3:1 side slope above the shoreline may be used. At no time should the side slope be designed with a slope steeper than 3:1.

9. Vegetation selection and planting:

Native vegetation should be integrated into the design as much as possible. Certain conditions or situations may warrant use of non-native species, which is discussed in further detail later in this section. Selection of vegetation should consider hydroperiod and light conditions, with preference given to species that are adaptable to the broadest ranges of depth, frequency, duration of ponding, and at least moderate tolerance to nutrient loads¹⁰. Where possible, water level fluctuation should be controlled to minimize excessive inundation during the first growing season, particularly after seed installation¹¹. This may be accomplished by delaying the installation of the restrictor until the seeded material has established through a growing season. Delayed installation of the restrictor will require coordination with construction

schedules related to installation of impervious cover and may need approval by the regulatory body.

Generally, three to four planting zones can be created based on slope, NWL, and anticipated water level fluctuations. The following tables illustrate water depth planting zones. The given elevation ranges are generalized; the actual design elevation ranges should consider the proposed water fluctuations for the specific stormwater facility, in particular, the 2-year stage elevation. It is not uncommon to have some species overlap between zones as they sort out to those areas that provide their optimal growing conditions. And as previously discussed, gradual slopes will provide more microclimate conditions that will favor vegetation establishment and a diversity of vegetation habitats. Given the typically unnatural conditions of a stormwater facility, it is recommended to limit plant species to those that are known to grow in such conditions, are native to the region, and are considered less conservative (i.e. those species with a coefficient of conservatism (C value) of 5 or less as described in *Plants of the Chicago Region*. It is recommended to also refer to the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* and *Plants for Stormwater Design Species Selection for the Upper Midwest* for selection of species and placement within the stormwater facility (see also References at the end of this Section).

<u>Zone</u>	<u>Elevation Range</u>
Submergent	3 – 6 feet below NWL
Deeper Emergent	NWL – 6-inches below NWL
Shallow Emergent	2" above NWL – 2" below NWL
Wetland Fringe	12" above NWL – NWL
Mesic Prairie	> 12" above NWL

Table 8 - General Planting Zones and Water Depth Elevation Ranges

Submergent Zone:

The following are two recommendations for planting within a submergent zone: Coontail (*Ceratophyllum demersum*) and Sago Pondweed (*Potamogeton pectinatus*). Other submergent species, however, may volunteer. Most of the available plant nursery species that are appropriate for a submergent zone are fairly conservative (C value ≥ 6) and may not be conducive to a stormwater facility environment.

Emergent Zone:

The following are recommendations for planting within an emergent zone. Some species are tolerant of deeper water conditions, e.g., 6-12 inches below NWL; these have been identified in the Deeper Emergent category. Although most of these identified species will tolerate deeper water depths than

indicated, these emergent species generally should be planted in water depths no greater than 6-inches. As they become established, many will migrate into deeper water depths. Other emergent species prefer shallower water depths, e.g., 2- to 3-inches to mudflat conditions; these species have been identified in the Shallow Emergent category.

Those portions of the emergent zone that are below the NWL should be plugged rather than seeded. The shallow emergent zone above the NWL can be plugged and/or seeded and protected with an erosion blanket. Plugging rates may vary depending on budget constraints. The minimum installation rate should be approximately 2-foot on centers. Some species, however, have a slow rate of spread and therefore should be planted at a higher frequency rate. The following table provides several recommended species for the emergent planting zones:

Typical Planting Zone Water Depths	Scientific Name	Common Name
Deeper Emergent: NWL – 6-inches below nwl	<i>Polygonum amphibium</i>	Marsh Smartweed
	<i>Sagittaria latifolia</i>	Common Arrowhead
	<i>Scirpus fluviatilis</i>	River Bulrush
	<i>Scirpus validus creber</i>	Great Bulrush
Other species that can tolerate this water depth, but are less tolerant of nutrient and/or siltation loads and considered more conservative (C value ≥ 6)	<i>Acorus calamus</i>	Sweet Flag
	<i>Carex lacustris</i>	Common Lake Sedge
	<i>Pontederia cordata</i>	Pickernel Weed
	<i>Scirpus acutus</i>	Hard-stem Bulrush
	<i>Sparganium eurycarpum</i>	Common Bur Reed

Typical Planting Zone Water Depths	Scientific Name	Common Name
Shallow Emergent: 2" above NWL – 2" below NWL	<i>Alisma subcordatum</i>	Common Water Plantain
	<i>Bidens cernua</i>	Nodding Bur Marigold
	<i>Carex hystericina</i>	Porcupine Sedge
	<i>Carex pellita</i>	Wooly Sedge
	<i>Carex stricta</i>	Tussock Sedge
	<i>Carex vulpinoidea</i>	Brown Fox Sedge
	<i>Eleocharis obtusa</i>	Blunt Spike Rush
	<i>Iris virginica shrevei</i>	Blue Flag
	<i>Scirpus atrovirens</i>	Dark Green Rush
	<i>Scirpus pungens</i>	Chairmaker's Rush
	<i>Spartina pectinata</i>	Prairie Cord Grass
Other species that can tolerate this water depth, but are less tolerant of nutrient and/or siltation loads and are considered more conservative (C value ≥ 6)	<i>Acorus calamus</i>	Sweet Flag
	<i>Calamagrostis canadensis</i>	Blue Joint Grass
	<i>Carex comosa</i>	Bristly Sedge
	<i>Eupatorium maculatum</i>	Spotted Joe Pye Weed
	<i>Glyceria striata</i>	Fowl Manna Grass
	<i>Juncus effusus</i>	Common Rush

Table 9 - Recommended Species for Emergent Planting Zones

Wetland Fringe Zone:

The wetland fringe zone can be installed as a combination of plug and seed material. This zone should be seeded with a cover crop and protected with an erosion blanket. Table 3 provides a list of recommended species for the wetland fringe zone. The specific species identified to be installed within this zone as well as the elevation of the zone will depend on the proposed water fluctuations for the designed stormwater facility. A variety of species that are tolerant of periodic wetness as well as mesic conditions should usually be considered for this fringe zone. If, however, the designed slope for the wetland fringe zone is too steep (3:1 or more), and/or the proposed water fluctuation for the 2-year storm event is greater than 2-feet, an alternative planting scheme may be necessary. Designed planting plans, for these conditions or others that pose severe growing conditions, should focus on

usage of a few species that may grow under these constraints. An example would be to seed Creeping Bent as the dominant species within a wetland fringe zone, along with typical annual species, such as Bidens, Rice Cut Grass, and other species typically found along mudflats or eroded slope habitats such as Common Water Horehound, Spikerushes, etc.

Typical Planting Zone Water Depths	Scientific Name	Common Name
Wetland Fringe: 12" above NWL - NWL	<i>Actinomeris alternifolia</i>	Wingstem
	<i>Agrostis alba palustris</i>	Creeping Bent
	<i>Asclepias incarnata</i>	Swamp Milkweed
	<i>Aster novae-angliae</i>	New England Aster
	<i>Aster simplex</i>	Panicked Aster
	<i>Bidens cernua</i>	Nodding Bur Marigold
	<i>Carex cristatella</i>	Crested Oval Sedge
	<i>Carex stipata</i>	Common Fox Sedge
	<i>Elymus virginicus</i>	Virginia Wild Rye
	<i>Eupatorium perfoliatum</i>	Common Boneset
	<i>Helenium autumnale</i>	Sneezeweed
	<i>Helianthus grosseserratus</i>	Sawtooth Sunflower
	<i>Juncus dudleyi</i>	Dudley's Rush
	<i>Juncus torreyi</i>	Torrey Rush
	<i>Leersia oryzoides</i>	Rice Cut Grass
	<i>Lycopus americanus</i>	Common Water Horehound
	<i>Penthorum sedoides</i>	Ditch Stonecrop
	<i>Rudbeckia laciniata</i>	Wild Golden Glow
	<i>Silphium perfoliatum</i>	Cup Plant
	<i>Spartina pectinata</i>	Prairie Cord Grass
	<i>Thalictrum dasycarpum</i>	Tall Meadow Rue
	<i>Verbena hastata</i>	Blue Vervain
	<i>Vernonia fasciculata</i>	Ironweed

Typical Planting Zone Water Depths	Scientific Name	Common Name
Other species that can tolerate this water depth, but less tolerant of nutrient and/or siltation loads and are considered more conservative species (C value ≥ 6)	<i>Calamagrostis canadensis</i>	Blue Joint Grass
	<i>Liatris pycnostachya</i>	Prairie Blazing Star
	<i>Liatris spicata</i>	Marsh Blazing Star
	<i>Lobelia siphilitica</i>	Great Blue Lobelia
	<i>Lythrum alatum</i>	Winged Loosestrife
	<i>Mimulus ringens</i>	Monkey Flower
	<i>Panicum virgatum</i>	Switch Grass
	<i>Physostegia virginiana</i>	Obedient Plant
	<i>Pycnanthemum virginianum</i>	Common Mountain Mint
	<i>Rudbeckia subtomentosa</i>	Sweet Black-eyed Susan
	<i>Scirpus cyperinus</i>	Wool Grass
	<i>Scirpus pendulus</i>	Red Bulrush
	<i>Solidago graminifolia</i>	Grass-leaved Goldenrod
	<i>Solidago riddellii</i>	Riddell's Goldenrod
	<i>Veronicastrum virginicum</i>	Culver's Root
	<i>Zizia aurea</i>	Golden Alexanders

Table 10 - Recommended Species for Wetland Fringe Planting Zone

Mesic Prairie Zone:

A prairie zone should be established for the remaining slope of the naturalized stormwater basin. The prairie zone will provide additional habitat value, as well as stabilization and filtration functions. The prairie area should also be established using native vegetation. Typically, a mesic prairie seed mix is used for this zone as is provided below in Table 11. The mesic prairie zone should be seeded at rates standard for the native landscape industry – usually, grasses seeded at 8- to 10-pounds per acre, forbs seeded at 2- to 3-pounds per acre. Applicable cover crop rates should be used based on whether it is installed during the growing season or as a dormant seed installation.

Mesic Prairie	Scientific Name	Common Name
>12" above NWL	<i>Andropogon gerardii</i>	Big Bluestem Grass
	<i>Andropogon scoparius</i>	Little Bluestem Grass
	<i>Aster azureus</i>	Sky-blue Aster
	<i>Aster laevis</i>	Smooth Blue Aster
	<i>Aster novae-angliae</i>	New England Aster
	<i>Astragalus canadensis</i>	Canada Milk Vetch
	<i>Baptisia leucantha</i>	White Wild Indigo
	<i>Bouteloua curtipendula</i>	Side-oats Grama
	<i>Coreopsis palmata</i>	Prairie Coreopsis
	<i>Desmodium canadense</i>	Showy Tick Trefoil
	<i>Echinacea purpurea</i>	Broad-leaved Purple Coneflower
	<i>Elymus canadensis</i>	Canada Wild Rye
	<i>Heliopsis helianthoides</i>	False Sunflower
	<i>Lespedeza capitata</i>	Round-headed Bush Clover
	<i>Monarda fistulosa</i>	Wild Bergamot
	<i>Panicum virgatum</i>	Switch Grass
	<i>Parthenium integrifolium</i>	Wild Quinine
	<i>Penstemon digitalis</i>	Foxglove Beard Tongue
	<i>Petalostemum purpureum</i>	Purple Prairie Clover
	<i>Ratibida pinnata</i>	Yellow Coneflower
	<i>Rudbeckia hirta</i>	Black-eyed Susan
	<i>Silphium integrifolium</i> <i>deamii</i>	Deam's Rosin Weed
	<i>Silphium laciniatum</i>	Compass Plant
	<i>Silphium terebinthinaceum</i>	Prairie Dock
	<i>Solidago rigida</i>	Stiff Goldenrod
	<i>Sorghastrum nutans</i>	Indian Grass
	<i>Veronicastrum virginicum</i>	Culver's Root
	<i>Zizia aurea</i>	Golden Alexanders

Table 11 - Recommended Species for Mesic Prairie Planting Zone

Burn/No Burn Management:

The vegetation recommendations above are predicated on the assumption that the area will be maintained via burn management as the primary long term maintenance activity. If burn management is not or cannot be used, the planting palette should be modified to incorporate a matrix of species that will provide better slope stabilization than standard turf grass but will persist in the absence of fire. The following table provides a list of species that may be used for the planting zones above NWL.

Typical Planting Zone Water Depths	Scientific Name	Common Name
2-yr Stage Elevation – NWL:	<i>Agrostis alba palustris</i>	Creeping Bent
Above 2-yr Stage Elevation: Meadow Mix	<i>Dactylis glomerata</i>	Orchard Grass
	<i>Festuca rubra</i>	Red Fescue
	<i>Lolium perenne</i>	Perennial Rye Grass
	<i>Phleum pratense</i>	Timothy Grass
	<i>Poa pratensis</i>	Kentucky Blue Grass
	<i>Trifolium pratense</i>	Red Clover
	<i>Trifolium repens</i>	White Clover

Table 12 - Recommended Species When Burn Management Will NOT Be Used

The emergent zone should be planted with the hardiest of species – River Bulrush, Great Bulrush, etc. The area may revert to cattails over time.

10. Outlet control structure and outlet protection:

There are various outlet control structures that may be used. A submerged orifice outlet located within a wet basin or, for a constructed wetland within a permanent pool, will provide clog protection, an important issue that must be considered in the design. A permanent pool or micropool at the outlet should be at least 4-feet deep¹². A deeper micropool at the outlet may provide for cooler water discharges that may help to alleviate downstream impacts to temperature sensitive aquatic life¹³. The restrictor, which controls the flow rate, should be located at least 1-foot below the NWL.

The outlet pipe that controls the NWL, should be set above the normal groundwater table elevation to prevent continuous flow through the naturalized stormwater basin. Continuous flow through the basin significantly reduces the residence time and pollutant removal performance¹⁴.

Outlet protection must be provided for detention discharges to prevent scour. Discharges from a basin that are directed to a stream, lake, or wetland should be directed to the buffer adjacent to the waterbody rather than to the waterbody itself¹⁵. The discharge to the buffer must be distributed and the velocity dissipated using a level spreader (see Section 5.0) or other BMP's (Section 3.0(F)(6)).

11. Maintenance access:

Maintenance access to the forebay, safety shelf (if applicable), and outflow structure should be provided. Any access routes located on top of berms used to impound the detention volume must be designed and constructed to carry the load associated with maintenance equipment (e.g. small backhoe and dump truck).

G. Construction Considerations

Soil Preparation:

Topsoil should be stripped and stockpiled prior to grading. If invasive species or weed seed are expected to be an issue, the top 2-inches of surface soil should be removed/scrapped to remove primary weed seed source prior to stripping of topsoil. The topsoil should be a silt loam based on the U.S.D.A. classification system; uniformly obtained from the A-horizon of the soil profile without admixture of subsoil.

Soil compaction should be kept to a minimum within the areas to be planted. If soil compaction occurs or if the soils have a high clay content, the area(s) should be deep disked prior to placement of topsoil.

Stockpiling of topsoil should be kept to a minimum. The longer topsoil is stockpiled, the greater the loss of organic carbon, which is needed for soil fertility and friability. Topsoil should contain 6-10% organic content. At the time of placement, topsoil should be tested for organic content and amended with additional organic matter if the content is less than 6%. The loss of organic carbon will diminish the quality of the topsoil as a growing medium and will affect its ability to absorb runoff.

Topsoil should be spread to a minimum thickness of 6-inches over the entire area to be planted. The topsoil should be blended with the top 2-inches of subsoil to avoid creation of a potential root barrier and to prevent potential slope failure due to slippage at the subsoil/topsoil interface.

Timing of Planting/Seeding:

To provide optimal growing conditions and allow the roots to become established prior to warmer and drier conditions, live plantings should be installed in spring prior to June 1st. Planting can occur later, until August 1st, if provisions are made for adequate watering to ensure plant and root establishment.

Seeding may occur in spring, March 1st (or when the soil thaws) through May 31st. Many of the native seeds require moist, cool conditions for germination, which is generally the condition during this time period. A late fall/winter dormant seeding, however, may also be done. A dormant seeding should not occur prior to November 1st, but prior to frozen ground or snow cover conditions. A dormant seeding is more appropriate for those portions of the naturalized stormwater basin that are unlikely to flood and flush the seed from the basin¹⁶.

Erosion and sedimentation control:

Immediately following seed installation of the wetland fringe and mesic prairie zones, a biodegradable erosion blanket should be installed. It is recommended that a double net erosion blanket with a 100% straw matrix, (e.g. North American Green (NAG) S150 or equivalent) be used from the NWL up to the 2-year stage elevation. A single net erosion blanket with a 100% straw matrix (e.g. NAG S75 or equivalent) may be used from the 2-year stage elevation up to the top of slope. Clean straw mulch applied at a 2000 lbs/acre rate and crimped in place may be used instead of an erosion blanket above the 2-year stage elevation. The usage of an erosion blanket or straw mulch has been noted to have benefits that typically outweigh the additional cost factor. These benefits include increased slope stabilization until vegetation is established, seed protection, and enhancement of seedling development.

Predation protection:

Most newly planted areas will need some type of predation protection. Various herbivore predation protection methods are readily available and should be incorporated into the design.

H. Operation and Maintenance

Annual inspections:

The naturalized stormwater basin should be inspected, at a minimum, twice a year for the first three years after construction, and once a year thereafter. The following items should be noted during each inspection:

- Presence of erosion rills and gullies, as well as sedimentation deposits.

- Sediment accumulation within forebay. When the portion of the forebay volume allocated to sediment accumulation is full (typically corresponds to a sediment depth of approximately one foot), removal of sediment is necessary.
- Vegetation species distribution/survival that includes dominant plant species; presence of installed species within the intended zones and if their aerial coverage has increased; what volunteer species have established and are they considered invasive; and what percent of the naturalized stormwater basin remains unvegetated, excluding designed open water areas.
- Determine if the depth zones and microtopographic features are still Persistent¹⁷.
- Inspect the condition of outlet structure – removal of debris or trash that may cause blockages.

From these inspections, various activities may be warranted such as erosion repair through various stabilization methods, clean out debris and trash that may clog the outlet structure, vegetation management of invasive species, removal of accumulated sediments, repair herbivore predation exclosures, etc.

Accumulated sediment removal:

The frequency of removal of accumulated sediments will depend on the adequacy of soil erosion and sediment control during construction and on the presence of BMP's within the upstream watershed¹⁸. If adequate controls are present, sediment removal may not be necessary for 10 years or longer depending upon the designed sediment storage volume. Sediments should be tested prior to removal to determine the appropriate method of disposal.

Vegetation maintenance:

Native vegetation maintenance should include mow management for the first 2 growing seasons following installation. Mowing should be limited to that portion of the side slope that is less frequently inundated. Mowing frequency and blade height should be adjusted to optimize control of annual and biennial weeds and minimize impact to native perennial species. Generally, mowing for the first full growing season after installation should begin early May and continue through the growing season at approximately 4- to 6-week intervals. The blade height should generally be set at 6- to 8-inches above the ground.

A non-native meadow installation should also be mowed the first growing season following installation at the frequency and blade height specified for the native vegetation. Beginning the second growing season, however, a meadow area should only be mowed once a year after approximately July 15th to a height of 4- to 6-inches.

Other weed control methods, including spot herbicide treatment and hand weeding, should be employed as necessary to control invasive species. Herbicide treatment should only be performed by a licensed applicator.

Burn management should be implemented as a maintenance activity generally after the third full growing season or as soon as an adequate fuel source is present. Burn management should be used as the primary maintenance activity for the long-term care of the naturalized stormwater basin. Although there are varying opinions as to the recommended frequency of a burn, annual burning will typically remove trash and burnable debris within the facility and reduce the intensity of the fire (potentially less damaging) relative to burns conducted every three to four years (minimum frequency).

Reinforcement plantings:

Reinforcement plantings should be planned and budgeted for implementation after the second or third growing season. Regardless of the care taken during the early stages of development, it is likely that various portions of the initial plantings will not survive. This may be caused by various factors such as predation, drought, various changes in water levels, or other unforeseen factors¹⁹. The selection of the reinforcement species should be based on information obtained during the site inspections. Species should include those that have persisted and increased in aerial coverage.

I. Easement

The Village's Stormwater Ordinance requires that stormwater features (such as naturalized stormwater basins) be protected by an easement. All naturalized stormwater basin areas that are part of the submitted and approved stormwater management system thus are required to be in an easement. If naturalized stormwater basins are not part of the permitted stormwater management system, such as those installed by a homeowner on his or her own accord, they are exempt from the easement requirement.

J. Typical Detail

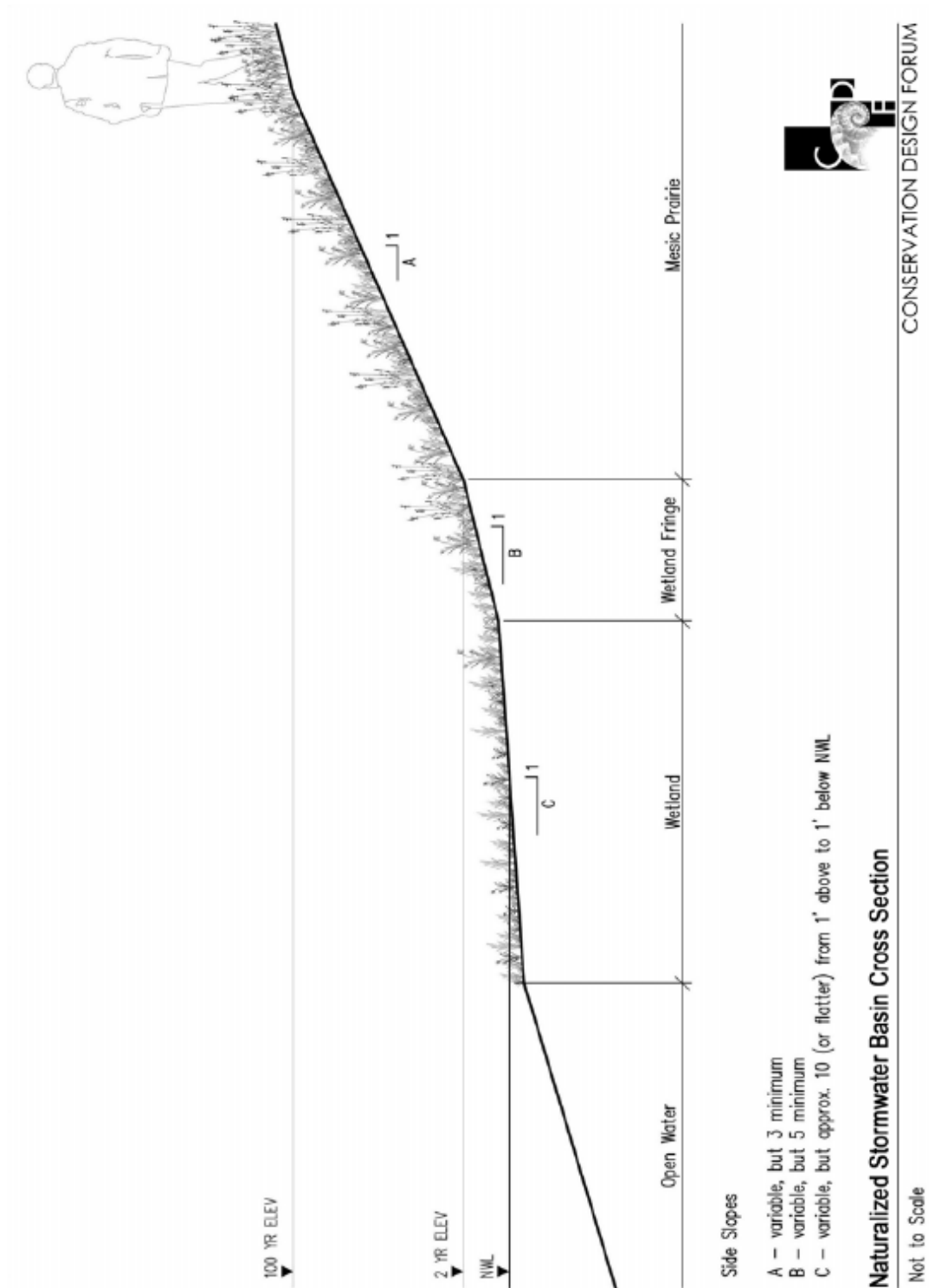


Figure 16 – Naturalized Stormwater Basin Cross Section

- ¹ Barr Engineering Company (2001)
- ² MA Department of Environmental Protection (1997); Barr Engineering Company (2001); Schueler (1992)
- ³ NIPC (2000)
- ⁴ MA Department of Environmental Protection (1997); Barr Engineering Company (2001); Schueler (1992)
- ⁵ EPA (1999)
- ⁶ EPA (1999)
- ⁷ MA Department of Environmental Protection (1997); NIPC (2000)
- ⁸ Soil & Water Conservation Society of Metro Halifax (2004)
- ⁹ NIPC (2000)
- ¹⁰ MA Department of Environmental Protection (1997); Barr Engineering Company (2001)
- ¹¹ NIPC (2000)
- ¹² Barr Engineering Company (2001)
- ¹³ EPA (1999)
- ¹⁴ NIPC (2000)
- ¹⁵ NIPC (2000)
- ¹⁶ NIPC (2000)
- ¹⁷ Schueler (1992)
- ¹⁸ NIPC (2000)
- ¹⁹ Schueler (1992)

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Research Team, Department of Environmental Programs, Metropolitan
Washington Council of Governments, Washington, D.C.

Soil & Water Conservation Society of Metro Halifax (2004), Stormwater
Treatment.

Attachment A – Falling Head Percolation Test Procedure¹

Number and Location of Tests

Commonly a minimum of three percolation tests are performed within the area proposed for an absorption system. They are spaced uniformly throughout the area. If soil conditions are highly variable, more tests may be required.

Preparation of Test Hole

The diameter of each test hole is 6-inches, dug or bored to the proposed depths at the infiltration systems or to the most limiting soil horizon. To expose a natural soil surface, the sides of the hole are scratched with a sharp pointed instrument and the loose material is removed from the bottom of the test hole. Two-inches of $\frac{1}{2}$ - to $\frac{3}{4}$ -inch gravel are placed in the hole to protect the bottom for scouring action when the water is added.

Soaking Period

The hole is carefully filled with at least 12-inches of clear water. This depth of water should be maintained for at least 4-hours and preferably overnight if clay soils are present. A funnel with an attached hose or similar device may be used to prevent water from washing down the sides of the hole. Automatic siphons or float valves may be employed to automatically maintain the water level during the soaking period. It is extremely important that the soil be allowed to soak for a sufficiently long period of time to allow the soil to swell if accurate results are to be obtained.

In sandy soils with little or no clay, soaking is not necessary. If, after filling the hole twice with 12-inches of water, the water seeps completely away in less than 10-minutes, the test can proceed immediately.

Measurement of the Percolation Rate

Except for sandy soils, percolation rate measurements are made 15-hours but not more than 30-hours after the soaking period began. Any soil that sloughed into the hole during the soaking period is removed and the water level is adjusted to 6-inches above the gravel (or 8-inches above the bottom of the hole). At no time during the test is the water level allowed to rise more than 6-inches above the gravel.

After each measurement, the water level is readjusted to the 6-inches level. The last water level drop is used to calculate the percolation rate.

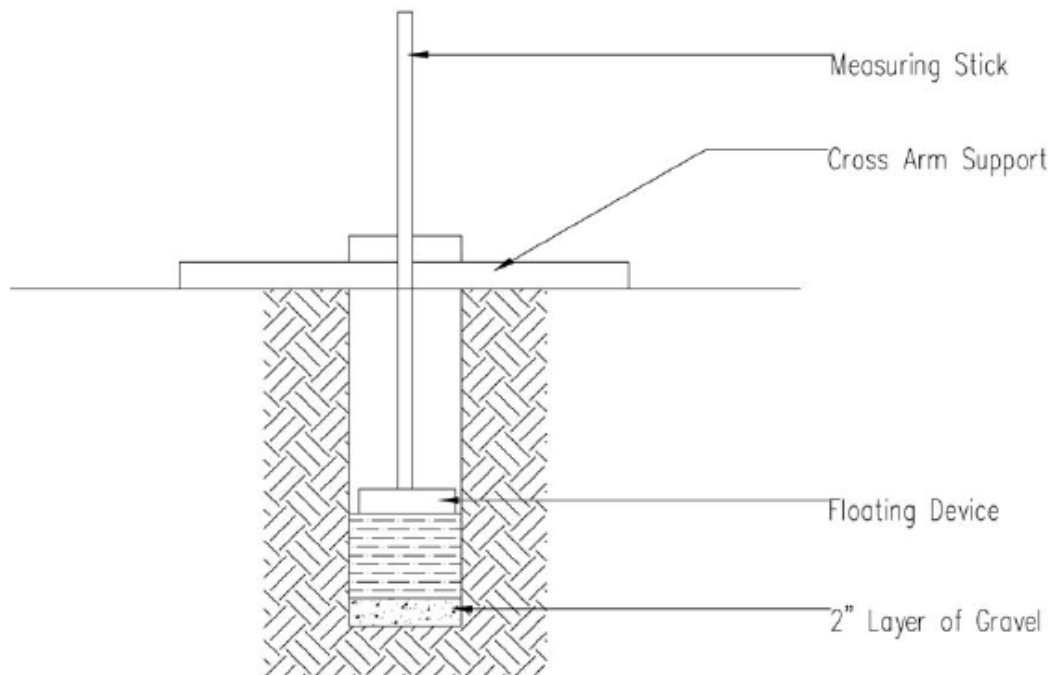
In sandy soils or soils in which the first 6-inches of water added after the soaking period seep away in less than 30-minutes, water level measurements are made

at 10-minute intervals for a 1-hour period. The last water level drop is used to calculate the percolation rate.

Calculation of the Percolation Rate

The percolation rate is calculated for each test hole by dividing the time interval used between measurements by the magnitude of the last water level drop. This calculation results in a percolation rate in terms of minutes/inch. To determine the percolation rate for the area, the rates obtained from each hole are averaged. (if tests in the area vary by more than 20-minutes/inch variations in soil type are indicated. Under these circumstances, percolation rates should not be averaged.)

Example: if the last measurement drop in water level after 30-minutes is 5/8-inch the percolation rate = (30-minutes)/(5/8-inch)= 48-minutes/inch.



Percolation Test Data Form

Location:	
Test hole #:	

Depth to bottom of hole:		Diameter of hole:	
--------------------------	--	-------------------	--

Depth, inches	Soil texture

Percolation test by:	
Date of test:	

Time	Time intervals, minutes	Measurement, inches	Drop in water level, inches	Percolation rate, minutes per inch	Remarks

Percolation rate =		minutes per inch
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Attachment B – Species Guide

The following species may be included in a seed / plant list. Suggested seed rates may need to be adjusted based on the specific site conditions. Further more, each list will have to be modified based upon the specific site conditions and circumstances that are associated with a project. As a general rule of thumb, species with a C-Value (level of conservatism¹) equal to or greater than 6 may be difficult to establish from seed and are generally more successfully introduced as live material (i.e. plugs). It is strongly recommended to develop a seed / plant list on a project-by-project basis and to consult a Landscape Architect, Botanist, or Ecologist knowledgeable on the specifics of selecting and establishing native vegetation in stormwater systems. The last column provides the designated wetland category for each species. The wetland category expresses each plant's preference of wetness (OBL) to dryness (UPL).

SPECIES	COMMON NAME	SEED QTY. LBS/ACRE	C- VALUE	WETLAND CATEGORY
COVER CROP				
<i>Agrostis alba</i>	Red Top	10.0		NA
<i>Avena sativa</i>	Seed Oats	20.0		NA
<i>Lolium multiflorum</i>	Annual Rye Grass	20.0		NA
TOTAL LBS/ACRE OF COVER CROP SEED		50.0		

Table 1 – Cover crop list

SPECIES	COMMON NAME	SEED QTY. LBS/ACRE	C- VALUE	WETLAND CATEGORY
GRASSES				
<i>Andropogon gerardii</i>	Big Bluestem Grass	1.0	5	FAC-
<i>Andropogon scoparius</i>	Little Bluestem Grass	2.0	5	FACU-
<i>Bouteloua curtipendula</i>	Side-oats Gramma	2.0	8	UPL
<i>Carex bicknellii</i>	Copper-shouldered Oval Sedge	plug	10	UPL
<i>Carex pensylvanica</i>	Common Oak Sedge	plug	5	UPL
<i>Carex rosea</i>	Curly-style Wood Sedge	plug	4	UPL
<i>Carex sprengelii</i>	Long-beaked Sedge	plug	9	FACU
<i>Carex vulpinoidea</i>	Brown Fox Sedge	0.25	2	OBL
<i>Elymus canadensis</i>	Canada Wild Rye	1.0	4	FAC-
<i>Panicum virgatum</i>	Switch Grass	1.0	5	FAC+
<i>Sorghastrum nutans</i>	Indian Grass	1.0	5	FACU+
TOTAL LBS/ACRE OF GRASS SEED		8.0		

Table 2 – Grass and sedge list

SPECIES	COMMON NAME	SEED QTY. OZ/ACRE	C- VALUE	WETLAND CATEGORY
FORBS				
<i>Allium cernuum</i>	Nodding Wild Onion	2.0	7	FAC-
<i>Aster ericoides</i>	Heath Aster	1.0	5	FACU-
<i>Aster laevis</i>	Smooth Blue Aster	2.0	9	UPL
<i>Aster novae-angliae</i>	New England Aster	2.0	4	FACW
<i>Astragalus canadensis</i>	Canada Milk Vetch	2.0	10	UPL
<i>Coreopsis lanceolata</i>	Sand Coreopsis	3.0	5	FACU
<i>Desmodium canadense</i>	Showy Tick Trefoil	2.0	4	FAC-
<i>Echinacea pallida</i>	Pale Purple Coneflower	3.0	8	UPL
<i>Echinacea purpurea</i>	Broad-leaved Purple Coneflower	2.0	3	UPL
<i>Helianthus mollis</i>	Downy Sunflower	2.0	9	UPL
<i>Heliopsis helianthoides</i>	False Sunflower	3.0	5	UPL
<i>Lespedeza capitata</i>	Round-headed Bush Clover	3.0	4	FACU
<i>Liatris spicata</i>	Gay Feather	2.0	6	FAC
<i>Monarda fistulosa</i>	Wild Bergamot	3.0	4	FACU
<i>Parthenium integrifolium</i>	Wild Quinine	2.0	8	UPL
<i>Penstemon digitalis</i>	Foxglove Beard Tongue	1.0	4	FAC-
<i>Petalostemum purpureum</i>	Purple Prairie Clover	2.0	9	UPL
<i>Physostegia virginiana</i>	Obedient Plant	2.0	6	OBL
<i>Pycnanthemum virginianum</i>	Common Mountain Mint	2.0	5	FACW+
<i>Ratibida pinnata</i>	Yellow Coneflower	3.0	4	UPL
<i>Rudbeckia hirta</i>	Black-eyed Susan	3.0	1	FACU
<i>Silphium integrifolium</i>	Rosin Weed	2.0	5	UPL
<i>Silphium laciniatum</i>	Compass Plant	2.0	5	UPL
<i>Silphium terebinthinaceum</i>	Prairie Dock	2.0	5	FACU
<i>Solidago graminifolia</i>	Grass-leaved Goldenrod	2.0	3	FACW-
<i>Solidago rigida</i>	Stiff Goldenrod	3.0	4	FACU-
<i>Verbena hastata</i>	Blue Vervain	2.0	4	FACW+
<i>Vernonia fasciculata</i>	Common Ironweed	2.0	7	FACW
<i>Veronicastrum virginicum</i>	Culver's Root	2.0	7	FAC
<i>Zizia aurea</i>	Golden Alexanders	2.0	7	FAC+

Table 3 – Forb list

¹ Swink, F., and Wilhelm, G. (1994), Plants of the Chicago Region. Indiana Academy of Science.

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VILLAGE OF BEECHER, ILLINOIS
ENGINEERING TECHNICAL SPECIFICATIONS

FINAL

March 2007



**VILLAGE OF BEECHER, ILLINOIS
ENGINEERING TECHNICAL STANDARDS**

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VILLAGE OF BEECHER, ILLINOIS

ENGINEERING TECHNICAL STANDARDS

SECTION 1- STREETS AND ALLEYS

Section 1.01 - General

- A. All developments shall include provisions for the construction of streets and appurtenances designed in accordance with this section.
- B. All streets shall be constructed in accordance with the latest version of the Illinois Department of Transportation's "Standard Specifications for Road and Bridge Construction in Illinois", unless otherwise noted in this section.

Section 1.02 – Basic Design Standards

A. General

- 1. The arrangement, character, extent, width, grade, and location of all streets shall conform to the Comprehensive Plan, and shall be considered in their relation to existing and planned streets; to reasonable circulation of traffic within the subdivision and adjoining lands; to topographical conditions; to runoff of storm water; to public convenience and safety; and in their appropriate relations to the proposed uses of the area to be served.
- 2. Where existing streets are dedicated (whether used or not), but not improved to the standards of this Ordinance, and border on, or are wholly within, the proposed subdivision land, they shall be improved to the standards of this Ordinance.
 - a. All public streets shall be completely improved to the full width of the right of way.
 - b. All street improvements shall be extended to the boundaries of the subdivision or development for future continuation.
- 3. The lengths, widths, and shapes of blocks shall be determined with regard to:
 - a. Provision of adequate building sites suitable for the special needs of the types of uses contemplated.
 - b. Zoning requirements as to lot sizes and dimensions within the corporate limits of the Village.
 - c. Needs for convenient access, circulation, control, and safety of street traffic.
 - d. Limitations and opportunities of topography.
 - e. Block lengths shall not exceed 1,200 feet or be less than 400 feet.
- 4. Where adjoining areas are not subdivided, the arrangement of streets in new subdivisions shall be extended to the boundary of the tract to make provision for the future protection of streets into adjacent areas.

5. Any construction within or changes to rights of way under the jurisdiction of the State of Illinois, Will County, or Washington Township shall require the approval of that jurisdiction in addition to Village Board approval before any construction is allowed to begin.

B. Right-of-way and Pavement Widths

All right-of-way and pavement widths shall conform to the standards in the following table.

TYPE	R.O.W./ Easement Width	Pavement Width (Back to Back of Curb)	Pavement Width, Conservation Design (Back to Back of Curb)
Minor Arterial	120'	State Standards	State Standards
Major Collector or Industrial	100'	48'	48'
Minor Collector or Industrial	80'	39'	39'
Residential	66'	32'	26'
Alley (Commercial)	30'	24'	20'
Alley (Residential)	20'	16'	16'
Utility Easement	15' minimum	N/A	N/A
Cul-de-sac (Commercial and Industrial-Urban)	130'	98'	98'
Cul-de-sac (Residential)	120'	93'	93'

C. Collector Street

A collector thoroughfare may be required by the Village Board:

1. in a residential subdivision containing 20 acres or more in area and where the lots are one-half acre or less in area,
2. in any subdivision as an extension of a collector thoroughfare in an adjacent subdivision,
3. in any manufacturing or business subdivision.

D. Residential Streets

Local streets shall be so aligned that their use by through traffic will be discouraged.

E. Cul-de-sac Streets

Cul-de sacs may be permitted in subdivisions where lot availability, site planning, or traffic control purposes determine a through street is not practicable.

1. Single-family residential district cul-de-sac streets shall be not more than 500 feet in length, measured along the street centerline from the centerline of the street of origin, through the center of the circle.
2. Single-family residential district cul-de-sac streets may be longer than 500 lineal feet provided not more than 15 lots abut upon its right-of-way line.
3. Multiple-family residential district cul-de-sac streets shall not exceed 300 feet in length.

4. A temporary cul-de-sac street, or a cul-de-sac street having not more than three lots fronting on its right-of-way may have a “tee/hammerhead” type terminus or other variation of the circular shape, as approved by the Planning and Zoning Commission.

The final plat shall provide for a temporary easement to accommodate the construction and use of “tee/hammerhead” turnaround until such time the street extension is completed and accepted by the Village.

5. A maximum of five (5) lots shall have frontage on the circumference of the cul-de-sac.

F. Alleys

1. Alleys are not permitted in residential subdivisions unless approved by the Planning and Zoning Commission.

G. Geometrics and Design

1. Street layout design must provide intersections and confluences that encourage safe and efficient traffic flow at or near right angles, with no intersections at less than sixty (60) degrees.
2. Intersections of more than two streets shall be avoided unless specific conditions of design indicate otherwise.
3. Sight distance calculations are required at intersections unless waived by Village Engineer.
4. Street jogs with centerline offsets of less than 150 feet shall be avoided.
5. Where there is a deflection in horizontal center lines in excess of one degree, within a given block at any given point, a curve shall be inserted with AASHTO Guidelines for the design speed of the roadway.
6. Broken back curves (reverse curves) are discouraged for horizontal alignment. Where they must be used, a 100 foot minimum tangent length shall be introduced between reverse curves on all secondary and collector thoroughfares; 50 foot minimum on all local and cul-de-sac streets.
7. Minimum horizontal centerline curve at “L” intersections shall be 90 feet.
8. Gradients of streets shall be at least 0.5 percent and a maximum of 7
9. Pavement design shall be in accordance with the standard details supplemented with site specific pavement borings in accordance with Illinois Department of Transportation policies and procedures unless waived by the Village Engineer.
10. Intersections shall have minimum curb radius of twenty-five (25) feet for minor streets, thirty (30) feet for collector streets, and forty (40) feet for arterials.
11. Provisions shall be made for vehicular and pedestrian access to residential property abutting an arterial street either by providing: (a) a marginal access street, or (b) by backing lots to the thoroughfare and providing access by a collector, local, or cul-de-sac street one (1) lot depth removed and with a no-access strip easement not less than ten (10) feet wide along the rear lot line. These standards are established for the purpose of providing protection for the residential properties and to provide for traffic safety and the efficient use of the major street for its intended function of accommodating through traffic.

H. Driveways

1. A paved access driveway, eleven (11) feet minimum, from the right-of-way to the street pavement shall be provided with location designed not to conflict with safety of public traffic. For hybrid or conservation designs, vegetated median strips may be used.
2. All proposed parking areas shall be paved.
3. Driveway or parking area pavements shall consist of a bituminous concrete or a Portland cement concrete surface course. However, for hybrid or conservation designs, permeable pavement may be used.
4. When an existing lot's only access is from an arterial street, the intersection of a proposed driveway with the arterial street may require the installation of acceleration/declaration lanes along the arterial street to provide for vehicular safety.

I. Construction Roads

1. All developments of property which are subject to this ordinance shall, whenever practicable, provide a construction road over the private property being developed for the use of all vehicles and equipment used in connection with such development and the making or delivery of materials and supplies thereto. The construction road shall be continuously maintained by the developer in a dust free manner. The construction road entrance shall be constructed in accordance with the Village of Beecher's erosion control ordinance.
2. Every construction road herein required shall be depicted on the preliminary and final engineering drawings.

J. Half Streets

Half streets shall be prohibited unless otherwise approved by the Board of Trustees.

K. Reserve strips

No strip or area shall be reserved along any portion of a street or alley which will prevent adjacent property owners access thereto.

L. Sidewalks and Pedestrian Way Requirements.

1. Sidewalks or Pedestrian Ways Shall be Provided as follows:
 - a. Residential Subdivision: Sidewalks are required on both sides of all streets.
 - b. Commercial Districts: Sidewalks are required on both sides of all streets.
 - c. Industrial Districts: Sidewalks in industrial districts shall be provided as directed by the Village Board.
 - d. Pedestrian ways or sidewalks may be required by the Village through the center of blocks more than eight hundred (800) feet long, where deemed essential to provide circulation of access to schools, playgrounds, shopping centers, transportation, and other community facilities. Said pedestrian ways or sidewalks shall be located within a right-of-way or easement at least twelve (12) feet in width.
 - e. Sidewalks will be required along major roadways such as state or county routes which are within or abutting the proposed development. Bike paths may be

permitted at the discretion of the Board of Trustees in lieu of sidewalks., if it is in the best interest of the Village as determined by the Board of Trustees

2. Sidewalks or Pedestrian Way Construction and Specifications:

- a. Sidewalks shall be constructed of Portland cement concrete, have a minimum thickness of five (5) inches, and be at least five (5) feet in width.
- b. The Standard location for sidewalks shall be within the street right-of-way (ROW) with the outside edge one (1) foot off said ROW line. Pedestrian ways may also be located one (1) foot off the street ROW line or within a pedestrian way easement.
- c. Sidewalks shall be constructed in conformance to Section 624 of the IDOT Standards Specifications. Test cylinders may be taken and certified compression test reports submitted to the Village Engineer. Finished surfaces of a newly constructed sidewalk shall be coated with anti-spall and curing compound as approved by the Village Engineer.
- d. Aggregate Base. Sidewalks shall be constructed with a minimum four (4) inch thick aggregate base with a CA-6 graduation.
- e. Handicap Ramps at Intersections. All sidewalks shall be provided with concrete handicap ramps at all intersections and at pedestrian ways in accordance with minimum Federal guidelines and requirements for accessible design.

Section 1.03 – Material Specifications

- A. All roadway construction materials and methods shall be in accordance with the Illinois Department of Transportation Standard Specifications for Road and Bridge construction in Illinois and, and Design Manual, Illinois Department of Transportation latest edition.
- B. Bituminous concrete mix designs shall be submitted to the Village engineer prior to scheduling paving work and shall be IDOT approved.
- C. All plant load tickets shall be clearly marked with an approved asphalt mix design code or mix type. Any bituminous material delivered without proper load tickets may be rejected.
- D. Base course materials shall be crushed stone or crushed gravel and shall conform to IDOT gradation CA-6.
- E. Material testing in accordance with Illinois Department of Transportation Bureau of Materials and Physical Research “Project Procedures Guide” shall be provided by an independent testing firm approved by the Village and paid for by the developer; unless deemed unnecessary by the Village Engineer.
- F. Asphalt pavement cores and additional testing may be required at the discretion of the Village Engineer if pavements have failed, if minimum density requirements are not met or if the pavement slope is inadequate.

Section 1.04 – Installation

- A. Notification

Provide 48 hour notice to Village, Village Engineer, and testing firm prior to work or test being performed. If an existing street is to be partially or totally closed by prior approval, the developer is to notify the Public Works Dept., Fire Dept., Police Dept. and Schools 48 hours prior to road closure. Traffic control/ detour route plans, using IDOT details, shall be submitted with all construction plans.

B. Erosion Control

1. All soil erosion control measures are to be in place prior to and during the installation of roadway and appurtenances. The soil erosion measures shall be in accordance with the "Procedures and Standards for Urban Soil Erosion Control in Illinois," the General National Pollution Discharge Elimination (NPDES) Permit, the Village of Beecher Soil Erosion and Sediment Control Ordinance No. 1002 and the project plans and specifications.
2. Traveled roadways shall be kept cleaned of mud/debris.
3. Open cuts of Village streets are not allowed unless the Village Administrator or Village Engineer grants written approval, and escrow provided per agreement.

C. Subgrade

1. The subgrade shall be graded and rolled to provide uniform density and shall comply with the profile and cross-sections contained in the drawings.
2. Acceptable proof roll vehicles are: tandem vehicles - 14 ton load or semi vehicles - 21 ton load.
3. All street subgrade shall be proof rolled in the presence of the Village Engineer with an acceptable piece of equipment prior to the placement of any fill materials or base course. A one (1) inch rut or roll maximum is allowed. Repair subgrade until an acceptable proof roll is obtained. If rain or damage from excess construction traffic occurs after the subgrade has been proof rolled and before the base course is placed, another proof roll shall be required prior to placing the base course.

D. Subbase Course (if applicable)

1. The subbase course shall be prepared in accordance with the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction in Illinois.
2. Lime stabilization of the subgrade is encouraged.
3. Acceptable proof roll vehicles are: tandem vehicles - 14 ton load or semi vehicles - 21 ton load.
4. The subbase course shall be proof rolled in the presence of the Village Engineer with an acceptable piece of equipment prior to the placement of any fill materials or base course. A one (1) inch rut or roll maximum is allowed. Repair subbase course and subgrade until an acceptable proof roll is obtained. If rain or damage from excess construction traffic occurs after the subbase course has been proof rolled and before the surface is placed, another proof roll shall be required prior to placing the base course.

E. Base Course

1. The base course shall be prepared in accordance with the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction in Illinois.
 2. Acceptable proof roll vehicles are: tandem vehicles - 14 ton load or semi vehicles - 21 ton load.
 3. The base course shall be proof rolled in the presence of the Village Engineer with an acceptable piece of equipment prior to the placement of any fill materials or base course. A one-half ½-inch rut or roll maximum is allowed. Repair base course and underlying layers until an acceptable proof roll is obtained. If rain or damage from excess construction traffic occurs after the base course has been proof rolled and before the surface is placed, another proof roll shall be required prior to placing the surface course.
- F. Prime Coat
1. Prime coat shall be applied according to the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction in Illinois.
 2. The prime coat must be cured prior to placement of binder course.
 3. Priming immediately in front of the paver is not allowed.
- G. Bituminous paving
1. All work shall be in accordance with the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction in Illinois.
 2. The Developer is responsible for pavement maintenance, including filling potholes, when requested by the Village.
 3. The surface course shall not be applied until the binder course has weathered through one winter season.
 - a. Binder course shall be installed to match curb elevation and ground to final elevation at the time of surface course installation.
 4. No open cutting of binder course shall be allowed for utility installations, including utility service lines.
 5. Clean pavement and curbs prior to proof roll.
 6. Remove and replace damaged curb and gutter.
 - a. The minimum length of removal and replacement is ten feet.
 - b. Two continuous #4 rebar are required in all replacement sections.
 - c. Replacement curb requires two dowel bars at each end.
 - d. Maximum diameter ¾-inch; twelve inch inserted length;
 - e. Installation shall be in accordance with IDOT requirements.
 - f. Any pavement disturbed by curb replacement shall be sawcut a minimum 18-inches inches wide. Pavement sawcut length to be determined by the Village review engineer.
 - g. Any bituminous driveway aprons disturbed by curb removal shall be sawcut a minimum of 24-inches wide and replaced full width.
 - h. Any concrete driveway aprons disturbed by curb removal shall be sawcut at the closest joint and replaced full width.

- i. Portland Cement Concrete shall be used to backfill the void created by removal of the front form boards of any concrete curb replacement to within two (2) inches of the final surface.
- 7. Remove cold patch mix and replace with hot mix.
- 8. Place level binder in binder irregularities. Any excessive settlement shall be removed and replaced as determined by the Village review engineer.
- 9. Bituminous material (tack coat) will be placed only if the Village accepts the conditions of the pavement.
- 10. Bituminous surface course placed on pavement not accepted by the Village will be removed and replaced.
- 11. The Village Engineer may establish a paving cut-off date each year.
- 13. The Developer is responsible for pavement maintenance including potholes, until maintenance Bond is released.
- F. Portland Cement Concrete Paving
 - 1. Concrete pavement will not be allowed without prior approval of the pavement thickness and jointing design by the Village Engineer.
 - 2. All work shall be in accordance with the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction in Illinois.
 - 3. The concrete pavements will be finished with a Type A final finish as specified in Article 420.11 of the Standard Specifications.
 - 4. Any concrete pavement greater than six (6) inches in thickness will require dowel bars between joints and curb and gutter for load transfer unless deemed unnecessary by the Village Engineer.
 - 5. Dowel bar diameters shall be in accordance with the latest version of IDOT Highway Standard 420001.
 - 6. Joint spacing shall be between 11-feet and 15-feet (maximum spacing) depending on the width of the pavement. Joint spacing may be adjusted to accommodate different road features (drainage castings, etc.) so long as it adheres to the guidelines of the IDOT Highway Standards and the American Concrete Pavement Association's *Intersection Joint Layout*.

Section 1.05 - Street Signs and Traffic Control

A. General

- 1. The Village may, within two years of final plat approval, designate the location and type of traffic control items and street signs that are required in any subdivision or development. If the signs are installed by the Village, the developer shall reimburse the Village for costs associated with the acquisition, installation, replacement, and maintenance of such signs.
- 2. Signs, striping, and other traffic control items shall be installed in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD), latest edition, and

the “Standard Specifications for Road and Bridge Construction in Illinois”, latest edition, unless otherwise modified in this section.

B. Sign Posts

1. All sign posts shall be made of a square two piece quick punch assembly and shall be 12-guage hot dipped galvanized steel.
2. The base post shall be a minimum of 36 inches in length and shall measure a minimum of 2 inches O.D. square. The sign post length shall vary depending on the sign in order to maintain a distance of a minimum of 7 feet from grade to the bottom of the sign and shall measure a minimum of 1 ¾ inches O.D. square.
3. The base post shall be driven plumb into undisturbed soil with a maximum of 3 inches above grade. The top of the post shall not be distorted or damaged from driving it into the soil.
4. The assembly shall be secured with a galvanized or equal bolt, flat washer, and lock nut. The end of bolt is to be peened over so the lock nut cannot be removed.

C. Signs

1. Street name sign blades shall be 9-inch wide extruded aluminum with white diamond grade sheeting. Street names shall be made of 6 inch series “B” letters, The street designation suffix shall be made of 3 inch series “B” letters. The letters shall be placed straight and evenly spaced.
2. The base color shall be diamond grade green with white E.C. film lettering and shall vary in length according to the street name. The Village of Beecher logo shall be on the left side of the sign and shall begin 3 inches from the end of the blade. The letter shall begin 2 inches from the logo and end 3 inches from the end of the blade.
3. Stop signs (R1-1) shall be 30-inch with diamond grade VIP sheeting. The “ALL WAY” placard (R1-4) shall be applied to all signs at all way stop intersections.
 - a. At least one stop sign shall be required at every three-way intersection and at least two stop signs shall be required at every four way intersection.
4. Stop signs (R1-1) shall be 36-inch with diamond grade VIP sheeting at Illinois Route 1 (Dixie Highway).
5. Yield signs (R1-2) shall be 36-inch with diamond grade VIP sheeting.
6. Speed limit signs for local roads shall have black lettering on a white background with diamond grade VIP sheeting.
 - a. Speed limit signs for local roads shall be 24-inch x 36-inch with “RESIDENTIAL” “25 MPH” “UNLESS OTHERWISE POSTED” text.
 - b. Speed limit signs (R2-1) for collector streets shall be 24-inch x 30-inch.
7. WEIGHT LIMIT – 5 TONS (R12-1) signs shall have black lettering on a white background and shall be 24-inch x 30-inch with diamond grade VIP sheeting.
8. NO PARKING ON VILLAGE STREETS AFTER 2 INCH SNOWFALL signs shall have red lettering on a white background shall be 24-inch x 30-inch with diamond grade VIP sheeting.

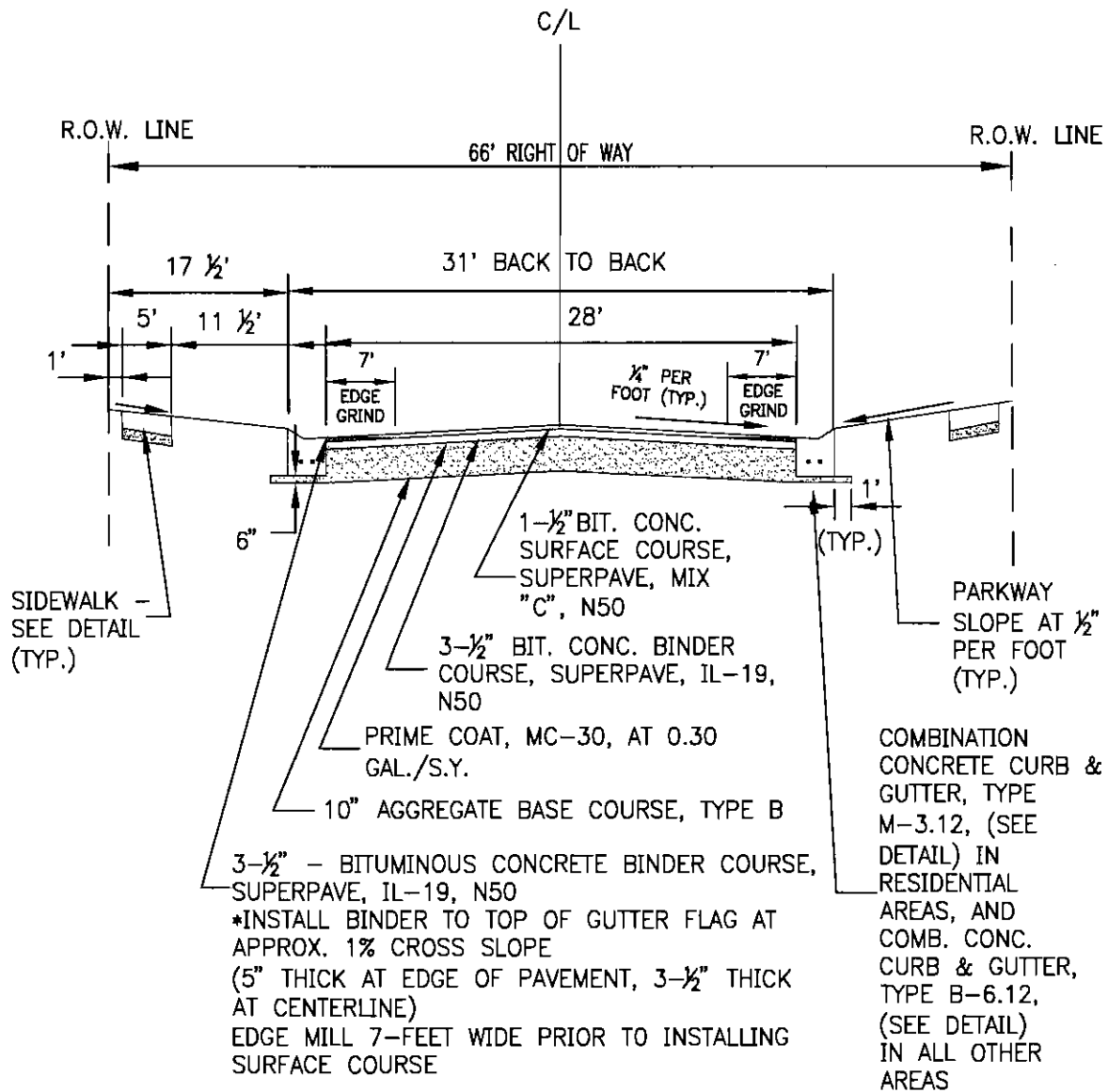
D. Hardware and Installation

1. All banding, buckles and clips shall be stainless steel. Banding shall have a minimum of ½ inch width and shall have a minimum of 30 thousands in thickness.
 2. All streets name signs shall be mounted on a free standing poles using a 14 inch wing bracket for blades under 36 inches and a 24 inch wing bracket for blades 36 inches or over. All wing brackets shall be made for extruded blades; mounted to street light poles with three bands; secured using 5/16 inch by 1 ¼ inch galvanized bolts or equal , with a flat washer and lock nut; and be placed a minimum of 12 feet above grade on the light pole. Regulatory signs shall be mounted with vandal-proof hardware.
 3. All streets name signs shall be placed a minimum of 12 feet from grade and placed parallel to the street named. Street name signs shall be located at all street intersections and changes in street names.
 4. All sign installations shall conform to the Manual on Uniform Traffic Control Devices, 2003 Edition and shall be consistent with the approved Traffic Control, Striping, and Signage Plans. In the case of a conflict, the Village of Beecher Code shall take precedence.
 5. For new subdivisions construction, temporary street signs may be mounted on a temporary post with a minimum of 2-pound green or galvanized U post and with a minimum length of 12 feet. Street signs and regulatory signs are to be erected prior to the issuance of the first Certificate of Occupancy. The signs shall be installed in accordance with the approved signage plan. The Developer is solely responsible for the maintenance of the sign installations until the Village accepts the signs.
 6. All signs on temporary posts will be transferred to a square post. Signs must be transferred to the pole/post at the time street lighting is installed or at the request of the Village.
- E. Decorative Signs And Sign Posts
1. Decorative type signs and posts may be utilized where approved by the Village.
 2. Decorative sign specifications shall comply with this ordinance.
 - a. Pole model: Combo 59HB manufactured by Mel Northey or approved equal.
- F. Pavement Striping
1. Stop bars shall be required at all stop signs.
 2. Stop bars and striping shall be thermoplastic with location, widths, and colors in accordance with the Illinois Department of Transportation District One Standard Detail.
 3. Temporary paint striping shall be required after binder placement on all collector or greater streets or between Nov. 1 through January 1.
 4. Raised reflective pavement markers will be required for major collectors, minor and major arterials on centerline skip dash, double yellow centerline and turn lanes.

Section 1.06 - Details

- A. Typical Pavement Sections
- B. Driveways

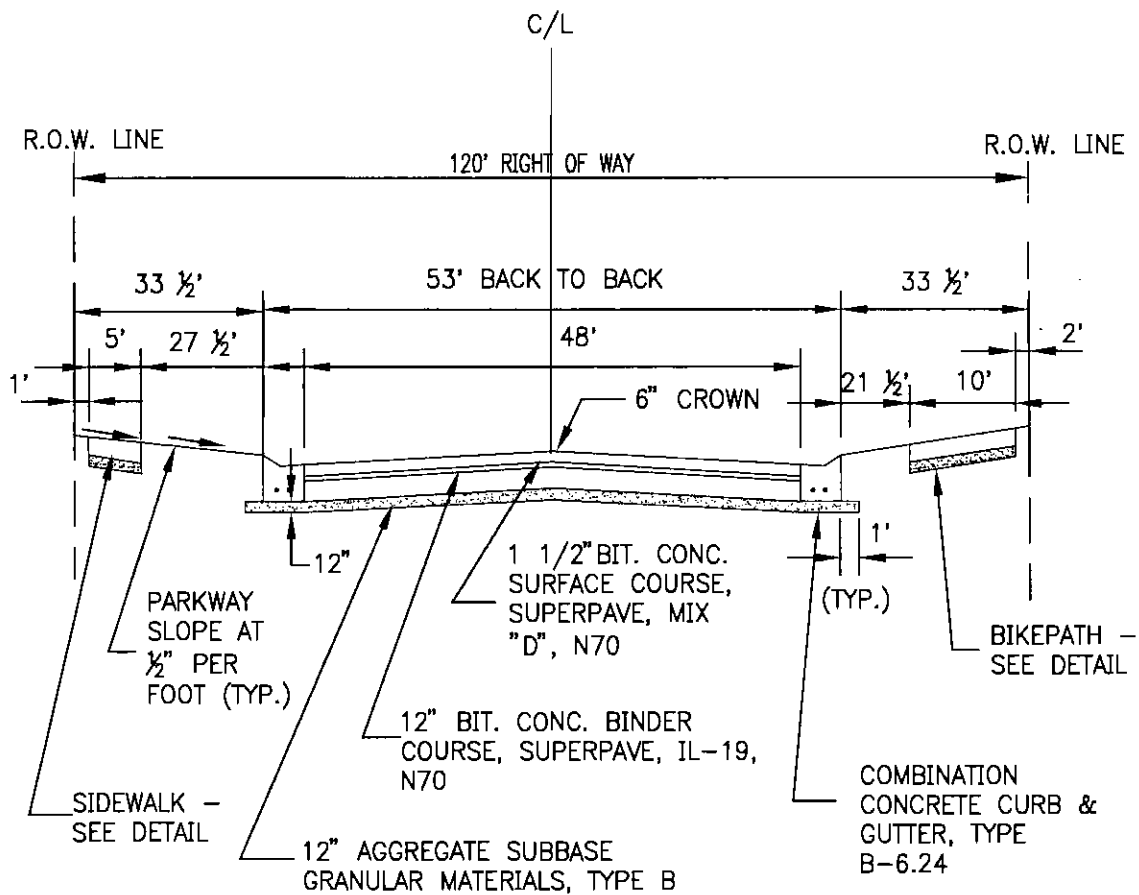
- C. Portland Cement Concrete Sidewalk
- D. Bicycle Path
- E. Street Signs



NOTES:

1. ALL CURBS AND SIDEWALKS SHALL BE CONSTRUCTED WITH IDOT CLASS "ST" CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 3,500 PSI AT 14 DAYS.
2. PARKWAYS SHALL BE FINISHED WITH A MINIMUM OF FOUR INCHES OF TOPSOIL AND SOD.
3. TESTING OF SUBGRADE AND ALL ROADWAY MATERIALS SHALL BE DONE IN ACCORDANCE WITH THE VILLAGE'S SUBDIVISION ORDINANCE.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
ROADWAY CROSS-SECTION
LOCAL
DATE: OCT. 2005

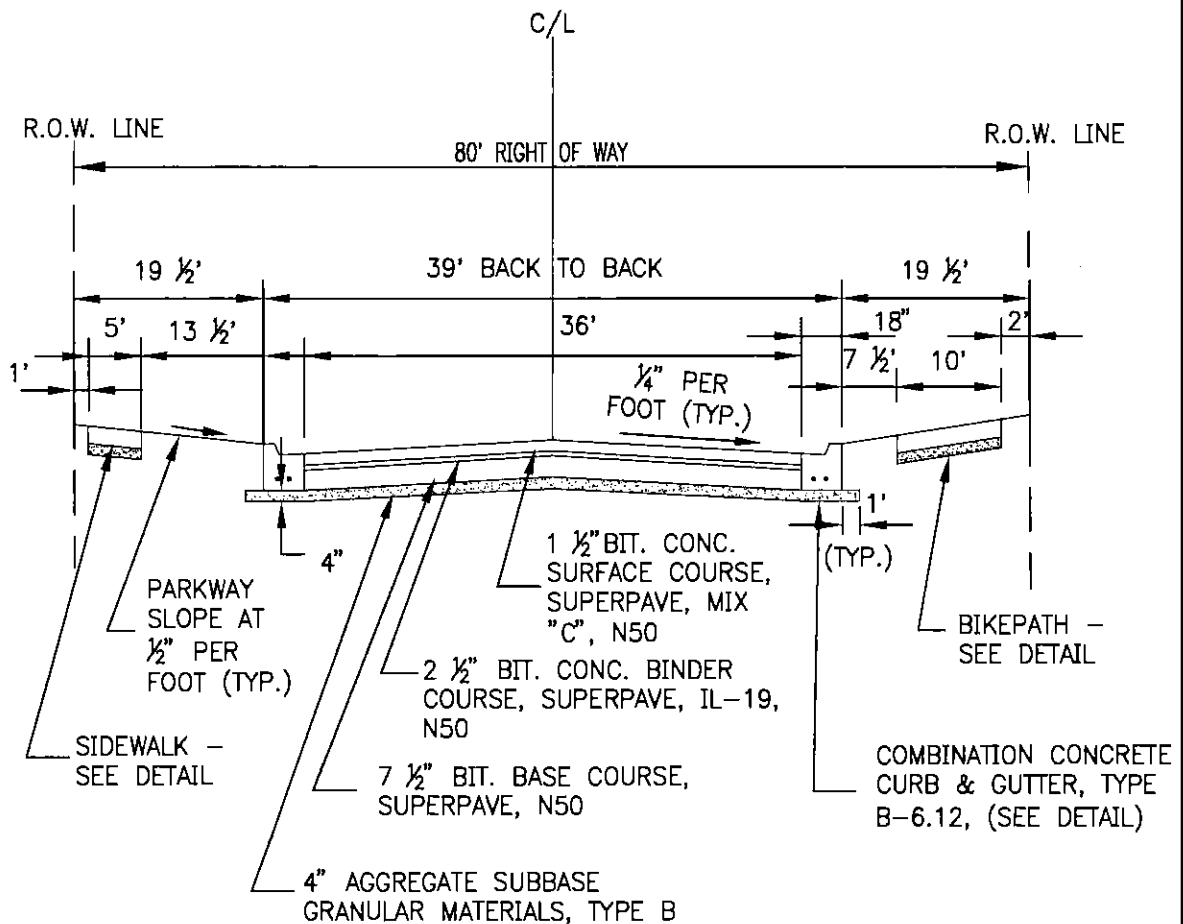


NOTES:

1. ALL CURBS AND SIDEWALKS SHALL BE CONSTRUCTED WITH IDOT CLASS "SI" CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 3,500 PSI AT 14 DAYS.
2. PARKWAYS SHALL BE FINISHED WITH A MINIMUM OF SIX INCHES OF TOPSOIL AND SOD.
3. TESTING OF SUBGRADE AND ALL ROADWAY MATERIALS SHALL BE DONE IN ACCORDANCE WITH THE VILLAGE'S SUBDIVISION ORDINANCE.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
ROADWAY CROSS-SECTION
ARTERIAL
DATE: OCT. 2005

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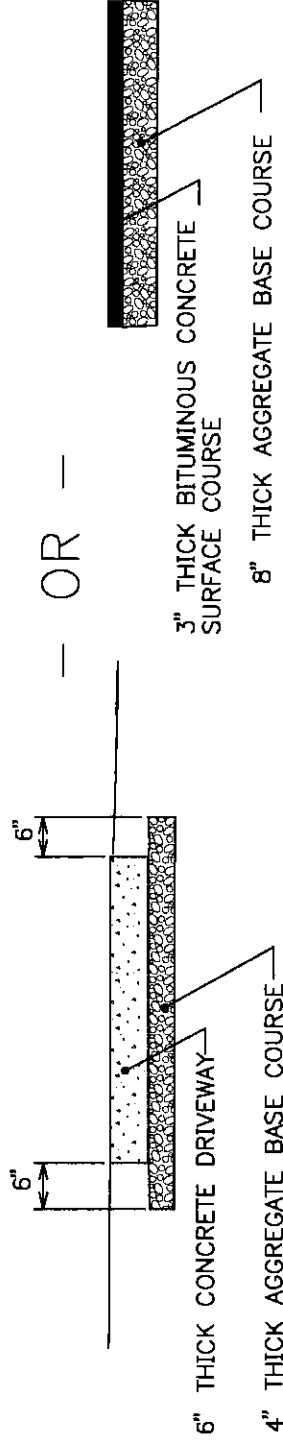


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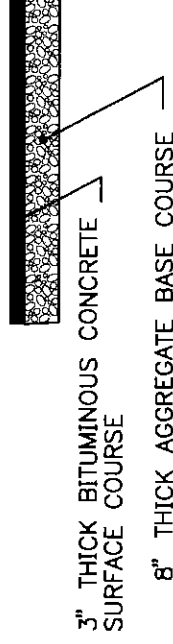
1. ALL CURBS AND SIDEWALKS SHALL BE CONSTRUCTED WITH IDOT CLASS "SI" CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 3,500 PSI AT 14 DAYS.
2. PARKWAYS SHALL BE FINISHED WITH A MINIMUM OF SIX INCHES OF TOPSOIL.
3. TESTING OF SUBGRADE AND ALL ROADWAY MATERIALS SHALL BE DONE IN ACCORDANCE WITH THE VILLAGE'S SUBDIVISION ORDINANCE.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
ROADWAY CROSS-SECTION
MINOR COLLECTOR
DATE: OCT. 2005

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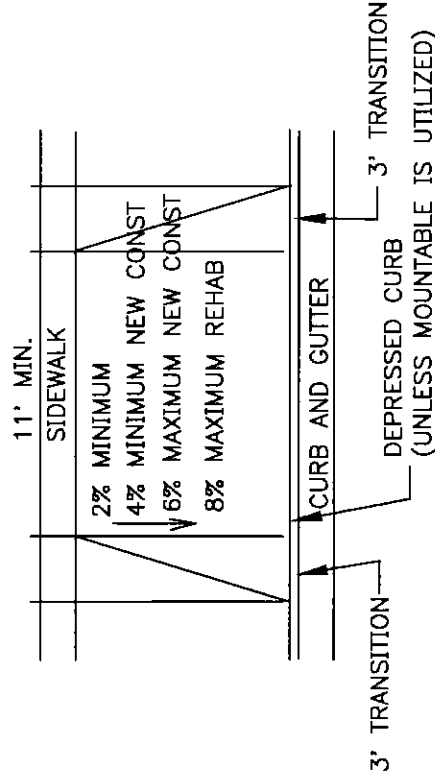


— OR —



NOTES:

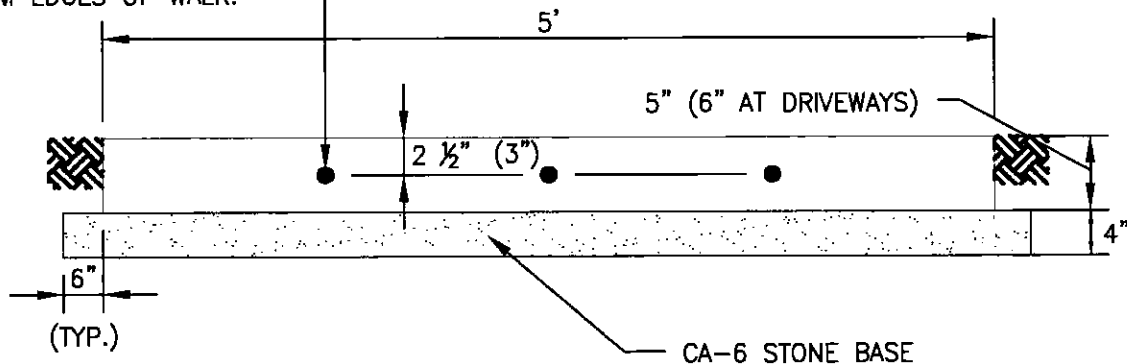
- 1.) CONCRETE SHALL BE CLASS "SL."
- 2.) BITUMINOUS SURFACE COURSE SHALL BE SUPER PAVE, MIX "C", N50.
- 3.) AGGREGATE BASE COURSE SHALL BE CA-6.
- 4.) PREMOULDED EXPANSION JOINTS SHALL BE PROVIDED AGAINST SIDEWALK AND CURB AND GUTTERS. (CONCRETE ONLY)
- 5.) BARRIER CURB AND GUTTER SHALL BE DEPRESSED AT DRIVEWAYS. BARRIER CURB AND GUTTER SHALL BE DEPRESSED AT DRIVEWAYS. A 12"-18" TRANSITION FROM FULL BARRIER TO FULL DEPRESSION SHALL BE PROVIDED ON EACH SIDE OF THE DRIVEWAY.
- 6.) MOUNTABLE CURB SHALL NOT BE CUT TO ACCOMMODATE DRIVEWAY.
- 7.) 6 X 6, 10 X 10 WELDED WIRE FABRIC SHALL BE USED IN CONCRETE DRIVEWAY PAVEMENTS



VILLAGE OF BEECHER
STANDARD DETAIL
FOR
DRIVEWAYS
DATE: OCT. 2005

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INSTALL #4 REINFORCING
BARS, 12" LONG,
EMBEDDED 6", AT ALL
CONNECTIONS BETWEEN
NEW AND EXISTING
SIDEWALKS.
(TYP. FOR 3)
BARS SHALL BE SPACED
A MINIMUM OF 6 INCHES
FROM EACH OTHER AND
FROM EDGES OF WALK.

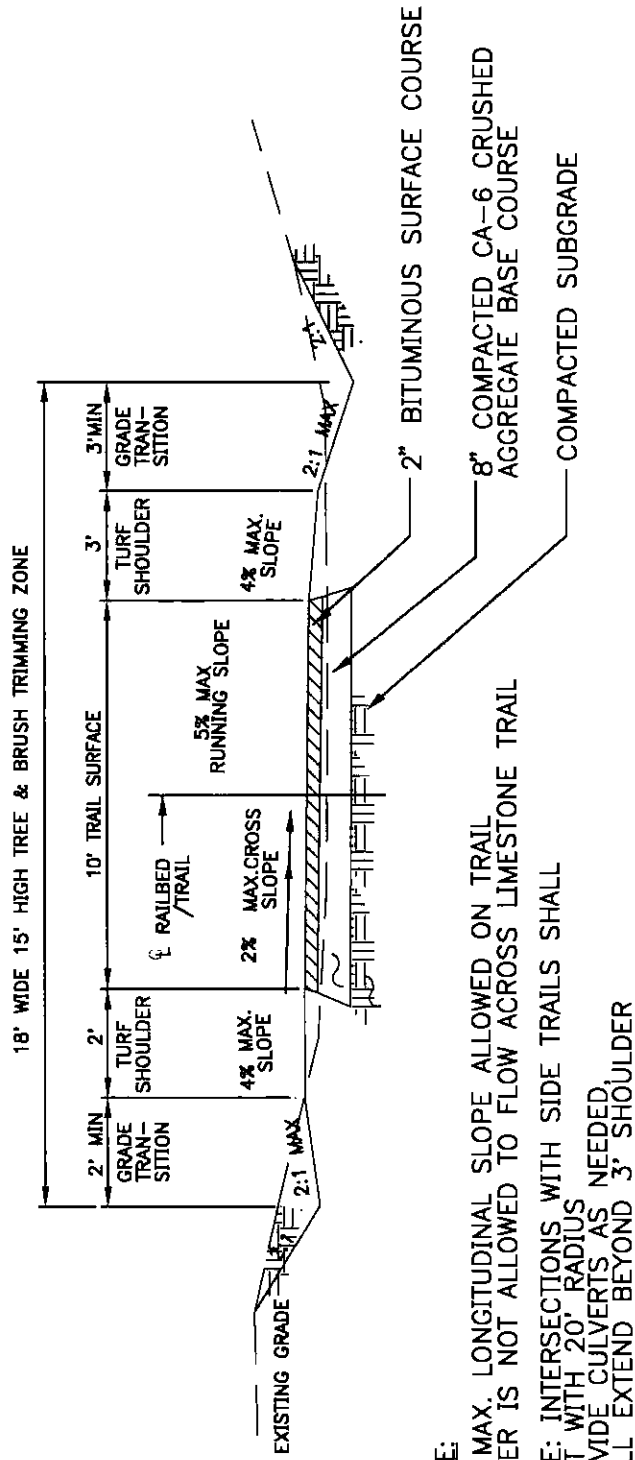


NOTES:

1. ALL SIDEWALK SHALL BE CONSTRUCTED WITH IDOT CLASS "SI" CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 3,500 PSI AT 14 DAYS
2. PREFORMED EXPANSION JOINTS (3/4" THICK) SHALL BE CONSTRUCTED IN SIDEWALK EVERY 100 FEET AND AT ALL ABUTTING DRIVEWAYS AND CURB AND GUTTER.
3. TOOLED CONTRACTION JOINTS SHALL BE CONSTRUCTED IN SIDEWALK EVERY FIVE FEET.
4. SIDEWALK SHALL HAVE 1/4" PER FOOT CROSS-SLOPE.
5. WELDED WIRE FABRIC (6X6/6X6) OR FIBER MESH SHALL BE INSTALLED THROUGH DRIVEWAYS AT 2" ABOVE SLAB BOTTOM.
6. FORMBOARD REQUIREMENTS: MINIMUM 2" X 6".
7. USE 2#4 REINFORCING BARS, 10' LONG OVER ALL UTILITY TRENCHES FOR NEW SIDEWALK.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
SIDEWALK
DATE: OCT. 2005

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NOTE:

5% MAX. LONGITUDINAL SLOPE ALLOWED ON TRAIL
WATER IS NOT ALLOWED TO FLOW ACROSS LIMESTONE TRAIL

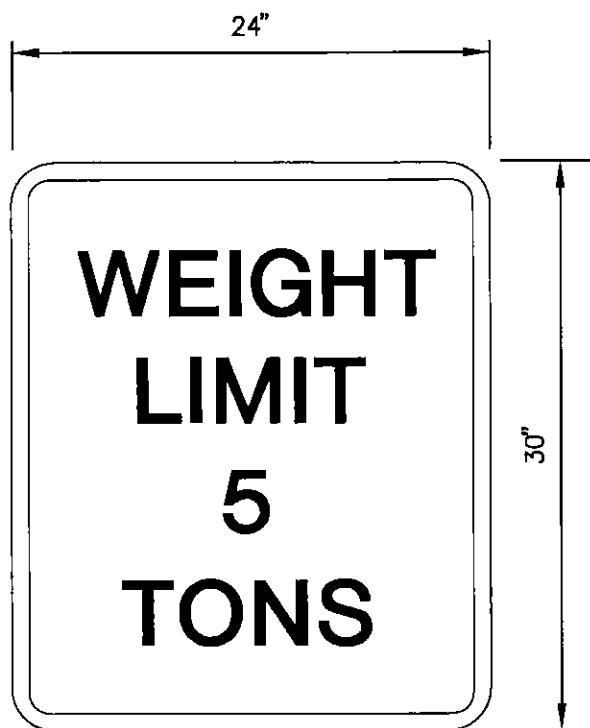
NOTE: INTERSECTIONS WITH SIDE TRAILS SHALL
MEET WITH 20' RADIUS
PROVIDE CULVERTS AS NEEDED,
SHALL EXTEND BEYOND 3' SHOULDER

TYPICAL TRAIL SECTION

NOT TO SCALE

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
BITUMINOUS BICYCLE
PATH PAVEMENT
DATE: OCT. 2005

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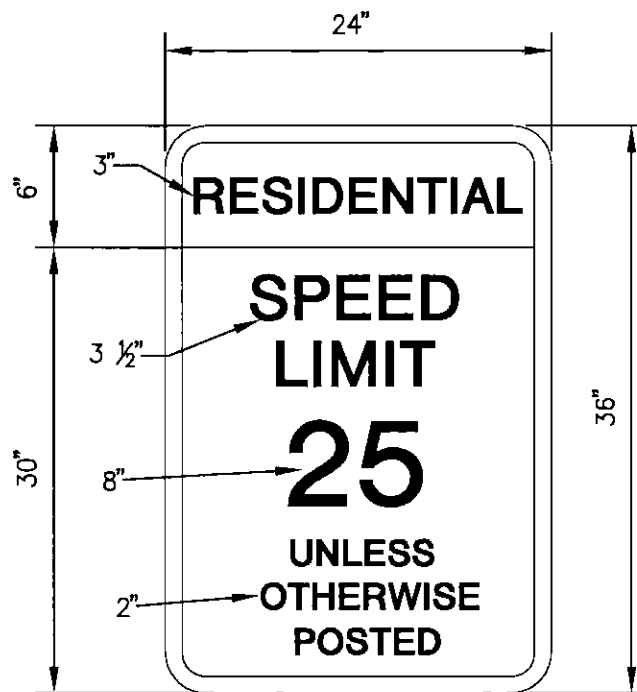


NOTE: PLACE UNDERNEATH SPEED LIMIT SIGN ON SAME POST.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
5 TON WEIGHT LIMIT SIGN

DATE: NOV. 2005

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NOTES:

1. PREFERRED LETTER SIZES NOTED.
2. PLACE ABOVE WEIGHT LIMIT SIGN ON SAME POST.
3. POSTED AT ALL ENTRANCES TO SUBDIVISION.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
RESIDENTIAL SPEED
LIMIT SIGN
DATE: NOV. 2005

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VILLAGE OF BEECHER
STANDARD DETAIL
FOR
NO PARKING SIGN

DATE: NOV. 2005

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1. SIGN POSTS

A. All sign posts shall be made of a square two piece quick punch assembly and shall be 12-gauge hot dipped galvanized steel.

B. The base post shall be a minimum of 36 inches in length and shall measure a minimum of 2 inches O.D. square. The sign post length shall vary depending on the sign in order to maintain a distance of a minimum of 7 feet from grade to the bottom of the sign and shall measure a minimum of 1 $\frac{3}{4}$ inches O.D. square.

C. The base post shall be driven plumb into undisturbed soil with a maximum of 3 inches above grade. The top of the post shall not be distorted or damaged from driving it into the soil.

D. The assembly shall be secured with a galvanized or equal bolt, flat washer, and lock nut. The end of bolt is to be peened over so the lock nut cannot be removed.

2. SIGNS

A. Street name sign blades shall be 9-inch wide extruded aluminum with white diamond grade sheeting. Street names shall be made of 6 inch series "B" letters. The street designation suffix shall be made of 3 inch series "B" letters. The letters shall be placed straight and evenly spaced.

B. The base color shall be diamond grade white with green E.C. film lettering and shall vary in length according to the street name. The Village of Beecher logo shall be on the left side of the sign and shall begin 3 inches from the end of the blade. The lettering shall begin 2 inches from the logo and end 3 inches from the end of the blade.

C. Stop signs (R1-1) shall be 30-inch with diamond grade VIP sheeting. The "ALL WAY" placard (R1-4) shall be applied to all stop signs at all way stop intersections.

D. Stop signs (R1-1) shall be 36-inch with diamond grade VIP sheeting at all intersections with Illinois Route 1 (Dixie Highway).

E. Yield signs (R1-2) shall be 36-inch with diamond grade VIP sheeting.

F. Speed limit signs for local roads shall have block lettering and borders on a white background with diamond grade VIP sheeting.

1. Speed limit signs for local roads shall be 24-inch x 36-inch with "RESIDENTIAL" "25 MPH" "UNLESS OTHERWISE POSTED" text.

2. Speed limit signs (R2-1) for collector streets shall be 24-inch x 30-inch.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
SIGN STANDARDS
SHEET 1 OF 2
DATE: NOV. 2005

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G. WEIGHT LIMIT - 5 TONS (R12-1) signs shall have black lettering and borders on a white background and shall be 24-inch x 30-inch with diamond grade VIP sheeting.

H. Sprinkling restriction signs shall have black lettering and borders on a white background and shall be 24-inch x 30-inch with diamond grade VIP sheeting with "SPRINKLING ALLOWED" "6AM TO 10AM" "6PM TO 10PM" "ODD/EVEN" text.

I. NO PARKING ON VILLAGE STREETS AFTER 2 INCH SNOWFALL signs shall have red lettering and borders on a white background and shall be 24-inch x 30-inch with diamond grade VIP sheeting.

3. HARDWARE AND INSTALLATION

A. All banding, buckles and clips shall be stainless steel. Banding shall have a minimum of 1/8 inch width and shall have a minimum of 30 thousandths inch thickness.

B. All street name signs shall be mounted on a street light pole using a 14 inch wing bracket for blades under 36 inches and a 24 inch wing bracket for blades 36 inches or over. All wing brackets shall be made for extruded blades; mounted to street light poles with three bands; secured using 5/16 inch by 1 1/4 inch galvanized bolts or equal, with a flat washer and lock nut; and be placed a minimum of 12 feet above grade on the light pole. Regulatory signs shall be mounted with vandal-proof hardware.

C. All streets name signs shall be placed a minimum of 12 feet from grade and placed parallel to the street named.

D. All sign installations shall conform to the Manual on Uniform Traffic Control Devices, 2003 Edition and shall be consistent with the approved Traffic Control, Striping, and Signage Plans. In the case of a conflict, the Village of Beecher Code shall take precedence.

E. For new subdivision construction, permanent street signs may be mounted on a temporary post with a minimum of 2-pound green or galvanized U post and with a minimum length of 12 feet. Street signs and regulatory signs are to be erected prior to the issuance of the first building permit. The signs shall be installed in accordance with the approved signage plan. The Developer is solely responsible for the maintenance of the sign installations until the Village accepts the signs.

F. All signs on temporary posts will be transferred to a light pole or a square post where there is no light pole. Signs must be transferred to the pole/post at the time street lighting is installed or at the request of the Village.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
SIGN STANDARDS
SHEET 2 OF 2
DATE: NOV. 2005

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VILLAGE OF BEECHER, ILLINOIS ENGINEERING TECHNICAL STANDARDS

SECTION 2 CURB AND GUTTER

Section - 2.01 General

- A. All curb and gutter shall be installed in accordance with the material installation and testing requirements of the “Standard Specifications for Road and Bridge Construction in Illinois,” latest edition, unless otherwise modified in this section.
- B. Specification references made herein for manufactured items, such as reinforcement, refer to designations of the American Society for Testing and Materials (ASTM).

Section - 2.02 Curb Standards

- A. Residential:
 - 1. Combination concrete curb and gutter, Type M-3.12 conforming to the dimensions shown in the Standard Detail shall be used.
 - 2. The back of curb shall be depressed at all sidewalk ADA ramp locations and at all driveways whose locations are known at the time of curb installation.
- B. Commercial / Industrial:
 - 1. Combination concrete curb and gutter Type B-6.12 conforming to the dimensions shown in the Standard Detail shall be used.
 - 2. Depressed curb shall be provided at all sidewalk ADA ramp locations and at all driveways whose locations are known at the time of curb installation. However, if the driveway location is not known at the time of curb and gutter installation, a vertical face barrier curb shall be installed, and the driveway opening will be provided later by the lot owner.

Section - 2.03 Materials

- A. Concrete:

Portland cement concrete having a minimum compressive strength of 4,000 pounds per square inch in 28 days shall be used. Air entrainment shall be in the 3 to 6 percent range and slump shall be 2 to 4 inches. However, if a slip form paver is used, the slump shall be adjusted to meet the requirements of the slip forming process.
- B. Expansion Joint Filler:

Bituminous performed expansion joint filler, ¾-inch thick, and pre-shaped to the profile of the curb shall be used.
- C. Expansion Joint Dowels:

Two #5 smooth steel dowels, 24-inches long with pinched stop caps on one end shall be used, (see Details).

D. Re-Bar:

Two #4 bars shall be placed continually between expansion joints.

E. Joint Sealant:

A cold poured joint compound shall be used.

F. Curing Compound:

Curing compound shall be Type II or III, as specified in Section 1022 of the Standard Specifications for Road and Bridge Construction.

G. Curb Base Course:

Curb base course shall be IDOT gradation CA-6 crushed stone or crushed gravel.

H. Curb Stamping:

Stamp curbs as shown on HC Standard Details.

Section - 2.04 Installation

A. Base Preparation:

The base course shall be CA-6, trimmed or filled as necessary to provide a full depth of curb and gutter as shown in the curb detail. Prior to concrete placement, the base course shall be compacted and proofrolled in accordance with the testing and acceptance requirements below.

B. Placing and Finishing Concrete:

1. The Village shall be notified at least 24-hours before pouring the curb.
2. Concrete shall be thoroughly tamped to remove all voids. The curb and gutter surface shall be broom finished at right angles to the flow line of the curb and gutter. Any honeycombed areas along the sides of the curb shall be pointed with mortar.
3. The curb shall be depressed for ADA ramps at all sidewalk locations.

C. Curing and Protection:

The curb shall be sealed with curing compound as the finishing work proceeds. Protection shall be in accordance with the standard specifications.

D. Joints:

1. Expansion joints shall be placed, as a minimum, at all curb radius points and all construction joints in the curb, and shall consist of expansion joint filler and dowels with end caps as shown in the detail.
2. Contraction joints shall be sawcut at 20-foot maximum intervals to a depth of 2 inches. Sawcutting shall be done as soon as practical before any random shrinkage cracking occurs and no later than 24 hours after the concrete has been placed. The clean joint space shall be sealed with a cold poured joint compound.

Section 2.05 – Testing and Acceptance

A. Proof Roll:

The proof roll shall be performed in accordance with the subbase or base preparation requirements of Section 1 of the Village standards.

B. Concrete:

The Village may require the compressive strength, slump, and air content of the concrete be tested. All costs of testing shall be borne by the Contractor. Any concrete not conforming to the standard specifications will be rejected.

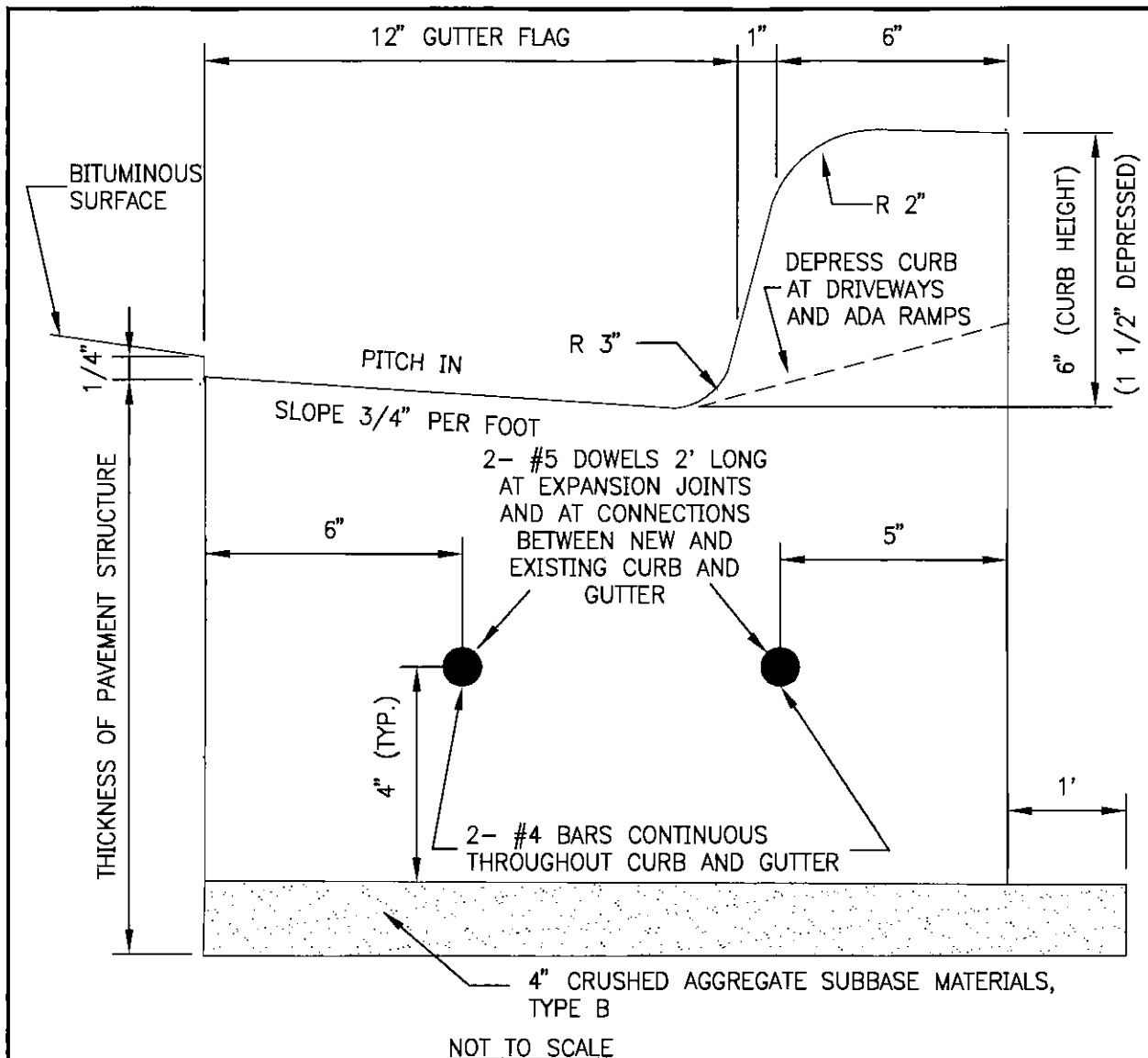
Section 2.06 - Defects

Any curb that has been installed at the improper line and grade, that is damaged or badly cracked, or that has been installed with improper material shall be removed and replaced as a condition of acceptance.

Section 2.07- Details

A. Barrier Combination Concrete Curb and Gutter, Type B-6.12 (RO-012)

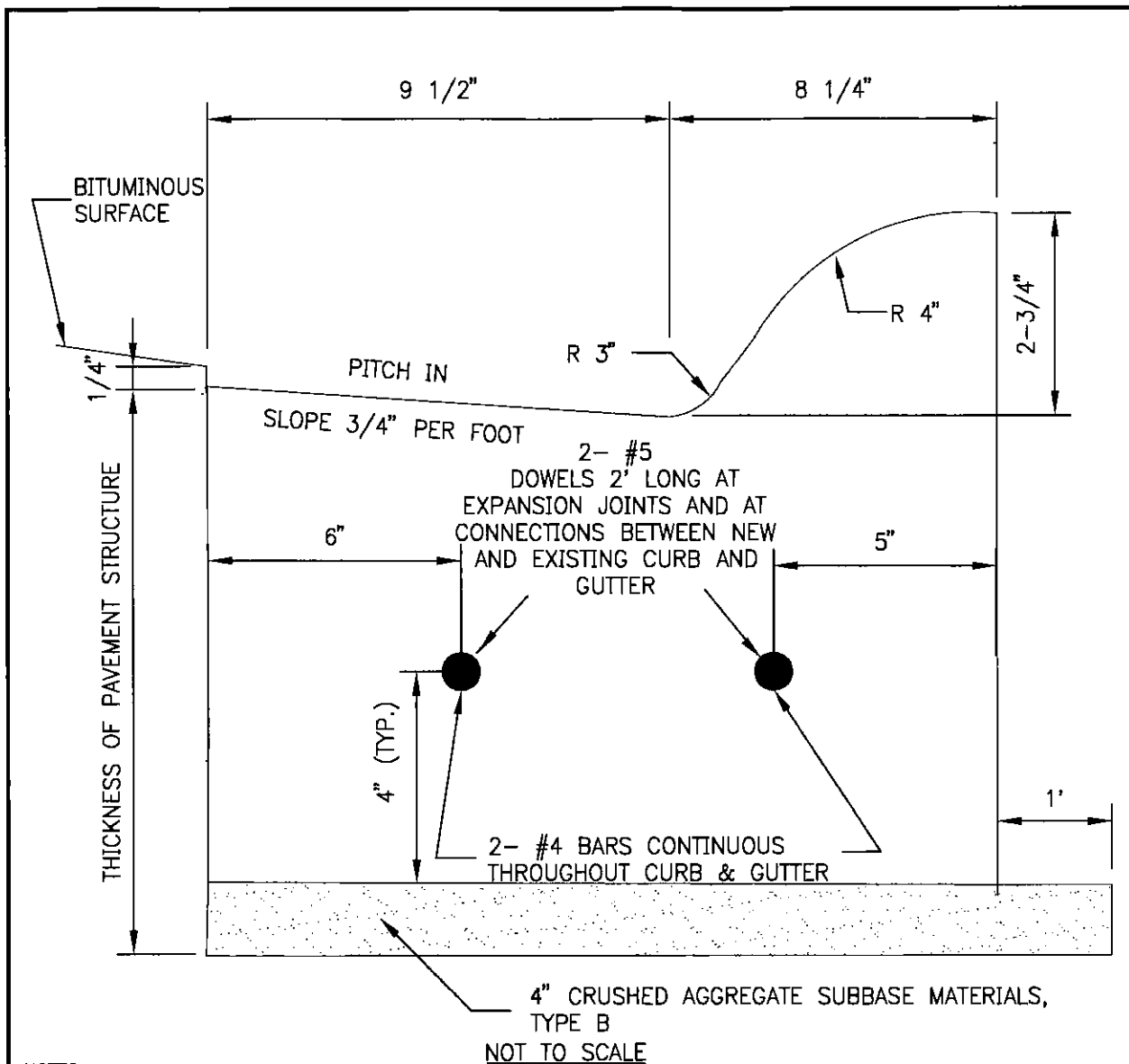
B. Mountable Combination Concrete Curb and Gutter, Type M-3.12 (RO-013)



NOTES:

1. ALL CURB AND GUTTER SHALL BE CONSTRUCTED WITH IDOT CLASS SI CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 3500 PSI AT 14 DAYS. PROVIDE AND TEST 3 CYLINDERS FOR EACH DAY'S POUR, OR 50 CUBIC YARDS, WHICHEVER IS LESS.
2. CONTRACTION JOINTS SHALL BE SAW-CUT AT 20' INTERVALS AND CAULKED.
3. PREFORMED EXPANSION JOINTS, 3/4" THICK, SHALL BE PLACED FIVE FEET EITHER SIDE OF STORM STRUCTURES IN CURB AND GUTTER, AT CURB RETURNS AND AT POINTS OF CURVATURE, AT ALL CONNECTIONS BETWEEN NEW AND EXISTING CURB AND GUTTER, AND AT 100' INTERVALS ON TANGENTS.
4. CURB AND GUTTER AT STORM STRUCTURES SHALL BE BOXED-OUT AND HAND-FORMED BETWEEN EXPANSION JOINTS. FORMS SHALL BE PLACED AND INSPECTED BY VILLAGE PRIOR TO POURING CONCRETE. STRUCTURE FRAMES SHALL BE PLACED AND ADJUSTED PRIOR TO THIS INSPECTION.
5. THE FOLLOWING SHALL BE STAMPED IN THE CURB AT THE INDICATED LOCATIONS:
 - "W" FOR WATER SERVICES
 - "S" FOR SANITARY SEWER SERVICES
 - "ST" FOR STORM SEWER SERVICES
 - "CO" FOR STORM SEWER SERVICE LINE CLEAN-OUTS
6. DOWELS AT EXPANSION JOINTS SHALL BE CENTERED ON THE JOINT (DRILLED INTO EXISTING CURB AND GUTTER), AND SHALL BE INSTALLED WITH GREASE CAPS ON ONE SIDE.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR BARRIER COMBINATION
CONCRETE CURB & GUTTER
TYPE B-6.12
DATE: OCT. 2005



NOTES:

1. ALL CURB AND GUTTER SHALL BE CONSTRUCTED WITH IDOT CLASS SI CONCRETE WITH A MINIMUM COMPRESSIVE STRENGTH OF 3500 PSI AT 14 DAYS. PROVIDE AND TEST 3 CYLINDERS FOR EACH DAY'S POUR, OR 50 CUBIC YARDS, WHICHEVER IS LESS.

2. CONTRACTION JOINTS SHALL BE SAW-CUT AT 20' INTERVALS AND CAULKED.

3. PREFORMED EXPANSION JOINTS, 3/4" THICK, SHALL BE PLACED FIVE FEET EITHER SIDE OF STORM STRUCTURES IN CURB AND GUTTER, AT CURB RETURNS AND AT POINTS OF CURVATURE, AT ALL CONNECTIONS BETWEEN NEW AND EXISTING CURB AND GUTTER, AND AT 100' INTERVALS ON TANGENTS.

4. CURB AND GUTTER AT STORM STRUCTURES SHALL BE BOXED-OUT AND HAND-FORMED BETWEEN EXPANSION JOINTS. FORMS SHALL BE PLACED AND INSPECTED BY VILLAGE PRIOR TO POURING CONCRETE. STRUCTURE FRAMES SHALL BE PLACED AND ADJUSTED PRIOR TO THIS INSPECTION.

5. THE FOLLOWING SHALL BE STAMPED IN THE CURB AT THE INDICATED LOCATIONS:

"W" FOR WATER SERVICES

"S" FOR SANITARY SEWER SERVICES

"ST" FOR STORM SEWER SERVICES

"CO" FOR STORM SEWER SERVICE LINE CLEAN-OUTS

6. DOWELS AT EXPANSION JOINTS SHALL BE CENTERED ON THE JOINT (DRILLED INTO EXISTING CURB AND GUTTER), AND SHALL BE INSTALLED WITH GREASE CAPS ON ONE SIDE.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR MOUNTABLE COMBINATION
CONCRETE CURB & GUTTER
TYPE M-3.12
DATE: OCT. 2005

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VILLAGE OF BEECHER, ILLINOIS

ENGINEERING TECHNICAL STANDARDS

SECTION 3 - WATER DISTRIBUTION SYSTEM

Section 3.01 – General

- A. All residential, commercial, or industrial subdivision or development including single lots shall be served by a water distribution system connected to the Village water distribution system. Each subdivision or development shall include provisions for the construction of water distribution facilities complete with valves, fire hydrants, and other such appurtenances required in accordance with this section.
- B. Any parcel and/or building located outside the Village shall be required to annex into the Village prior to connecting onto the Village water distribution system, and any and all expenses incurred to extend said water distribution system would be totally at the property owner's expense, unless otherwise approved by the Board of Trustees.
- C. The water distribution system shall be designed and constructed in accordance with the latest edition of the "Standard Specifications for Water and Sewer Main Construction," in Illinois, the Illinois Environmental Protection Agency's Division of Public Water Supply Technical Policy Statements, the latest edition of the "Recommended Standards of Water Works", and the Illinois Plumbing Code of the Village of Beecher, unless otherwise modified in this section.
- D. Specification references made herein for manufactured materials, such as pipe, hydrants, valves, and fittings refer to designations of the American Society for Testing and Materials (ASTM), the American Water Works Associations (AWWA), and the American National Standards Institute (ANSI).
- E. Before commencing the water distribution system layout, the developer shall confer with the Village Engineer to determine the required size for any distribution lines traversing the subdivision or lot to allow for extension of water service to areas beyond the subject development and proper looping of the system

Section 3.02 – Basic Design Standards

- A. Complete System Requirements:

A complete water distribution system shall be designed to serve the entire development. The water mains shall be of adequate size to supply the required domestic, commercial, and industrial consumption and fire flow demands throughout the system. Water main systems shall be looped to provide continuous flow whenever possible. The design engineer shall submit calculations showing the flows in the system at various locations are adequate for domestic consumption and fire flow demand with a required minimum twenty (20) residual pressure.

B. Location:

1. All water distribution system piping shall be extended to the far property line, and to other locations indicated by the Village Engineer.
2. All water distribution system piping shall be constructed within public right-of-way or within approved easements dedicated for public utilities.

C. Sizing Requirements:

1. The minimum water main pipe size shall be eight (8) inches in diameter, unless otherwise approved by the Village Engineer.
2. Water transmission main sizing shall be constructed as identified in the Village's Water System Master Plan, or as otherwise determined by the Village Engineer.
3. Water mains twelve (12) inches in diameter and less shall be paid for by the developer. In the case where the Village requires a water main larger than twelve (12) inches, the Village would pay for the upsizing from a twelve (12) inch main and collect recapture from the benefiting area.

D. Cover Requirements:

All water mains shall be constructed at a minimum depth of five and one half (5-1/2) feet from final grade to the top of the water main unless otherwise approved by the Village Engineer.

E. Dead End Mains:

1. Dead end mains over one hundred (100) feet in length are prohibited unless approved by the Village Engineer.
2. All water main within cul-de-sacs shall be looped.
3. All unlooped ends of water mains shall have a system valve and one capped twenty (20) feet length of pipe, with fire hydrant for flushing purposes.

F. Sewer Separation and Main Protection:

1. Protection and separation of water mains from sewers shall comply with the Illinois Environmental Protection Agency (IEPA) Division of Public Water Supplies Technical Policy Statements, latest edition and the Illinois Plumbing Code, latest edition.
2. Wherever water mains cross storm sewers, sanitary sewers, or sewer service connections:
 - a. Lay the water main so that its invert is at least eighteen (18) inches above the top of the sewer.
 - b. Maintain this vertical separation for that portion of the water main located within then (10) feet horizontally of any sewer or drain crossed.
 - c. Center a length of water main pipe over the sewer to be crossed with joints equidistant from the sewer or drain.
3. When it is impossible to maintain the minimum eighteen (18) inches vertical separation, or when it is necessary for the water main to pass under a sewer or drain:
 - a. Construct the sewer or drain of pressure pipe, conforming to the specification for water main materials.

- b. Extend the sewer construction on each side of the crossing until the normal distance from the water main to the sewer or drain is at least ten (10) feet.
 - c. As an alternate, install either the water main or sewer inside a water main quality casing or carrier pipe for a distance of ten (10) feet measured perpendicular to the sewer on each side of the crossing.
- 4. Where a water main must cross under a sewer:
 - a. Maintain a minimum vertical separation of eighteen (18) inches between the invert of the sewer and the crown of the water main.
 - b. Support the sewer or drain line to prevent settling and breaking of either pipe.
- G. Thrust Blocking:
 - 1. Provide protection from movement of water main piping, plugs, caps, tees, valves, hydrants, and bends of eleven and one quarter (11 ¼ °) degrees or greater with precast concrete thrust blocking against undisturbed earth.
 - 2. All mechanical joint fittings require utilizing restrained joint retaining glands, Mega-lug, manufactured by Ebaa Iron.
 - a. Provide restrained joints for a minimum of three pipe lengths from fittings.
- H. Fire Hydrants:
 - 1. Hydrants shall be installed at a maximum spacing of three hundred fifty (350) feet with hydrants located at all intersections, high points, cul-de-sacs, and at the end of all stubs.
 - 2. No hydrant shall be located within the roadway easement adjacent to the ball of a cul-de-sac.
 - 3. The maximum distance from the most remote part of any building to an operational fire hydrant shall be three hundred (300) feet.
 - 4. When a building will be set back two hundred fifty (250) feet or more from a street or located more than three hundred (300) from a hydrant, additional hydrants shall be installed such that one (1) hydrant shall be located at the entrance to the building and other hydrants shall be provided around the perimeter of the building at a maximum two hundred fifty (250) feet spacing along access roads. Such hydrants shall be installed not more than one hundred twenty (120) feet nor less than forty (40) feet from the building.
 - 5. Fire hydrant spacing plans shall be submitted to the Village Engineer for review.
 - 6. Minimum Service Leader – All fire hydrants must be served by a minimum six (6) inch diameter main.
 - 7. No part of the fire hydrant shall be closer than 18 inches from the back of curb and the pumper shall face the roadway.
 - 8. No part of the fire hydrant shall be closer than three feet from any driveway.
 - 9. Hydrants shall be accessible so that a connection can be made between the hydrant and fire department apparatus located in the street with twenty (20) feet of suction hose.

I. Valves and Vaults:

1. Valves shall be located on water mains in a configuration as to isolate sections of main from the entire system with minimum disruption of service.
2. Valves shall be located so that it will require no more than three (3) valves to be closed to isolate a section of water main.
3. Valves shall be spaced so that no more than eight hundred (800) feet of water main, with services, will be shut off at any time. Valves on water main servicing single family residential areas shall be installed so that no more than eight hundred (800) feet of water main and/or no more than twenty (20) units shall be affected when shutting off a section of water main.

J. Service Connections:

1. All water service lines shall be designed with a diameter necessary to provide adequate domestic, commercial or industrial used and fire flow capacity.
 - a. Comply with the Illinois Plumbing Code for water service sizing.
 - b. No water service shall be less than one-inch (1").
2. All attached and detached single family dwelling units shall be served directly by a separate water service connected to the Village's water distribution system and not to be a of common service.
3. All water service lines shall be stubbed at the B-Box at no less than one (1) foot inside the property line and marked with a 4-inch by 4-inch post no less than three (3) feet above grade and painted blue.
4. B-boxes shall be located in the parkway and shall be prohibited from the area covered by a sidewalk or driveway.
 - a. B-boxes shall be located seven feet from the front property line unless otherwise approved by the Village Engineer.
5. Comply with the requirements of water main separation.

Section 3.03 – Material Specifications

A. All water distribution system elements shall conform to the following specifications.

B. Water Main Pipes:

1. Provide pipe, fittings, valves, hydrants, and appurtenances.
2. Materials:
 - a. PVC Plastic Pressure pipe:
 - 1) Pipe material: Use Class 12454A or B polyvinyl chloride complying with ASTM D1784.
 - 2) Pipe 12-inch and smaller: Comply with AWWA C-909 for Class 150 molecular oriented CIOD pressure pipe.
 - i. Provide pipe manufactured with ductile iron outside diameters.
 - ii. Provide pipe manufactured from a PVC stock with a starting hydrostatic design basis (HDB) of 4000 psi., and a finished HDB of 7100 psi..

- 3) Use push-on bell and spigot type joints with elastomeric ring conforming to ASTM F-477.
 - b. Alternate pipe materials may be allowed upon review and recommendation of the Village Engineer and upon approval of the Village Board.
 - c. Install a No. 10 AWG, single strand, single conductor, insulated copper wire on top of PVC mains and fittings. Connect the wire through valves.
 - d. Water Main fittings:
 - 1) Use ductile iron fittings with mechanical joint complying with ANSI A21.10 or A21.53.
 - 2) Use cement lining complying with ANSI A-21.4, standard thickness.
 - 3) Polyethylene sheet: Comply with ANSI/AWWA C105/A 21-93, with a thickness of not less than 8 mils.
 - 4) Bolts and Nuts
 - i. Provide weathering carbon steel $\frac{3}{4}$ " – 10 T-head bolts and Duratron SAC-NUT modules on every other bolt for restraining system. Comply with ANSI/AWWA C111/A221.22-95.
 - 5) Provide restrained joint pipe for three (3) pipe lengths from each fitting.
 - e. Pipe and Fitting Joint Restraining Systems:
 1. Acceptable products:
 - i. Meg-A-Lug System.
 - ii. American Fastite, Flex-ring, Lok-ring, and MJ coupled joint.
 - iii. Clow Tyton Joint – Type A or Type B, and Super-Lock.
 - iv. U.S. Pipe TR-Flex Gripper.
 - v. Griffin Bolt Lok or Snap Lok.
 - vi. Field Lok or Fast Grip Gasket Systems.
- C. Valves:
1. General:
 - a. Valves smaller than 16-inch size shall be gate valves.
 - b. Valves 16-inch size or larger shall be butterfly valves.
 - c. Provide valves with clockwise closing direction.
 2. Materials:
 - a. Gate valves shall comply with AWWA C509 (cast iron body) or AWWA C515 (ductile iron body), bronze fitted, resilient wedge and seat type with non-rising stem and O-ring packing.
 - b. Butterfly valves shall comply with AWWA C504 for pressure Class 150B, cast iron body, rubber-seated, tight closing type, valve shaft of either 18-8 or Type 304 stainless steel, and operated by a two (2) inch square nut.
 - c. Other valves may be allowed upon review and approval of the Village Engineer.
 3. Acceptable manufacturers:
 - a. Gate valves: Mueller A2360-20 or approved equal.
 - b. Butterfly valves: Mueller Linesal III or approved equal.

4. Provide valve vaults for all valves located in pavement and valve boxes for all valves in grass areas.
- D. Fire Hydrants:
1. General:
 - a. Comply with AWWA C502.
 - b. Paint hydrants with Ace brand RUST STOP-Safety Red.
 2. Acceptable products:
 - a. Mueller Super Centurion A-423.
 - b. East Jordan 5 BR (with epoxy shoe)
 - c. No substitutions.
 3. Materials:
 - a. Compression type with a 5¼-inch minimum size main valve assembly, O-ring seals, two 2½-inch hose nozzles, and a 4-inch pumper nozzle with National Standard threads, a National Standard operating nut, and an above ground break flange.
 - b. Provide a 6-inch auxiliary resilient seat type gate valve.
 - c. Provide MJ anchoring tee with anchoring MJ gland.
 - d. Valve boxes with cover marked with the word "WATER".
 - (1) Acceptable manufacturer:
 - (a.) Tyler 664-S, or approved equal.
 - e. Provide valve box stabilizers on all hydrant auxiliary valves.
 - f. Acceptable manufacturer:
 - (1) Adapter, Inc. or approved equal.
- E. Water Service Connections:
1. Service connection to the water main for services less than two (2) inches in diameter shall be with a stainless steel full band (12 inches minimum) tapping saddle and a corporation stop.
 2. Corporation Stops, acceptable products:
 - a. 1-inch service: Mueller Model H-15008.
 - b. 1 ½ or 2-inch service: Mueller H-15013.
 3. Stainless steel service saddle, acceptable products:
 - a. 1-inch service: Smith Blair Model 372 or approved equal
 - b. 1 ½ or 2-inch service: Smith Blair Model 317 (epoxy coated ductile iron with stainless steel straps).
 4. Water Service Pipe:
 - a. Type K (1-inch minimum) soft temper seamless copper water tubing complying with ASTM B-88.
 - 1) There shall be no joints between the curb stop and the building unless the service is longer than a one hundred (100) roll of copper.
 - b. Ductile iron pipe or Schedule 80 PVC shall be used for all services over 2-inch size
 5. Curb Stops:
 - a. 1-inch 1 ½ or 2 inch service: Mueller Model H-25155.

6. Curb Boxes:
 - a. 1-inch, 1½ or 2-inch service: Tyler 95E.
7. Provide pre-cast concrete support for curb stops..
- F. Casing Pipe:
 1. Materials:
 - a. Steel casing pipe shall conform to ASTM A139 Grade A with continuous field-welded butt joints in accordance with AWWA C206, a minimum yield strength of 35,000 psi, and the following minimum wall thickness for a 36-inch casing pipe:
 - (1) Highway Crossing: 0.375-inches.
 - (2) Railroad Crossing: 0.5625-inches.
 - b. Casing Spacers:
 1. Bands: Molded high density polyethylene, 304 stainless steel, or 14 gauge (minimum) hot rolled and pickled steel.
 2. Steel band coating: Minimum 10 mil of fusion bonded PVC coating.
 3. Steel band liner: Minimum 0.090-inch PVC.
 4. Bolts, washers, and nuts: 304 stainless steel.
 5. Runners: Glass reinforced or glass filled high density reinforced plastic.
 6. Casing spacer configuration: Restrained, in all directions.
 7. Spacing: One spacer on each side of and a maximum of 12 inches from each joint, and a minimum of one between the joints, with additional spacers and as recommended by casing spacer manufacturer.
 8. Acceptable products:
 - i. PSI.
 - ii. Advance.
 - iii. Cascade.
 Or approved equal
 - c. Use rubber end seals made specifically for this purpose.
- G. Tapping Sleeves and Valves:
 1. Materials:
 - a. Two-piece bolted sleeve ductile iron or stainless steel type with mechanical joints.
 - b. Tapping valves (fully ported) shall conform with AWWA C500.
 2. Acceptable manufacturers:
 - a. Tapping sleeves:
 - (1) Ductile iron: Mueller H615, or approved equal.
 - b. Tapping valves:
 - (1) Mueller A2360-16, or approved equal.
- H. Valve Vaults:
 1. Precast Sections:
 - a. Provide precast reinforced concrete manhole sections, bottoms, and flat top slabs complying with ASTM C478.

- b. Provide concentric cone section unless otherwise approved by the Village Engineer.
 - c. Provide precast reinforced concrete monolithic or separate base.
 - d. Design flat slab tops for AASHTO HS20-44 wheel loading.
- 2. Concrete:
 - a. Provide 4000 psi concrete using Type I Portland Cement complying with ASTM C150.
- 3. Mortar:
 - a. Mix one part Portland Cement to three parts fine aggregate.
- 4. Joints for Precast Sections:
 - a. Provide joints of either flexible watertight rubber gaskets or preformed bituminous plastic gaskets consisting of a homogeneous blend of refined hydrocarbon resins and plasticizing compound reinforced with inert mineral filler.
 - (1) Acceptable preformed gasket products:
 - (a.) K. T. Snyder Co., RAM-NEK.
 - (b.) Concrete Sealants, Type CS-208.
 - (c.) Or equal.
- 5. Steps:
 - a. Provide steps with a minimum width of 12 inches and a minimum projection of 5 inches.
 - b. Use steps consisting of copolymer polypropylene plastic with continuous ½-inch steel reinforcement as manufactured by M.A. Industries, Inc. cast iron steps, Neenah R-1981-I, or equal.
- 6. Frames and covers:
 - a. Provide cast iron frames and covers with heavy duty, indented top, with solid self-sealing lids and machined bearing surfaces, stamped with the words “VILLAGE OF BEECHER” and “WATER”.
 - (1) Acceptable products: Neenah R-1712, East Jordan 1050 EXHD, or approved equal.
- 7. Flexible pipe connectors:
 - a. Flexible rubber gasket collar for connecting pipe to the manhole.
 - b. For pipe 24-inch and smaller, use PSX gasket system by Press-Seal Gasket Corporation, or equal.
 - c. For pipe 27-inch and larger, use resilient gasket by A-LOK Products, Inc., or approved equal.
- M. Valve Boxes:
 - 1. Valve box compatible with size and type of valve protested.
 - 2. Extend box to finished grade.
 - 3. Mark valve box cover “WATER” for potable water piping valves.
 - 4. Bituminous coated carbon steel valve extension stems and 2-inch square operating nuts 2 inches below cover.

5. Provide two operating tee wrenches with 2-inch square socket 24-inch long, 1-1/2-inch pipe handle, and 1-1/2-inch pipe stem.
 6. Provide valve box stabilizer for all valve boxes.
 - a. Acceptable manufactures:
 - (1) Adapter, Inc. or approved equal.
- N. Pipe Bedding and Backfill:
1. Provide well graded, washed, mixture of gravel or crushed stone aggregate free of clay, loam, dirt, calcareous, or other foreign matter conforming to the IDOT "Standard Specification" gradation No. CA-7, or the Standard Specifications for Water and Sewer Construction in Illinois granular cradle Type B, with the following gradation:
- | <u>Sieve Size</u> | <u>Percent Passing</u> |
|-------------------|------------------------|
| 1-inch | 100% |
| 3/4-inch | 84 -100% |
| 1/2-inch | 0 - 60% |
| No. 4 | 0 -12% |
| No. 16 | 0 - 6% |
- O. Special Granular Trench Backfill:
1. Provide granular material: Use 100 percent crushed stone or gravel complying with the IDOT "Standard Specification" gradation No. CA-7 material.

Section 3.04 – Construction and Inspection Standards

- A. Approval and Permits:
1. Construction of water mains and/or services shall not commence until engineering plans and specifications have been approved by the Village Engineer.
 2. No construction shall commence until a copy of all needed permits (IEPA, IDOT, ACOE, IDNR, and other applicable regulatory agencies) are filed with the Village and Village Engineer.
- B. Notification:
1. Prior to beginning the water main installation, the contractor shall give the Village forty-eight (48) hours notice of the intended time of starting work.
- C. Conformance:
1. The installation of water mains and appurtenances, including services, shall conform to the requirements of this Section and shall conform to AWWA C-600, and "Standard Specifications for Water and Sewer Main Construction in Illinois".
 2. The contractor shall be responsible for providing a competent individual on site during trenching operations to insure that all OSHA and other applicable safety standards are met by the construction means and methods.
 3. Valves shall only be operated by the Village Water Department.
- D. Pipe Bedding and Backfilling:
1. Four-inches of CA-7 material shall be used as bedding for the water main pipe.

2. Six-inches of CA-7 material shall be used to cover the water main in areas over five (5) feet away from existing or proposed pavements, driveways, or sidewalks.
 3. Any pipe installed under or within five (5) feet of an existing or proposed pavements, driveway, or sidewalk shall be backfilled to within one foot of the top of the trench with CA-7 material. The final twelve (12) inches shall be backfilled with CA-6 material.
 4. Backfilling shall not be completed until installation of the water main has been inspected and approved by the Superintendent of Public Works or Village Engineer.
- E. Fire Hydrants:
1. Fire hydrants shall have a minimum of two (2) cubic yards of CA-7 material placed at the base of the hydrant to provide drainage at the barrel.
 2. The minimum distance between the auxiliary valve and hydrant shall be thirty (30) inches.
 3. The center of the hydrant's pumper nozzle shall be no less than eighteen (18) inches or more than twenty-four (24) inches above the finished ground elevation.
 4. Hydrants in street rights-of-way shall be placed no less than three (3) feet no more than eight (8) feet from the back of curb. Hydrants shall be a minimum of forty-eight (48) inches from any tree, pole, or other obstruction.
 5. Hydrants shall be marked with a six (6) foot whip locator or six (6) foot sign post, painted green in color with a reflector or the size and mounting location approved by the Superintendent of Public Works and/or Village Engineer.
 6. New hydrants (not in service) shall be covered with a black plastic bag until the new system is in service.
- F. Connections to Existing Main:
1. All connections to the existing water system shall be made under full water service pressure unless otherwise approved by the Superintendent of Public Works and/or Village Administrator upon advise of the Village Engineer.

Section 3.05 – Testing, Flushing, and Disinfection

- A. Notification and Operation:
1. The Public Works Department and Village Engineer shall be notified of the time of testing a minimum of 48 hours prior to each test.
 2. All tests shall be performed in the presence of a representative of the Village of Beecher and/or Village Engineer.
 3. Devise a method for disposal of waste water from testing operations as approved in advance by the Village Engineer.
 4. Only the Village Water Department shall operate existing valves.
- B. Hydrostatic Pressure Testing:
1. All new water mains and service lines, including valves and hydrants, shall be subject to a hydrostatic pressure of 125 psi.

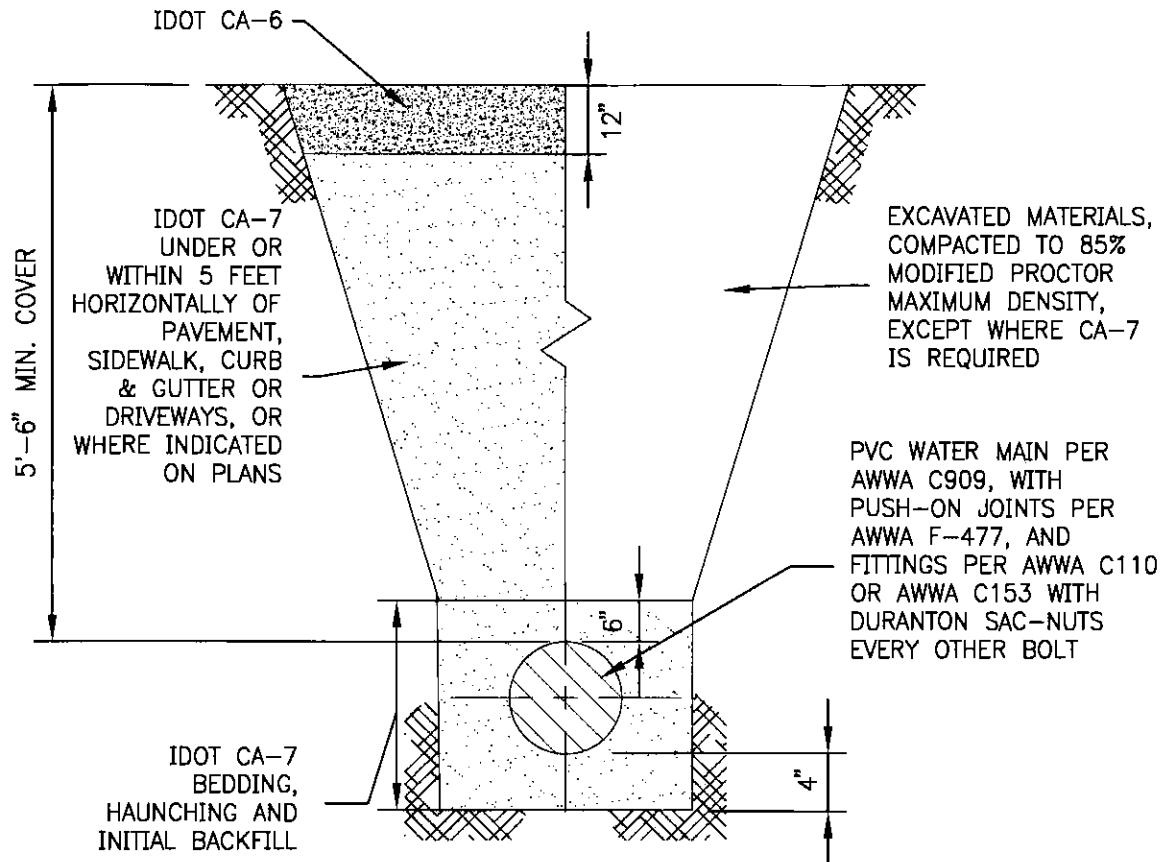
2. Hold the test pressure for a duration of one hour without pressure loss or further pressure application.
 3. Before applying the specified test pressure, all air shall be expelled from the pipe.
 4. Carefully examine exposed pipe, joints, fittings, and valves.
 5. Replace or remake joints showing visible leakage.
 6. 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.
- C. Metered Leakage Testing:
1. A metered leakage test shall be conducted after the pressure test has been satisfactorily completed.
 2. Duration of each leakage test: At least 24 hours.
 3. During the test, subject water lines to a normal water pressure of the Owner's water system.
 4. Maximum allowable leakage: Four gallons per inch of pipe diameter per 1,000 feet of pipe per 24 hours as recorded by a meter approved by the Superintendent of Public Works or Village Engineer.
 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 24-hour metered leakage test until the leakage is within the specified allowance.
- D. Preliminary Flushing:
1. Prior to disinfection and after the pressure test, flush main as thoroughly as possible.
 2. Flush main until water runs clear.
 3. Coordinate time of flushing with Owner and Engineer, at least 72 hours in advance of flushing.
 4. Do not initiate flush without Owner's permission.
 5. Hydrants shall be installed at the end of the water main and shall be flowed at 1,150 gpm for at least five minutes per 500 lineal feet or longer until the water runs clear.
- E. Disinfection:
1. After the water main work has been satisfactorily completed and tested, disinfect the work in accordance with AWWA C651, and "Standard Specifications for Water and Sewer Main Construction in Illinois".
 2. The preferred point of application of the chlorinating agent shall be at the beginning of the pipe line extension of any valved section of it and through corporation stop in the top of the newly laid pipe. The injector for delivering the chlorine gas into the pipe should be supplied from a tap on the pressure side of the gate valve controlling flow into the pipeline extension.
 3. Forms of applied chlorine:
 - a. Apply chlorine by dry gas feeder unless solution feed chlorinator, solution of chlorine-bearing compounds, or tablet method are approved by the Owner.
 1. Provide effective diffusion of the gas into the water and regulate the rate of gas flow.

2. Provide means for preventing the backflow of water into the feeder.
4. Requirement of chlorine:
 - a. Apply disinfecting solutions having at least 50 mg/l of available chlorine.
 - b. Retain the disinfecting solutions in the work for at least 24 hours.
 - c. Chlorine residual after the retention period: At least 25 mg/l.
- F. Final 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 Owner's system, or less than 1 mg/l.
 - a. After flushing, collect water samples on two successive days in sterile bottles treated with sodium thiosulfate. Notify the Engineer and the Owner to witness sample collection.
 - b. The Owner will deliver the samples to a State approved laboratory for bacteriological analysis.
 - c. Should the initial disinfection result in an unsatisfactory bacterial test, repeat the chlorination procedure until satisfactory results are obtained.
 - d. The Owner will provide the water for initial flushing and testing only. Compensate the Owner for water used in subsequent flushing and testing.
 2. Swabbing:
 - a. 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 percent solution of calcium hypochlorite prior to assembly. Secure the Village Engineer's approval before applying this method of disinfection.
- G. Abandonment of Existing Mains:
 1. Abandon water mains only after all requirements for testing and disinfection have been satisfied and all existing services have been connected to new water mains.
 2. Provide mechanical joint caps or plugs on all water main pipes to be abandoned at the limits of the trench excavations, or at other locations if so indicated by the Drawings.
 3. Provide ductile iron plugs, caps, or other necessary fittings, and thrust blocking, on ends of portions of existing water mains that are to remain in service.
 4. Close existing water valves only with the permission of the Village Engineer.
 5. Remove valves, and valve boxes at the top of the existing valve, and fill excavation with compacted special granular material.
 6. Remove valves, and valve vaults to top of lowest pipe, and backfill with compacted special granular backfill material.
 7. Remove fire hydrants in total, including auxiliary box, and backfill excavation with compacted special granular backfill material.
 8. Deliver valves, valve boxes, fire hydrants, and frames and grates to the Owner's Public Works Department.
- H. Miscellaneous:
 1. All corporation stops used for testing and chlorination purposes shall be removed and plugged with a tapered brass plug.

2. Prior to final acceptance of the work, “Record Drawings” shall be submitted to the Village. One mylar reproducible, two 24” x 36” copies, and a applicable CAD files shall be submitted in accordance with the current Village requirements.

Section 3.06 – Details

A. Water Main Installation	(WM-001)
B. Water Valve in Vault	(WM-002)
C. Pressure Connection in Vault	(WM-003)
D. Fire Hydrant	(WM-004)
E. Typical Service Laterals	(WM-005)
F. Water Service	(WM-006)
G. Casing Pipe	(WM-007)
H. Thrust Block Installations	(WM-008)
I. Casting Installation and Adjusting	(WM-009)
J. Water Valve in Box	(WM-010)



NOTES:

1. PROVIDE A NO. 10 AWG, SINGLE CONDUCTOR, INSULATED COPPER WIRE ON TOP OF PVC WATER MAIN AND ALL FITTINGS.
2. PRESSURE AND LEAKAGE TESTS AND CHLORINATION SHALL BE COORDINATED WITH VILLAGE ENGINEER.
3. MAINS SHALL BE PRESSURE TESTED AT A MINIMUM PRESSURE OF 125 PSI FOR ONE HOUR WITHOUT PRESSURE LOSS OR FURTHER PRESSURE APPLICATION. TEST SHALL BE PERFORMED IN ACCORDANCE WITH AWWA C600 AND AWWA C603. IF MAINS TO BE TESTED INCLUDE CONCRETE THRUST BLOCKING, DO NOT BEGIN TEST UNTIL AT LEAST 5 DAYS AFTER THE INSTALLATION OF THE THRUST BLOCKING.
4. AFTER COMPLETING A SATISFACTORY PRESSURE TEST, THE WATER MAIN SHALL BE LEAKAGE TESTED FOR A MINIMUM OF 24 HOURS, IN ACCORDANCE WITH ARTICLE 41-2.13C OF THE STANDARD SPECIFICATIONS FOR WATER & SEWER MAIN CONSTRUCTION IN ILLINOIS, FIFTH EDITION.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
WATER MAIN INSTALLATION
DATE: OCT. 2005

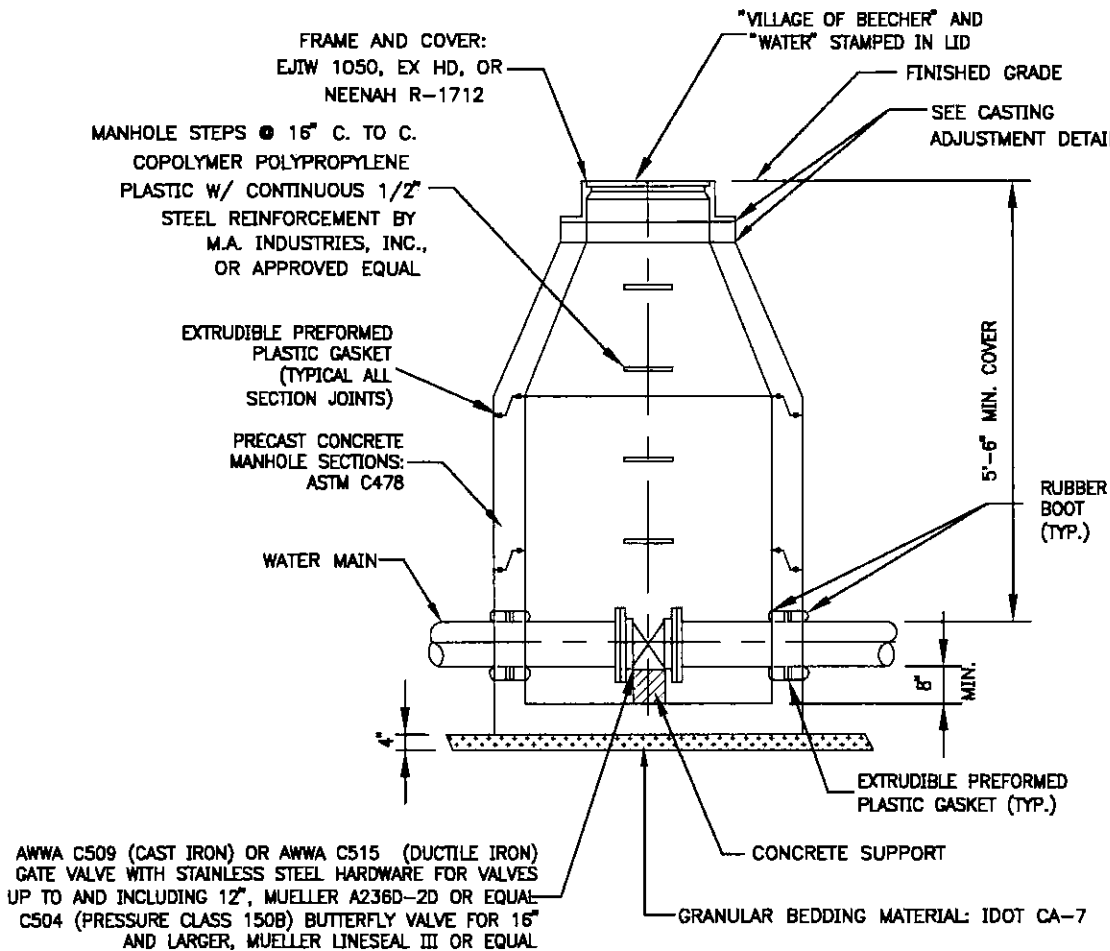
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NOTES:

1. USE CONCENTRIC CONE FOR GATE VALVES AND ECCENTRIC CONE FOR BUTTERFLY VALVES.
2. USE 4'-0" DIAMETER
FOR WATER MAIN SIZES 8" OR LESS,
USE 5'-0" DIAMETER
FOR WATER MAIN SIZES 10" THRU 20",
USE 6'-0" DIAMETER
FOR WATER MAIN SIZES GREATER THAN 20".
3. DURATRON SAC-NUTS SHALL BE USED ON 50% OF ALL BOLTS.

BUTTERFLY VALVES SHALL:

4. HAVE A CAST IRON BODY, AND BE RUBBER-SEATED, TIGHT-CLOSING TYPE SUITABLE FOR BURIED SERVICE.
5. HAVE ANSI CLASS 125 STANDARD FLANGE OR VICTAULIC COUPLING ENDS.
6. HAVE VALVE SHAFT OF EITHER 18-8 OR TYPE 304 STAINLESS STEEL, EXTENDED THROUGH VALVE DISC AND BODY INTO THE OPERATOR.
7. HAVE A FULLY ENCLOSED, SEALED, GREASE-PACKED INTEGRAL GEARED MANUAL OPERATOR WITH A 2-INCH SQUARE OPERATING NUT.



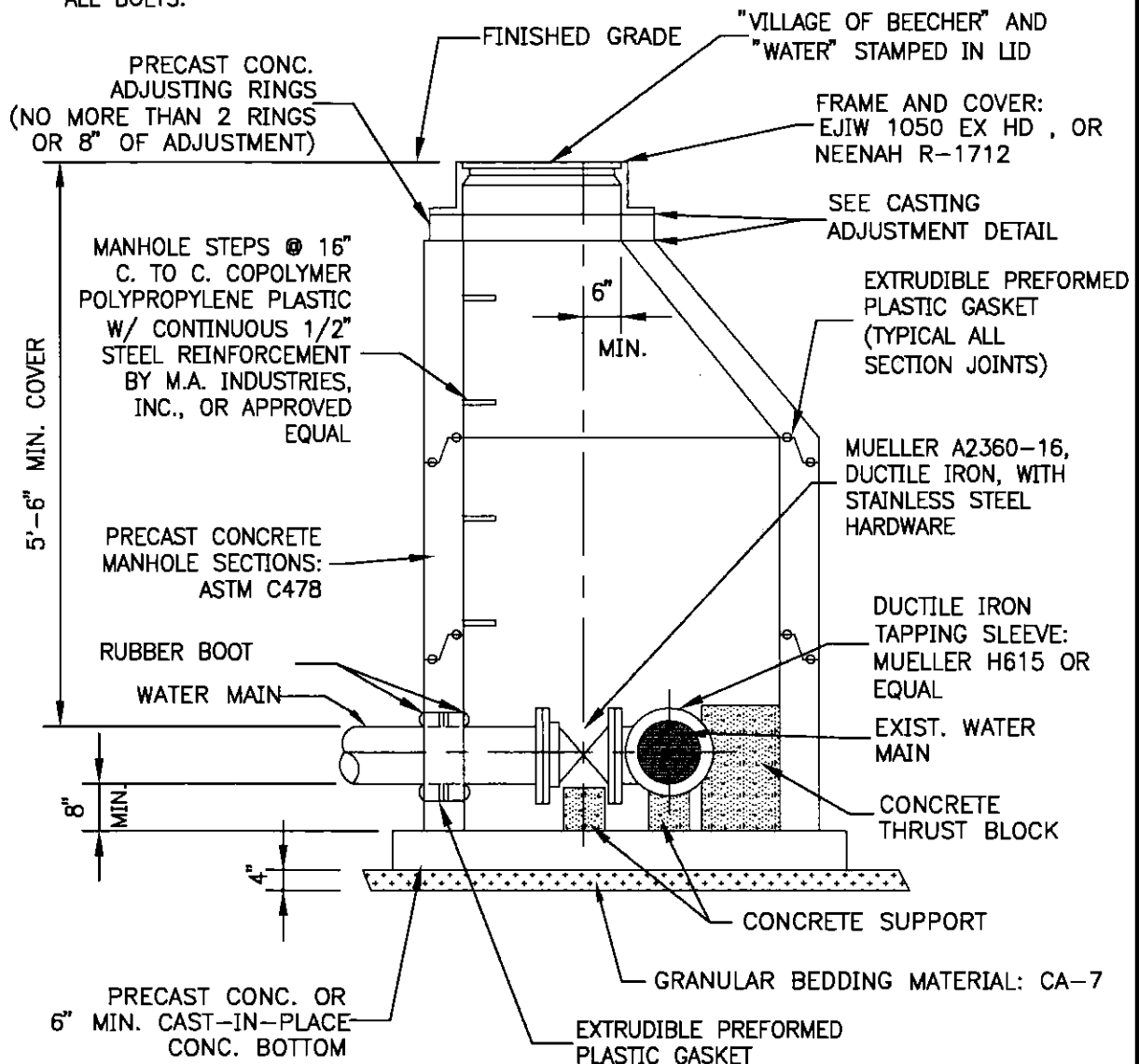
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VILLAGE OF BEECHER
DETAIL
FOR
STANDARD VALVE
DATE: OCT. 2005

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NOTES:

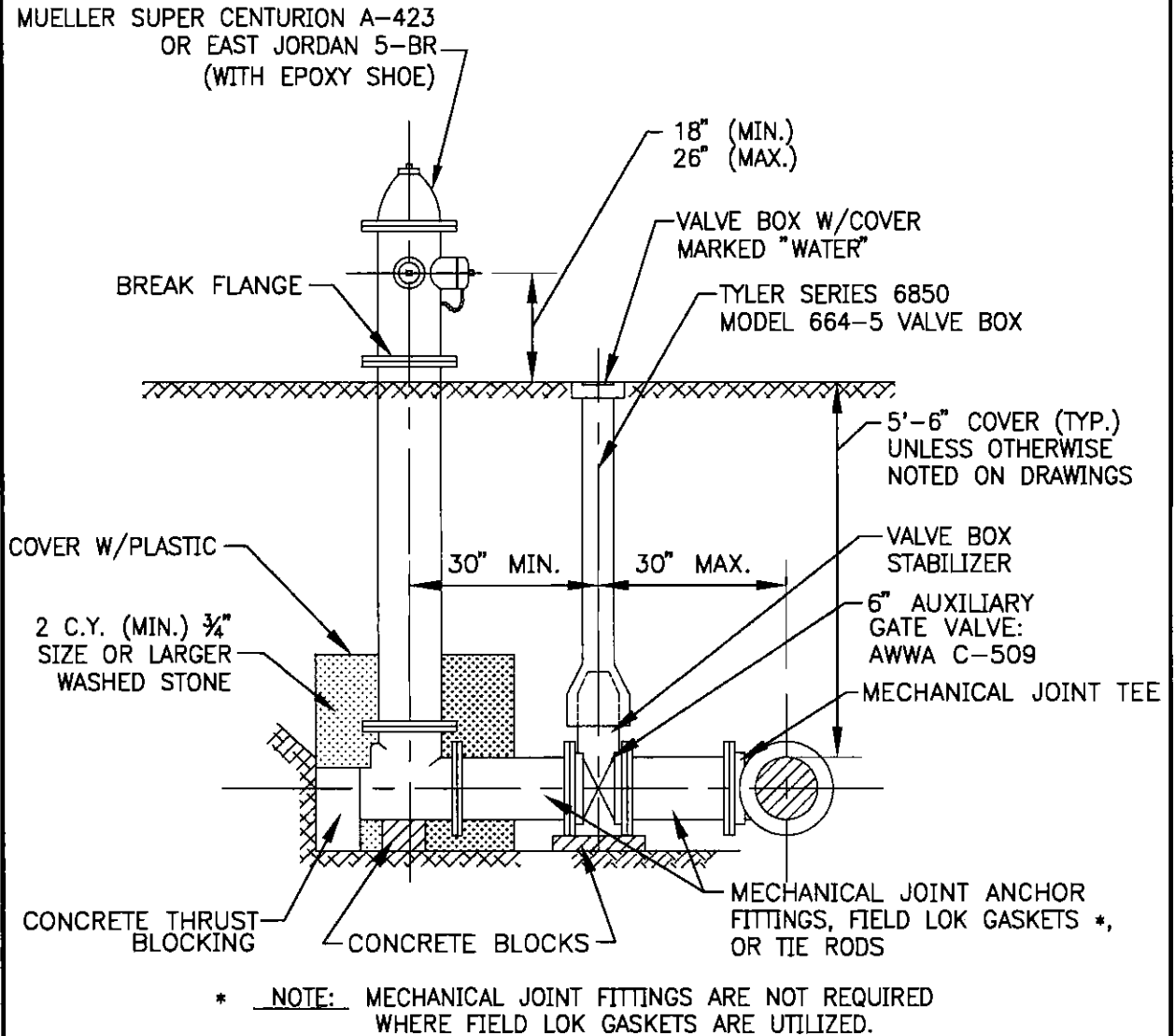
1. ECCENTRIC CONE REQUIRED
2. USE 4'-0" DIAMETER
FOR WATER MAIN SIZES 8" OR LESS,
USE 5'-0" DIAMETER
FOR WATER MAIN SIZES 10" THRU 20",
USE 6'-0" DIAMETER
FOR WATER MAIN SIZES GREATER THAN 20".
3. TAPPING OF WATER MAINS SHALL BE DONE ONLY IN THE
PRESENCE OF AN AUTHORIZED VILLAGE REPRESENTATIVE,
AND AFTER 48 HOURS PRIOR NOTICE TO THE VILLAGE.
4. DURATRON SAC-NUTS SHALL BE USED ON 50% OF
ALL BOLTS.



NO SCALE

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
PRESSURE CONNECTION VALVE VAULT
DATE: OCT. 2005

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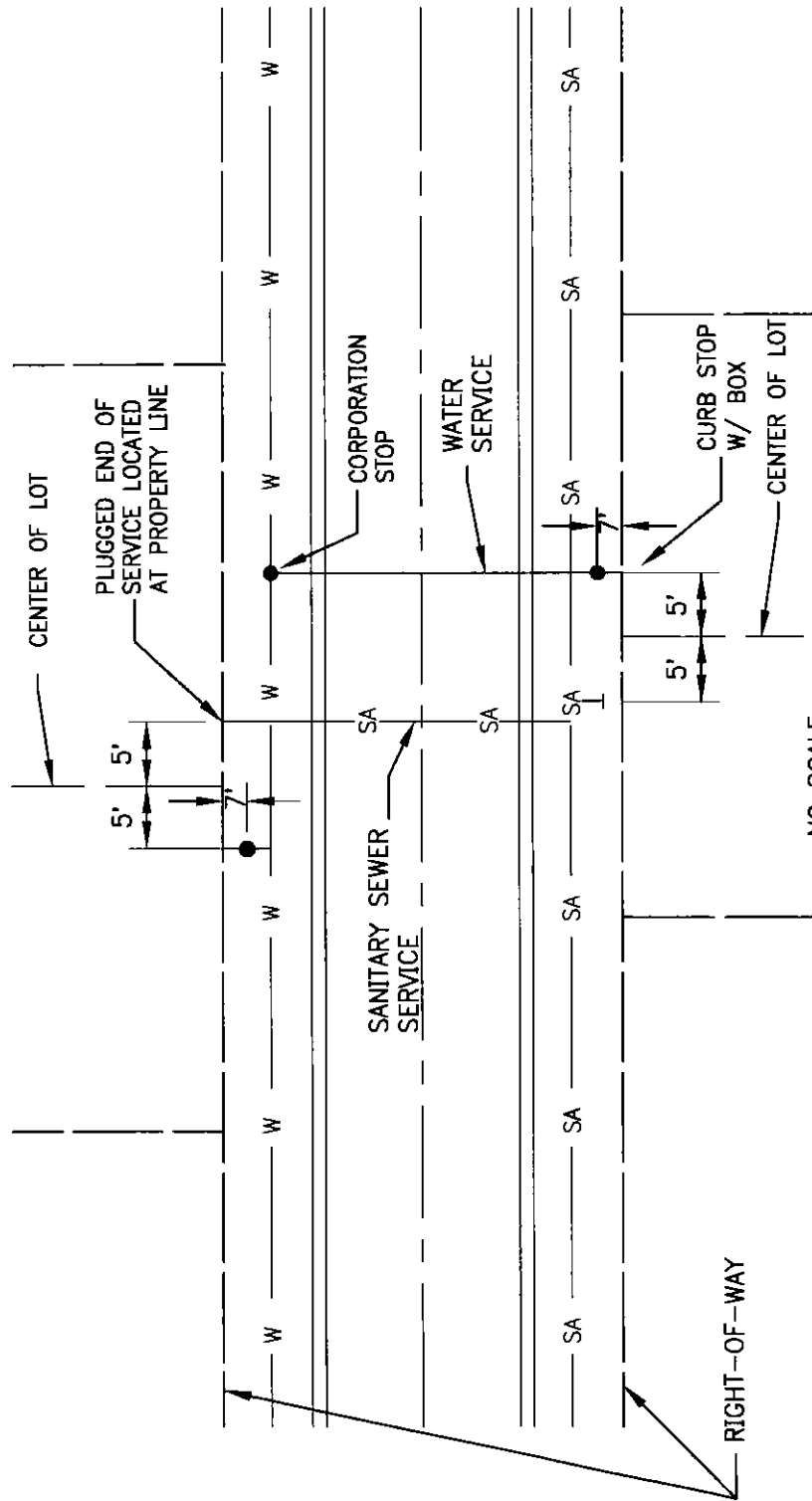
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NOTES:

1. HYDRANT SHALL BE PAINTED ACE BRAND RUST STOP SAFETY RED.
2. ALL BOLTS & NUTS BELOW GRADE ON FIRE HYDRANT SHALL BE STAINLESS STEEL.
3. ALL BOLTS & NUTS ON AUXILIARY VALVE SEAL PLATE AND BONNET SHALL BE STAINLESS STEEL.
4. THRUST BLOCKING SHALL BE CONSTRUCTED SO HYDRANT DRAIN HOLE IS NOT OBSTRUCTED.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
FIRE HYDRANT
DATE: NOV. 2005

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NO SCALE

NOTES:

1. LOCATION OF SEWER AND WATER SERVICES SHALL BE AS SHOWN BELOW UNLESS INDICATED OTHERWISE ON PLANS.

2. THE END OF EACH WATER SERVICE SHALL BE MARKED WITH A BLUE 4"x4" POST, AND STAMPED "W" ON THE CURB.

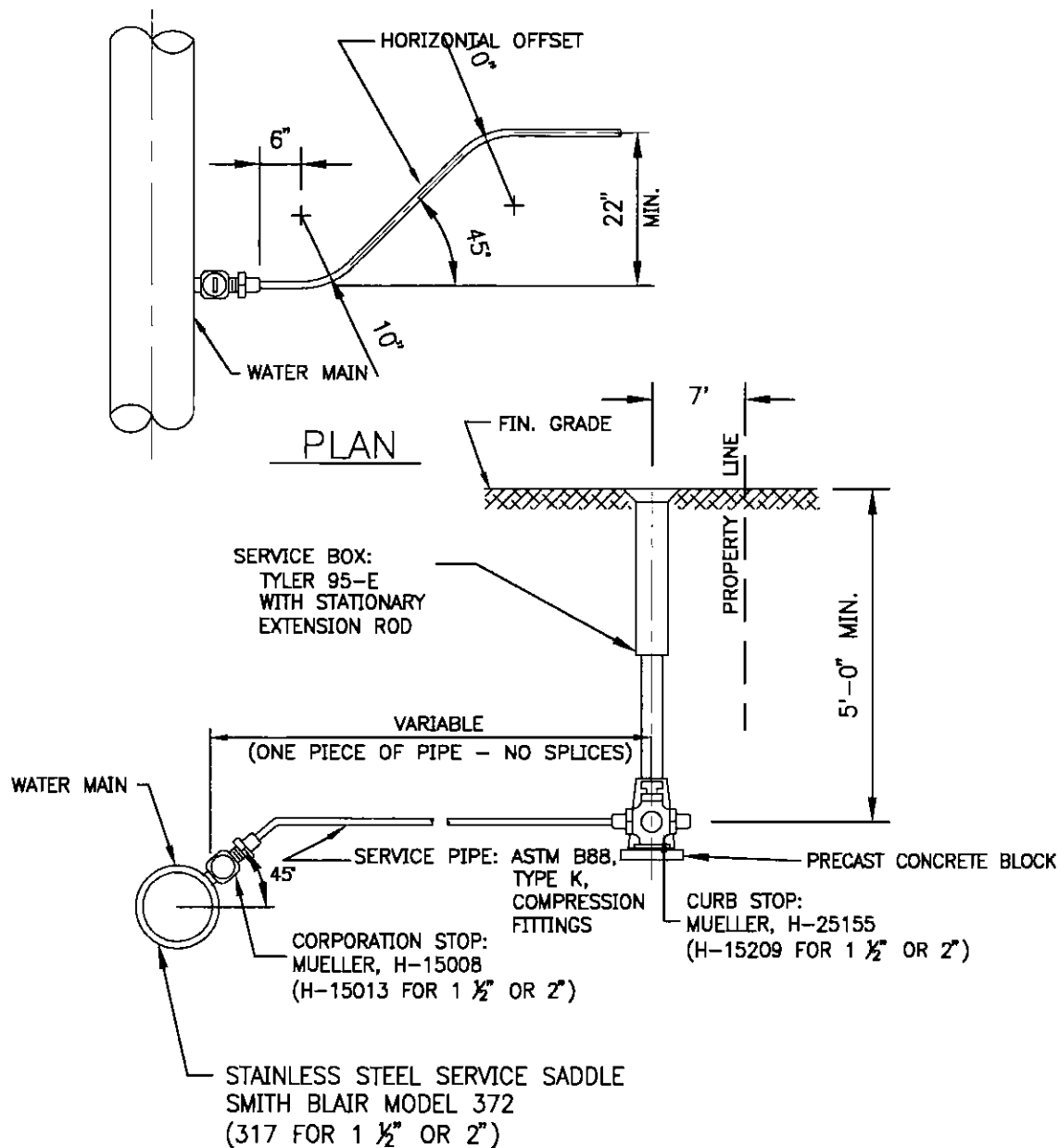
3. THE END OF EACH SANITARY SEWER SERVICE SHALL BE MARKED WITH A GREEN 4"x4" POST, AND STAMPED "S" ON THE CURB.

4. WATER SERVICES SHALL END ONE FOOT INTO PROPERTY UNLESS OTHERWISE INDICATED ON PLANS.

5. B-BOXES SHALL NOT BE PLACED IN THE DRIVEWAY.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
TYPICAL SERVICE LATERALS
DATE: OCT. 2005

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SECTION

NO SCALE

NOTES:

1. TRENCH BACKFILL SHALL BE INSTALLED PER WATER MAIN INSTALLATION DETAIL.
2. PLACE AND HAND-TAMP AT LEAST 1/4 CUBIC YARDS OF SAND AROUND CORPORATION STOP.
3. MINIMUM DISTANCE BETWEEN SERVICE TAPS SHALL BE 18 INCHES.

SERVICE PIPE	CORP. STOP	CURB STOP	SERVICE BOX
3/4"	3/4"	3/4"	1 1/4"
1"	1"	1"	2 1/2"
1 1/4"	1 1/4"	1 1/4"	3"
1 1/2"	1 1/2"	1 1/2"	3"
2"	2"	2"	3"

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
WATER SERVICE
DATE: OCT. 2005

NOTES:

1. CASING PIPE SHALL BE NEW PIPE CONFORMING TO ASTM C139 GRADE A WITH CONTINUOUS FIELD-WELDED BUTT JOINTS IN ACCORDANCE WITH AWWA C206, A MINIMUM YIELD STRENGTH OF 35,000 PSI, AND THE FOLLOWING MINIMUM WALL THICKNESS:

NOMINAL PIPE SIZE - INCHES	MINIMUM WALL THICKNESS - INCHES	
	UNDER HIGHWAY	UNDER RAILROAD
UNDER 14	0.188	0.2500
14 AND 16	0.250	0.3125
18	0.250	0.3125
20	0.250	0.3750
24	0.312	0.4375
30	0.312	0.5000
36	0.375	0.5625
42	0.375	0.563
48	0.375	0.625
54	0.500	0.719
60	0.575	0.781
66	0.650	0.875
72	0.650	0.938

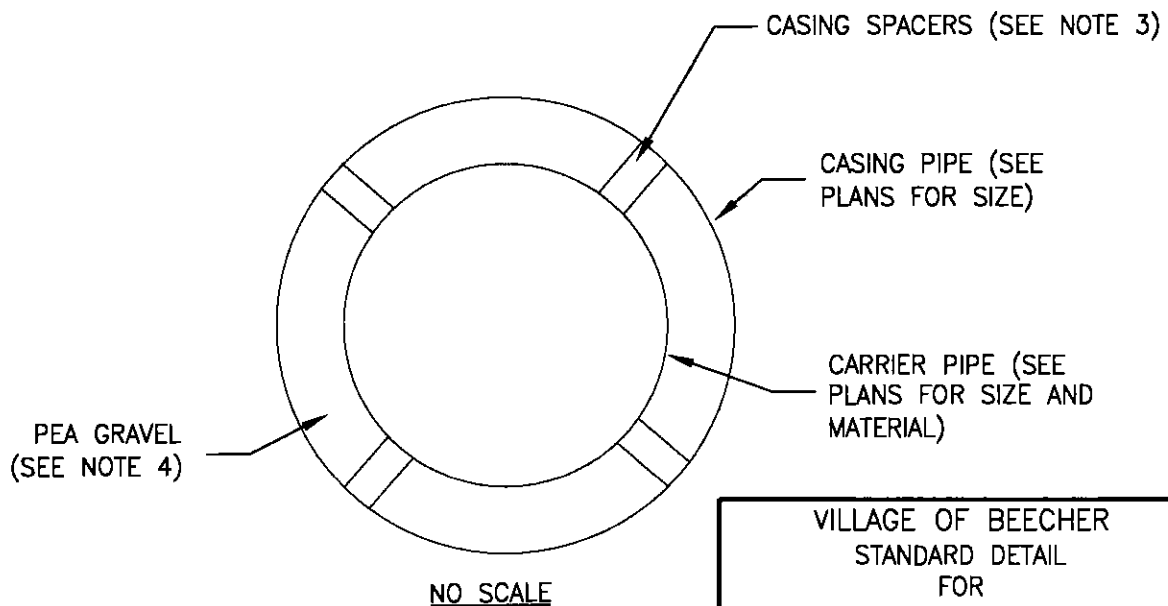
2. COAT EXTERIOR SURFACES OF THE CASING PIPE WITH COAL-TAR EPOXY COMPLYING WITH AWWA C210.

3. PROVIDE CARRIER PIPE SUPPORT SYSTEM TO POSITION CARRIER PIPE AT THE INDICATED ELEVATION AND SLOPE WITHIN THE CASING, USING POWERSEAL CASING CHOCK MODEL 4810 STAINLESS STEEL SPACERS CONSISTING OF 4 GAUGE TYPE 304 STAINLESS STEEL SHELLS, PVC LINER, HIGH MOLECULAR WEIGHT POLYMER RUNNERS, AND STAINLESS STEEL BOLTS AND LOCK NUTS, OR APPROVED EQUAL. A MINIMUM OF THREE SPACERS SHALL BE PROVIDED PER CARRIER PIPE LENGTH, ON 6-FOOT CENTERS.

4. FILL ANNULAR SPACE BETWEEN CARRIER AND CASING PIPES FOR ALL PIPES EXCEPT WATER MAINS WITH PEA GRAVEL.

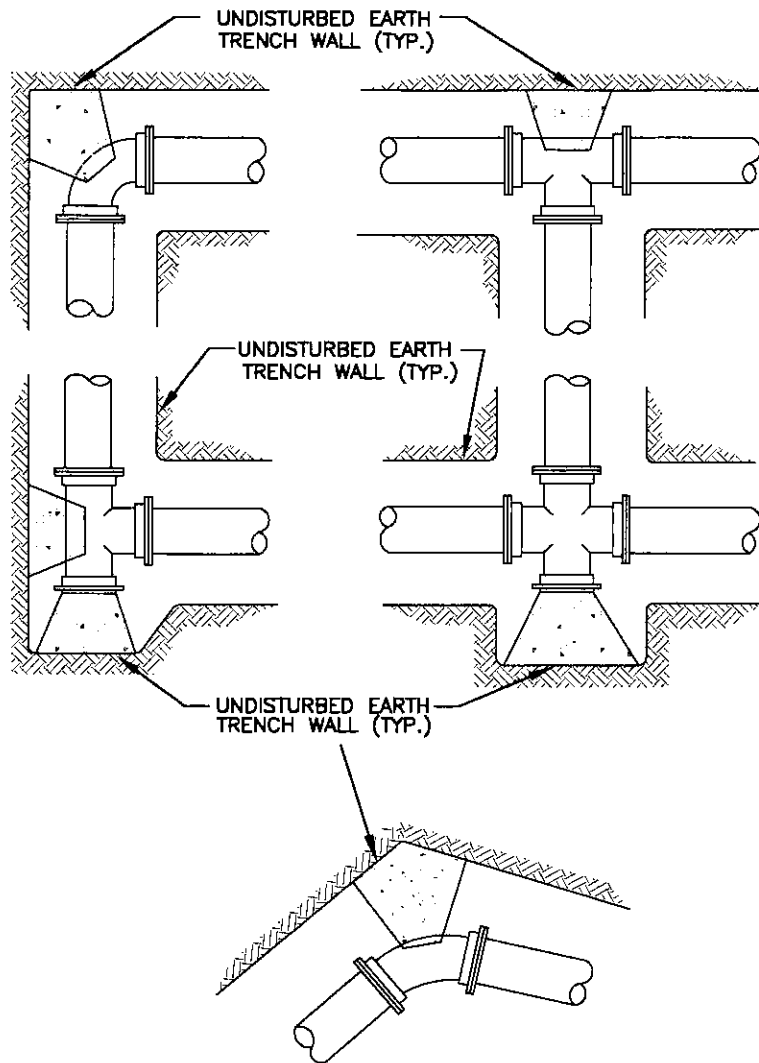
5. CONSTRUCT END SEALS WITH PREMANUFACTURED RUBBER END SEALS MADE SPECIFICALLY FOR THIS PURPOSE.

6. FILL VOIDS AROUND EXTERIOR OF CASING PIPE WITH MEARL GEOFOAM LIQUID CONCENTRATE LOW DENSITY CELLULAR CONCRETE GROUT HAVING A MINIMUM NET DENSITY OF 45 PCF AND A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 160 PSI.

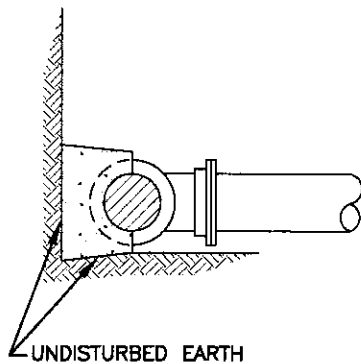


VILLAGE OF BEECHER
STANDARD DETAIL
FOR
CASING PIPE
DATE: OCT. 2005

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PLANS



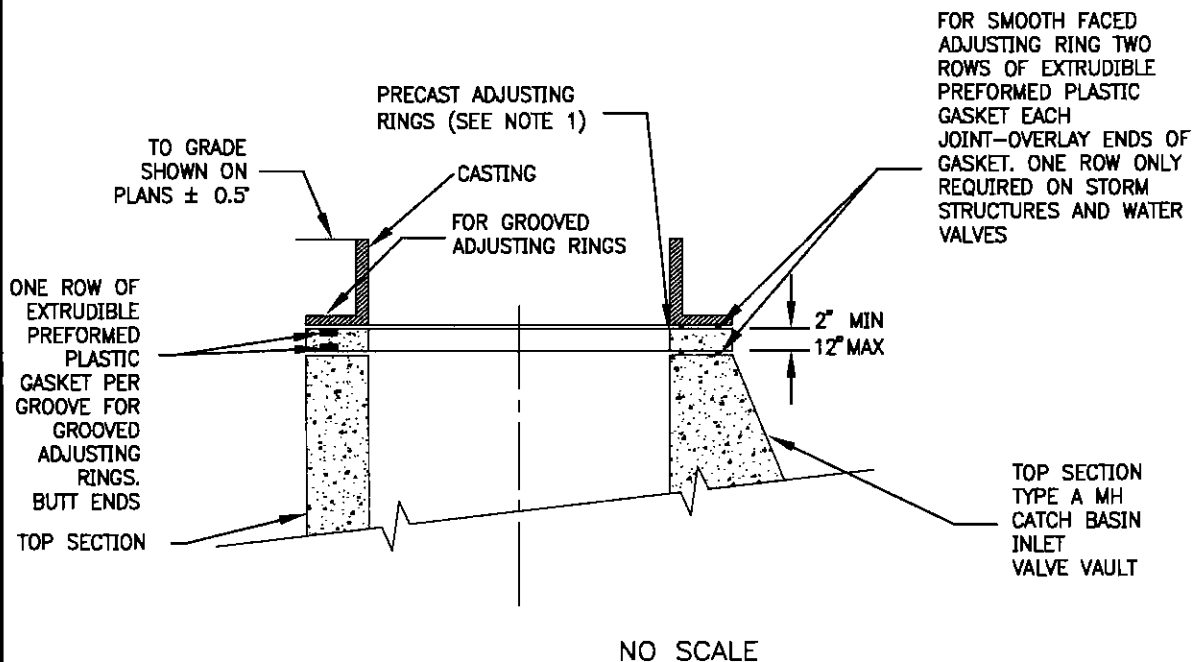
SECTION

NO SCALE

NOTES

1. PROVIDE PRECAST OR CAST-IN-PLACE IDOT CLASS SI CONCRETE THRUST BLOCKS OF ADEQUATE SIZE AND THRUST BEARING SURFACE TO PREVENT MOVEMENT OF PIPELINE UNDER PRESSURE.
2. PLACE THE BASE AND THRUST BEARING SIDES OF THRUST BLOCK DIRECTLY AGAINST UNDISTURBED EARTH.
3. PLACE THRUST BLOCKING SO THE FITTING JOINTS WILL BE ACCESSIBLE FOR REPAIR.
4. ALL FITTINGS SHALL HAVE MECHANICAL JOINTS WITH MEGA-LUG RETAINER GLANDS BY EBAA IRON, AND DURATRON SAC-NUTS ON 50% OF ALL BOLTS.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
THRUST BLOCK INSTALLATIONS
DATE: OCT. 2005

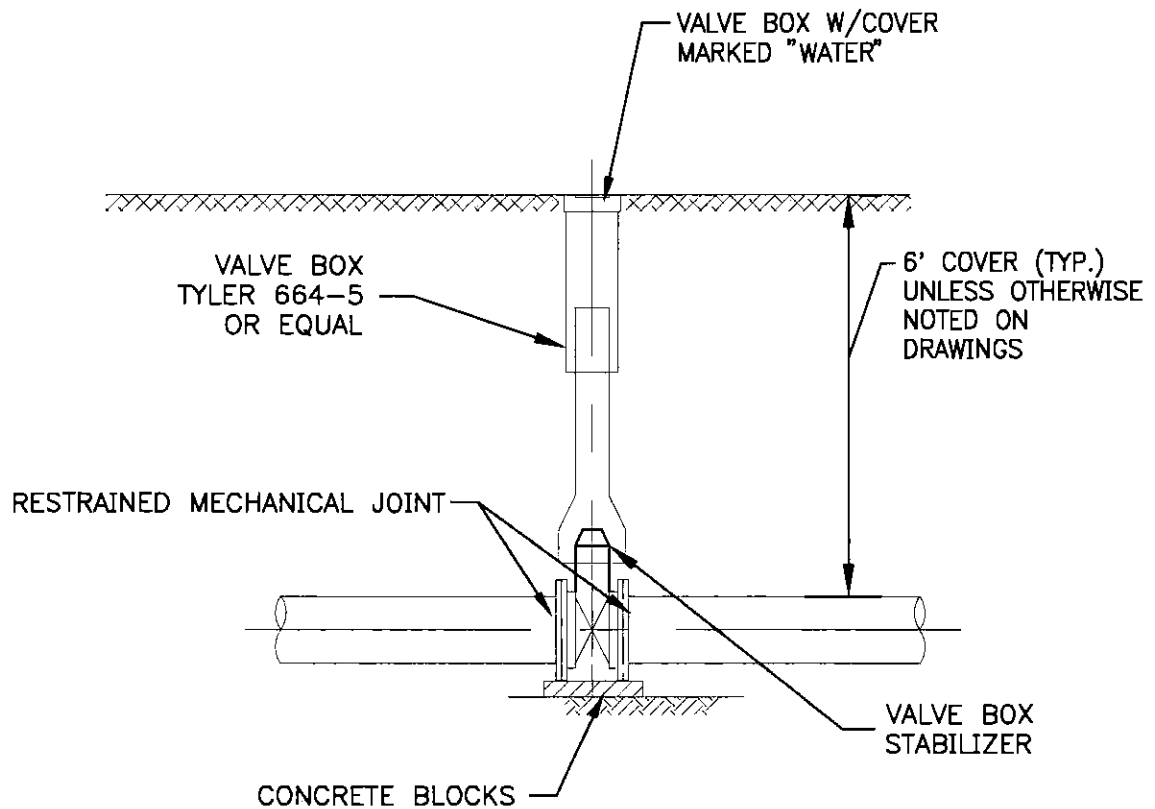


NOTES:

1. THERE SHALL BE A MAXIMUM OF 2 ADJUSTING RINGS WITH A MAXIMUM TOTAL HEIGHT OF 8".
2. THE FOLLOWING CASTING, OR APPROVED EQUAL, SHALL BE UTILIZED AS INDICATED:
 - A. SANITARY MANHOLES: EAST JORDAN IRON WORKS #1050, OR NEENAH R-1712 EX HD WATERTIGHT LID WITH CONCEALED PICKHOLE, O-RING GASKETS, AND "BEECHER" AND "SANITARY" CAST IN LID.
 - B. WATER VALVE VAULTS: EAST JORDAN IRON WORKS #1050, OR NEENAH R-1712 EX HD WATERTIGHT LID WITH CONCEALED PICKHOLE, O-RING GASKETS, AND "BEECHER" AND "WATER" CAST IN LID.
 - C. STORM MANHOLES: EAST JORDAN IRON WORKS #1050, EX HD LID WITH CONCEALED PICKHOLE, AND "BEECHER" AND "STORM" CAST IN LID, FOR LIDS INDICATED AS "SOLID" ON PLANS. FOR LIDS INDICATED AS "OPEN" ON PLANS, USE THE SAME CASTING, BUT WITH A TYPE M1 RADIAL FLAT GRATE.
 - D. DRAINAGE STRUCTURES IN AREAS WITH UNPAVED SURFACES: EAST JORDAN IRON WORKS 6527, OR NEENAH R-4340-B.
 - E. WITHIN FLOOD PLAIN AREAS, PROVIDE SANITARY STRUCTURES WITH WATERTIGHT, LOCK-TYPE COVERS - NEENAH R-1916-C WITH $\frac{1}{2}$ " DIA. STN. STL RODS TO ANCHOR TO PRECAST CONE WITH 3" MIN. EMBEDMENT USING EPOXY ADHESIVE (TYP. FOR 4).

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
CASTING INSTALLATION AND
ADJUSTING
DATE: OCT. 2005

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NO SCALE

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
STANDARD WATER VALVE
WITH VALVE BOX

DATE: NOVEMBER 2005
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VILLAGE OF BEECHER, ILLINOIS ENGINEERING TECHNICAL STANDARDS

SECTION 4

SANITARY SEWER SYSTEM

Section 4.01 – General

- A. All residential, commercial, or industrial subdivision or development including single lots shall be served by a sanitary sewer system connected to the Village sanitary sewer system. Each subdivision or development shall include provisions for the construction of sanitary sewer facilities complete with manholes and other appurtenances required in accordance with this section.
- B. The sanitary sewer system shall be designed and constructed in accordance with the latest edition of the “Standard Specifications for Water and Sewer Main Construction in Illinois”; the Illinois Environmental Protection Agency’s “Illinois Recommended Standards for Sewage Works” as included in the latest edition of Title 35 of the Illinois Administrative Code, Subtitle C, Chapter II, Part 370; the latest edition of the “Recommended Standards for Wastewater Facilities”; and the Plumbing Code of the Village of Beecher, unless otherwise modified in the section.
- C. Specification references made herein for manufactured materials, such as pipe, manholes, and fittings refer to designations of the American Society for Testing and Materials (ASTM), and the American National Standards Institute (ANSI).
- D. Before commencing the sanitary sewer system layout, the developer shall confer with the Village Engineer to determine the required size, grades, and depth for any trunk sewers traversing the subdivision or lot to allow for the extension of sewer service to areas beyond the subject development.

Section 4.02 – Basic Design Standards

- A. Complete System Requirements:

A complete sanitary sewer system shall be designed to serve the entire development. The sanitary sewers shall be of adequate size to collect and transport the wastewater from the development to the Village’s Wastewater Treatment Plant. The design engineer shall submit calculations showing that the sewers have adequate capacity.
- B. Location:
 - 1. All sanitary sewer system piping shall be extended to the far property line, and to other locations indicated by the Village Engineer.
 - 2. All sanitary sewers shall be extended to the property line and shall be constructed within public right-of-way or within approved easements dedicated for public utilities.
- C. Sizing Requirements:

1. Minimum sanitary sewer size shall be eight (8) inch diameter.
 2. Minimum building sanitary service sewer size shall be six (6) inch diameter.
- D. Cover Requirements:
1. Sewers shall be sufficiently deep to prevent freezing.
 2. A minimum of four (4) feet of cover shall be provided.
 3. Where high ground water conditions are anticipated, buoyancy of sewers shall be considered and adequate provisions made for protection.
- E. Service Connections:
1. All attached and detached single family dwelling units shall be served directly by a separate sanitary service connected to the Village's sanitary sewer system and not be part of a common service.
 2. Overhead sewers are required for all buildings. Gravity basement service will not be allowed.
 3. Each sanitary sewer stub extended to a minimum of one (1) foot inside of the lot line, plugged, and marked with a 4-inch by 4-inch post no less than three (3) feet above grade painted green in color.
- F. Design Flows:
1. Design flows shall be based upon full development of the ultimate service area using generally accepted engineering principles and resident occupancy criteria as well as commonly used quantities of sewage flows as found in the "Illinois Recommended Standards for Sewerage Works".
 2. Sewers shall be designed on the basis of not less than 100 gallons per capita per day.
 3. Design peak flows shall be determined using the ratio of peak to average daily flow as determined from Appendix D, Figure No. 1 in the "Illinois Recommended Standards for Sewerage Works".
- G. Sewer Design Hydraulics:
1. All sewers shall be designed to provide design flow capacity, using Manning's formula with an "n" value of 0.013.
 - a. 8-inch and 10-inch sewers are to be designed to flow at 50 percent of capacity at design flow.
 - b. 12-inch, 15-inch, and 18-inch sewers are to be designed to flow at 67 percent of capacity at design flow.
 - c. Sewers greater than 18-inch in sizes shall be designed to flow at 80 percent of capacity at design flow.
 2. All sewers shall be designed and constructed to give a mean velocities, when flowing full, of not less than two (2) feet per second.
Where velocities greater than ten (10) feet per second are attained, special provisions shall be made to protect against erosion and shock.
- H. Vertical and Horizontal Alignment:
1. Sewers shall be laid straight in both horizontal and vertical planes between manholes.
- I. Sewer Size Changes:
1. Sanitary sewers of different diameter shall join only at manholes.

2. The invert elevations shall be adjusted to maintain a uniform energy gradient by matching the 0.8 depth points of different diameters.

J. Sanitary Manholes:

1. Manholes shall be provided at the following locations:
 - a. Termination of existing and future lines
 - b. Changes in direction, horizontal, or vertical
 - c. Changes in shape or pipe size
 - d. Junctions with other sanitary sewers
 - e. For inspection and sampling where required by the Village or Village Engineer.
2. Access spacing shall be:

<u>Sewer Pipe Size</u>	<u>Maximum Interval</u>
8 to 15-inch	400 feet
18 to 30-inch	500 feet

3. A drop manhole shall be provided for any manhole with a pipe having a difference in invert elevation of more than twenty-four (24) inches above the invert of the sewer leaving the manhole.
4. Where flows, pipe size, or other conditions dictate, special manholes or junction chambers shall be designed and constructed, as approved by the Village Engineer.
5. Minimum manhole diameters shall be:

<u>Sewer Pipe Size</u>	<u>Manhole Diameter</u>
8 to 21-inch	48 inches
24 to 30-inch	60 inches

K. Water and Sewer Separation:

See Water Main Technical Standards Section 3.02-F.

Section 4.03 – Material Specifications

A. Sanitary Sewer Pipe:

1. PVC plastic sewer pipe: 4-inch through 15-inch:
 - a. Comply with ASTM D3034 for Type PSM polyvinyl chloride (PVC) sewer pipe and fittings of minimum wall thickness SDR 26.
 - b. Joints: Use either the solvent-weld type complying with ASTM D2564 and ASTM D2855, or the elastomeric gasket type complying with ASTM F477 and ASTM D3212.
 - c. Fittings in sizes through 8-inch: Molded in one piece with elastomeric joints and minimum socket depths as specified in Section 6.2 and 7.3.2 of ASTM D3034.
 - d. Fittings 10-inch and larger: Molded or fabricated in accordance with Section 7.11 with manufacturer's standard pipe bells and gaskets.
 - e. Gaskets for fittings and joints: Provide minimum cross-sectional area of 0.20 square inches complying with ASTM F477.
2. PVC plastic sewer pipe: 18-inch through 24-inch:
 - a. Comply with ASTM F679 for polyvinyl chloride (PVC) large diameter heavy wall gravity sewer pipe and fittings.

- (1) Corresponding to SDR 26 (pipe stiffness = 115 psi).
 - b. Joints: Use integral bell gasketed type with elastomeric gaskets to form a watertight seal complying with ASTM F477 or ASTM D3212.
- 3. PVC plastic pressure pipe:
 - a. Pipe material: Use Type I, Grade 1, polyvinyl chloride complying with ASTM D1784.
 - b. Comply with ASTM D2241 for 160 psi pressure rated pipe with a standard dimension ratio of 26.
 - c. Joints:
 - (1) Underground pipe: Use push-on bell and spigot type with rubber ring seal gasket conforming to ASTM D3139.
 - d. Branch fittings:
 - (1) Use factory fabricated type with attached main line coupling, with same rating as pipe.
 - e. Risers and service pipe:
 - (1) Use ASTM D2241, 160 psi pressure pipe, SDR 26.
 - f. Adapters:
 - (1) Use PVC adapters specifically made for purpose of changing from PVC pressure to PVC gravity pipe.
 - g. Acceptable manufacturers:
 - (1) Harco.
 - (2) Or equal.
- 4. PVC large diameter close profile (double-wall): over 24-inch:
 - a. Comply with ASTM F1803, closed profile, with polyvinyl chloride complying with a minimum cell classification of 12364A as per ASTM D1784, pipe stiffness 46 psi minimum.
 - (1) Provide Manufacturers Certification that PVC pipe has been designed to withstand all earth loads and live loads that will bear upon the pipe.
 - (2) Provide smooth interior surface for pipe and fittings.
 - b. Joints:
 - (1) Bell and spigot with elastomeric seals conforming to ASTM D3212, and gaskets to ASTM F477.
 - (2) No-bell, smooth exterior wall, with elastomeric seals conforming to ASTM D3212.
 - c. Plug: Use watertight gasketed plugs and caps provided by the pipe manufacturer.
 - d. Acceptable products:
 - (1) Lamson Vylon pipe,
 - (2) Diamond Plastics,
 - (3) Or equal.
- 5. Alternate pipe materials may be allowed upon review and recommendation of the Village Engineer and upon approval of the Village of Beecher.

B. Branch fittings:

1. Use either factory fabricated type with attached main line coupling, or solvent welded saddle type attached to the pipe with cement and held in place with stainless steel bands.
 - a. Branch fittings: SDR 26.
 - (1) Acceptable manufacturers:
 - i. Harco, or
 - ii. Freedom Plastic.
- C. Risers and service pipe and fittings:
 1. Use SDR 26, solid wall type complying with ASTM D3034 for PVC pipe.
 2. Caps and plugs shall be gasketed SDR 26.
- D. Sanitary Manholes:
 1. Precast:
 - a. Provide precast reinforced concrete manhole sections, bottoms, and flat top slabs complying with ASTM C478 unless otherwise indicated on Drawings.
 - b. Provide eccentric cone section unless otherwise indicated on the Drawings.
 - c. Provide precast reinforced concrete monolithic base for new and existing sewer lines.
 - d. Design flat slab top for HS-2044 loading.
 - e. Provide reducer flat top or cone to reduce manhole barrel to 48-inch diameter on manholes with larger than 48 diameter monolithic bases.
 - f. Provide the following to manholes:
 - (1) External frame seal.
 - (2) Manhole exterior joint protection.
 - g. No more than two (2) precast concrete adjusting rings with eight (8) inch maximum height adjustment.
 2. Concrete:
 - a. Provide 4000 psi concrete using Type I Portland Cement complying with ASTM C150.
 3. Mortar:
 - a. Mix one part Portland Cement to three parts fine aggregate.
 4. Joints for precast sections:
 - a. Provide tongue and groove joints with either flexible watertight rubber gaskets or preformed bituminous plastic gaskets consisting of a homogeneous blend of refined hydrocarbon resins and plasticizing compound reinforced with inert mineral filler.
 - (1) Acceptable preformed gasket products:
 - i. K. T. Snyder Co., RAM-NEK.
 - ii. Concrete Sealants, Type CS-102.
 - iii. Or equal.
 5. Steps:
 - a. Provide steps with a minimum width of 12 inches and a minimum projection of 5 inches.
 - b. Use steps consisting of copolymer polypropylene plastic with a continuous 1/2-inch steel reinforcement as manufactured by M.A. Industries, Inc.
 6. Frames and covers:

- a. Provide cast iron frames and covers with heavy duty indented top with solid self-sealing lids and machined bearing surfaces, stamped with the word "SANITARY" and "VILLAGE OF BEECHER".
 - (1) Acceptable products: East Jordan 1050 EXHD, or Neenah R-1712 equal.
 - (2) Within floodplain areas and having a rim elevation below the flood protection elevations, provide watertight, lock-type covers – Neenah No. R-1916-C, or approved equal.
- 7. Flexible pipe connectors:
 - a. Provide flexible rubber gasket collar for connecting pipe to the manhole.
 - (1) For pipe 24-inch and smaller, use PSX gasket system by Press-Seal Gasket Corporation, or equal.
 - (2) For pipe 27-inch and larger, use resilient gasket by A-LOK Products, Inc., or equal.
- 8. Manhole exterior joint protection:
 - a. Two piece wrap-around heat shrinkable sleeve system.
 - (1) Minimum width: 9 inches.
 - (2) Acceptable manufacturer: CANUSA WRAPID SEAL.
 - b. Woven polypropylene fabric with rubberized mastic coating and steel strapping.
 - (1) Minimum width 9 inches.
 - (2) Acceptable manufacturer: MacWrap.
 - c. EDPM (Ethylene Propylene Diene Monomer) external rubber sleeve with 2-inch wide mastic strip on top and bottom edge of sleeve.
 - (1) Minimum thickness: 60 mils.
 - (2) Minimum width: 8 inches.
 - (3) Mastic: Non-hardening butyl rubber sealant; minimum thickness ¼-inch.
 - (4) Acceptable products: Infi-Shield External Sealing System; or equal.
- 9. Internal Frame Seal:
 - a. Provide rubber gasket consisting of flexible synthetic rubber sleeve and stainless steel expansion bands.
 - (1) Sleeve material conforming to ASTM C923 with a hardness of 45 durometer, 3/16-inch minimum thickness, double pleated sleeve capable of vertical expansion of 2 inches when installed.
 - (2) Expansion bands to compress sleeve in place: 16 gauge minimum thickness, Type 304, ASTM A2740 stainless steel construction.
 - 1. minimum bank width: 1-3/4 inches.
 - 2. All screw and bolt fasteners: Type 304, ASTM A276, stainless steel.
 - 3. Rubber gasket capable of removal and adjustment in the field after initial installation without damage to the rubber sleeve, extensions, and bands.
 - b. Provide accessories when required by each application.
 - (1) Tapered sleeve for sloped sealing surfaces.
 - (2) Wedge inserts of same construction as sleeve.

- (3) Sleeve extension of synthetic rubber construction, height as necessary to seal manhole frame and all existing adjusting rings to the cone section/corbel.
 - c. Acceptable manufacturers:
 - (1) Cretex Specialty Products.
 - (2) Or equal.
- 10. Manhole Internal/External frame seal:
 - a. Internal/External frame seal:
 - (1) Provide frame seals consisting of a flexible internal rubber sleeve, rubber ring, and external rubber sleeve and extension, and stainless steel compression bands.
 - (2) Rubber sleeve, ring, and extension:
 - 1. Provide rubber sleeve and extension complying with ASTM D412 and ASTM D2240.
 - 2. Provide rubber ring complying with ASTM D-2000.
 - 3. Comply with a minimum 20 psi adhesion tensile strength, elongation @ 32 degrees F, and maximum 25 psi compressibility @ 77 degrees F.
 - 4. Provide sleeve with a minimum thickness of .062: and unexpanded external vertical heights of 10 to 12 inches.
 - 5. Provide extension having a minimum thickness of .062".
 - (3) Compression band:
 - 1. Provide compression band to compress the external sleeve against the manhole.
 - 2. Use stainless steel band conforming to ASTM A240 Type 304 with no welded attachments and having a minimum width of ½-inch.
 - 3. Make a watertight seal having a minimum adjustment range of 2 diameter inches.
 - (4) Acceptable products:
 - 1. Adaptor, Inc. Internal/External Adaptor Seal.
 - 2. Or equal.
- 10. Manhole drop connection:
 - a. 8-inch to 12-inch diameter drop: PVC SDR 26.
 - (1) Encase entire drop pipe
 - (2) from base of manhole to 6 inches above top of incoming sewer with 4000 psi concrete at a minimum thickness of 6 inches.
 - b. Over 12-inch diameter drop: Ductile iron class 50.
 - (1) Encase drop elbow at base of manhole only in concrete.
 - (2) Encase to 2 feet above top of elbow.
 - (3) Utilize ductile iron restrained joint pipe and fittings for drop elbow, pipe, and ductile iron tee at incoming sewer.
 - (4) Support drop pipe to manhole wall with stainless steel brackets and strapping where drops are over 10 feet long.
 - c. PVC drops over 12-inch diameter with total concrete encasement may be utilized if approved by the Engineer.
- E. Pipe Bedding and Backfill:

1. Provide well graded, washed, mixture of gravel or crushed stone aggregate free of clay, loam, dirt, calcareous, or other foreign matter conforming to the IDOT "Standard Specification" gradation No. CA-7.
 2. For flexible thermoplastic pipes including sewer pipes, sewage force mains, and water mains: Comply with ASTM D2321, Class I or II as modified below.
 - a. Exclude sharp angular granular materials.
 - b. Limit maximum particle size to ½-inch.
 - c. Do not use Class II materials in wet conditions.
- F. Special Granular Trench Backfill:
Provide granular material: Use 100 percent crushed stone or gravel complying with the IDOT "Standard Specification" gradation No. CA-7 material.
- G. Casing Pipe:
See Water Main Technical Standards Section 3.03-K.

Section 4.04 – Construction and Inspection Standards

- A. Approval and Permits:
1. Construction of sanitary sewers and/or services shall not commence until engineering plans and specifications have been approved by the Village Engineer.
 2. No construction shall commence until a copy of all needed permits (IEPA, IDOT, ACOE, IDNR, and other applicable regulatory agencies) are filed with the Village and Village Engineer.
- B. Notification:
1. Prior to beginning the sanitary sewer installation, the contractor shall give the Village forty-eight (48) hours notice of the intended time of starting work.
 2. Prior to beginning the all sewer taps onto existing mains, sewer repairs, or service line installation from the stub to the building, the contractor shall give the Village twenty-four (24) hours notice of the intended time of starting work.
- C. Conformance:
1. The installation of sanitary sewers and appurtenances, including services, shall conform to the requirements of the Illinois Environmental Protection Agency and the Illinois Pollution Control Board.
 2. The contractor shall be responsible for providing a competent individual on site during trenching operations to insure that all OSHA and other applicable safety standards are met by the construction means and methods.
- D. Excavation and Foundation:
1. The trench shall be excavated so that the flow line of the finished sewer shall be at the depth and grade shown on the approved plans. The trench shall be at least twelve (12) inches wider than the external diameter of the pipe. The width of the trench shall not exceed the external diameter of the pipe by more than eighteen (18) inches at the top of the pipe.

2. If the excavation has deeper than necessary, the foundation shall be brought to proper grade by the addition of well-compacted bedding material. Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unsuitable soil, (unless other special construction methods are called for on the plans or in the special provisions), all such unsuitable soil under the pipe and for the width of the trench shall be removed and replaced with well-compacted bedding material.
 3. The pipe shall be laid so that it will be uniformly supported and the entire length of the pipe barrel will have full bearing. No blocking of any kind shall be used to adjust the pipe to grade except when used with embedment concrete.
- E. Pipe Bedding and Backfilling:
1. Four-inches of CA-7 material shall be used as bedding for the sanitary sewer pipe.
 2. Twelve-inches of CA-7 material shall be used to cover the sanitary sewer in areas over five (5) feet or within a 1:1 slope from existing or proposed pavements, driveways, or sidewalks. Excavation shall be backfilled with material excavated from the trench, unless such material is determined to be unsuitable by the Village Engineer. The material shall be free from clods and rocks and shall be placed in twelve inch lifts compacting each lift to yield a minimum of 85 percent maximum dry density as determined according to ASTM D1557.
 3. Any pipe installed under or within five (5) feet of an existing or proposed pavements, driveway, or sidewalk shall be backfilled to within one foot of the top of the trench with CA-7 material. Backfill shall be placed in 12 inch lifts compacted to 95 percent maximum dry density as determined according to ASTM D1557. The final twelve (12) inches shall be backfilled with CA-6 material.
 4. Backfilling shall not be done until installation of the sewer has been inspected and approved by the Superintendent of Public Works or Village Engineer.
- F. Pipe Laying:
1. Pipe laying and joining shall be done in accordance with ASTM D2321 "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe" and the pipe manufacturer's recommendations.
 2. Pipe shall be laid straight both horizontally and vertically between manholes.
 3. Pipe shall not be dropped from delivery vehicles. All pipe shall be lowered into the trench with a suitable apparatus; in no case shall the pipe be dropped or thrown.
- G. Service Connections:
1. Connections to the sewer main shall be done by means of a wye fitting installed in the main.
 2. When the sewer mains are deeper than twelve (12) feet, risers shall be installed at connections such that service pipe shall be not more than twelve (12) feet deep.
 3. Unused wye fittings shall have socket ends sealed by water tight rubber or plastic stoppers suitable fastened or braced to prevent dislodging by back pressure from the main line.
 4. Connections to existing sewer mains shall be made by installing a new wye fitting or by use of a circular sawcut by proper tools ("sewer tap" machine or similar) and installation of a wye saddle in accordance with manufacturer's

- recommendations. All such connections shall be done in the presence of the Village Engineer.
5. All sanitary service laterals shall be plugged or capped at the time of installation.
 6. Minimum slope shall be 1/8-inch per foot.

Section 4.05 – Testing and Televising Standards

A. General:

1. The maximum allowable infiltration allowed under these technical standards shall be two hundred (200) gallons per inch of diameter of the sewer per mile per twenty four (24) hour day at any time for any section of the system. The joints shall be visibly tight and visible leakage in the joints, or leakage in excess of that specified above, shall be repaired at the contractor's expense by means approved by the Village Engineer.
2. New sanitary sewers shall be plugged and not allowed to discharge into existing sewers until the sewers have been tested and the results accepted by the Village.
3. All mainline sanitary sewer testing shall be completed no sooner than thirty (30) days of backfilling, per IEPA requirements.

B. Notification and Operation:

The Public Works Department and Village Engineer shall be notified of the time of the test a minimum of 48 hours prior to each test.

1. All tests shall be performed in the presence of a representative of the Village of Beecher.
2. Devise a method for disposal of waste water from testing operations as approved in advance by the Village Engineer.

C. Sewer Televising:

Upon completion of construction and prior to acceptance of this sewer system and again prior to expiration of the maintenance guarantee, an internal inspection of the sanitary sewers shall be made through the use of televising equipment. The television. inspection shall be done by the contractor and witnessed by the Village Engineer.

1. All deficiencies noted during the inspection shall be repaired by the contractor at his expense by means approved by the Village Engineer.
2. A written report and a color CD or DVD format video of the inspections shall be supplied to the Village Engineer.

D. 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 using an approved stopwatch 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, except that the minimum required time for the one pound per square inch pressure drop described in paragraph (f) shall not be less than that shown in the table below:

MINIMUM ALLOWABLE TIME (min:sec) FOR PRESSURE
DROP
FROM 3-1/2 TO 2-1/2 PSIG WHEN TESTING ON PIPE
DIAMETER ONLY PIPE DIAMETER, INCHES

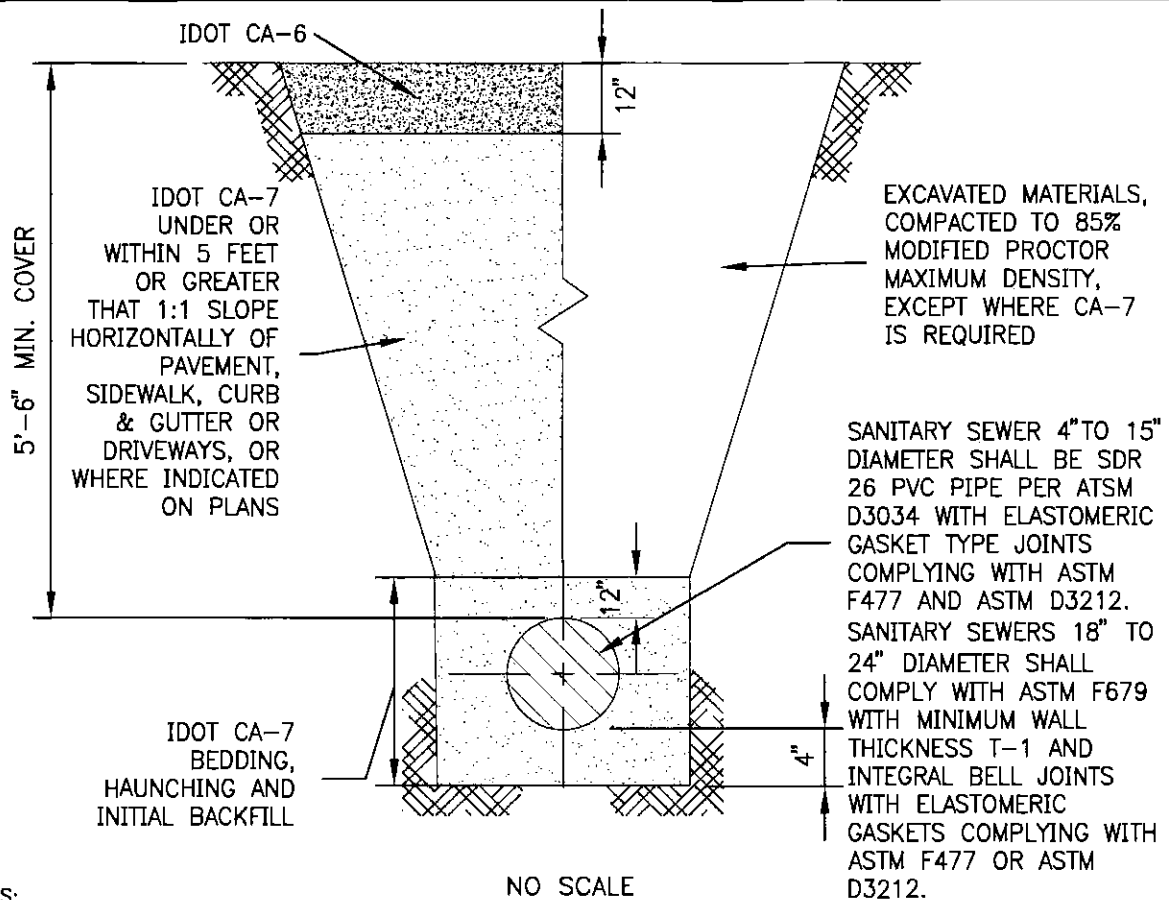
Length of Sewer Pipe In Feet	4	6	8	10	12	15	18	21	24
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29	2:01	2:38
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58	4:03	5:17
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27	6:04	7:55
100	0:18	0:40	1:10	1:50	2:38	4:08	5:56	8:05	10:34
125	0:22	0:50	1:28	2:18	3:18	5:09	7:26	9:55	11:20
150	0:26	0:59	1:46	2:45	3:58	6:11	8:30	10:02	11:35
175	0:31	1:09	2:03	3:13	4:37	7:05	8:30	10:09	11:50
200	0:35	1:19	2:21	3:40	5:17	7:17	8:30	10:17	12:06
225	0:40	1:29	2:38	4:08	5:40	7:29	8:30	10:25	13:36
250	0:44	1:39	2:56	4:35	5:43	7:41	8:31	11:35	15:07
275	0:48	1:49	3:14	4:43	5:46	7:53	9:21	12:44	16:38
300	0:53	1:59	3:31	5:00	5:50	8:05	10:12	13:53	18:09
350	1:02	2:19	3:47	5:15	5:57	8:16	11:54	16:12	21:10
400	1:10	2:38	4:48	6:00	6:03	9:27	13:36	18:31	24:12
450	1:19	2:50	5:24	6:45	6:48	10:38	15:19	20:50	27:13
500	1:28	3:30	6:00	7:30	7:34	11:49	17:01	23:09	30:14

- h. The required times will be adjusted by the Engineer for main line sewers larger than 24 inches and for lateral pipes connected and tested with the main line sewer.
 - i. If the air test fails to meet these requirements, locate and repair, or remove and replace the faulty sections of sewer in a manner approved by the Engineer, as necessary to meet the allowable limits upon retesting.
 - j. Do not use acrylamid gel sealant to correct leakage.
- 2. Individual joint air pressure test:
 - a. Comply with requirements of ASTM C1103-90.
 - b. Test will be conducted on approximately 15 percent of the sewer joints, with locations of sections to be selected by Engineer.
 - c. Utilize commercially available test apparatus utilizing two separate inflatable sealing rings at least 2.50 inches, but not more than 2 feet apart.
 - d. Acceptable maximum air loss is 1 psi in 5 seconds.
 - e. Test pressure is 3.5 psi higher than groundwater pressure, but do not use the individual joint air pressure test if the required test pressure is greater than 6 psi.
 - f. Provide test apparatus that allows remote monitoring of test by Engineer.
 - g. Conduct all tests in the presence of the Engineer.
- 3. Provide and use measuring devices approved by the Engineer.
- 4. Provide materials and labor for making required tests.
- 5. Make tests in the presence of the Engineer, giving the Engineer at least three days advance notice of being ready for test observation.
- E. Deflection test for flexible thermoplastic pipe:
 - 1. Test the deflection of all installed ABS, PVC, and other flexible thermoplastic pipe.
 - 2. Perform the test no sooner than 30 days after backfilling has been completed.
 - 3. Perform the test by pulling a mandrel or rigid ball having a diameter equal to 95 percent of the inside diameter of the pipe through the pipe from manhole to manhole without using mechanical pulling devices.
 - 4. Allowable deflection limits: 5.0 percent of the base inside diameter of the PVC pipe or the average inside diameter of the ABS pipe.
 - 5. Wherever the deflection limitation is exceeded, uncover the pipe, carefully replace compacted embedment and backfill material, and retest for deflection.
- F. Sanitary Manhole Vacuum Testing:
 - 1. Test each sanitary manhole for leakage no sooner than 30 days after installation
 - 2. Plug all lift holes with a non-shrink grout.
 - a. Do not place grout in horizontal joints before testing.
 - 3. Seal all inlet and outlet pipes with airtight plugs, taking care to securely brace plugs to prevent the plugs from being drawn into the manhole.
 - 4. Place the vacuum test equipment at the inside top of the cone section and inflate the seal to 40 psi.
 - 5. Draw a vacuum of 10 inches of mercury and shut the vacuum pump off.
 - 6. Close valves and measure the time for the vacuum to drop to 9 inches of mercury

7. Allowable limits: the manhole shall pass if the time for the vacuum reading to drop from 10 inches to 9 inches exceeds 60 seconds for a 48-inch diameter manhole, 75 seconds for a 60-inch diameter manhole, and 90 seconds for a 72-inch diameter manhole.
 8. Repair all manholes failing the initial test with a non-shrink grout.
 9. If a manhole fails the initial test, retest until a satisfactory test is obtained.
 10. Provide equipment, materials and labor necessary to conduct vacuum testing.
 11. Make tests in the presence of the Owner, giving the Owner at least 48 hours notice prior to testing.
- G. Miscellaneous:
- Prior to final acceptance of the work, "Record Drawings" shall be submitted to the Village. One mylar reproducible, two 24" x 36" copies, and a applicable electronic format acceptable to the Village files shall be submitted in accordance with the current Village requirements.

Section 4.06 - Details

- | | |
|-------------------------------------|----------|
| A. Sanitary Sewer Installation | (SA-001) |
| B. Sanitary Manhole | (SA-002) |
| C. Sanitary Manhole Pipe Connection | (SA-003) |
| D. Sewer Service | (SA-004) |
| E. Drop Connection | (SA-005) |



NOTES:

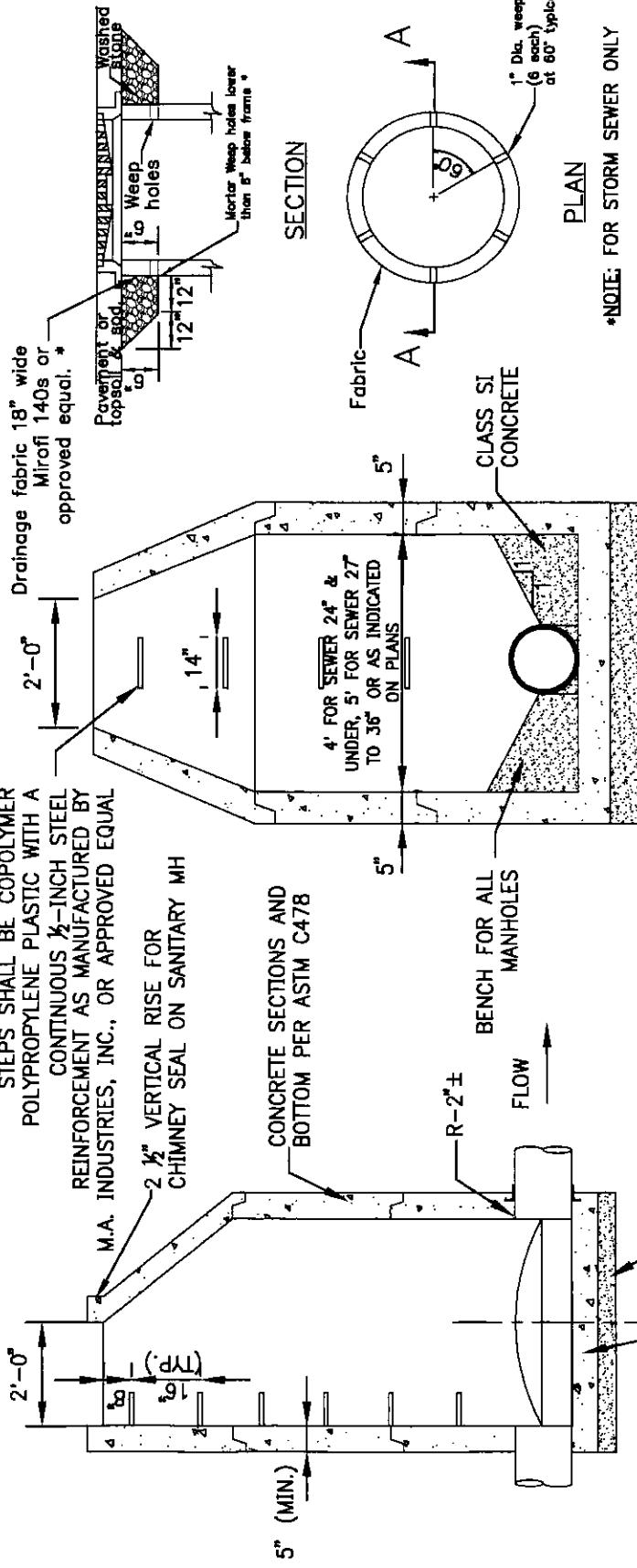
1. WHERE INDICATED ON THE PLANS, SANITARY SEWER PRESSURE PIPE SHALL COMPLY WITH ASTM D2241 FOR 160 PSI PRESSURE RATED PIPE SDR 26, MADE OF TYPE 1, GRADE 1 POLYVINYL CHLORIDE CONFORMING TO ASTM D1784. JOINTS SHALL USE PUSH-ON BELL AND SPIGOT TYPE WITH RUBBER RING SEAL GASKETS CONFORMING TO ASTM D3139.
2. GRAVITY SANITARY SEWER FITTINGS 4-INCH THROUGH 8-INCH SHALL COMPLY WITH ASTM D3034 SDR26; 10-INCH AND LARGER FITTINGS SHALL BE MOLDED OR FABRICATED IN ACCORDANCE WITH SECTION 7.11 OF ASTM D3034 WITH MANUFACTURER'S STANDARD PIPE BELLS AND GASKETS. GRAVITY SEWER RISERS AND SERVICE PIPE AND FITTINGS SHALL COMPLY WITH ASTM D3034 FOR PVC PIPE, WITH AN SDR OF 26.
3. PRESSURE SANITARY SEWER FITTINGS SHALL BE FACTORY FABRICATED WITH ATTACHED MAIN LINE COUPLING, WITH SAME RATING AS PIPE. PRESSURE SEWER RISERS AND SERVICE PIPE AND FITTINGS SHALL COMPLY WITH ASTM D2241, 160 PSI PRESSURE RATED, SDR 26 PIPE. SEPARATE NOTIFICATION SHALL BE PROVIDED TO PUBLIC WORKS DEPARTMENT PRIOR TO INSTALLING PRESSURE SANITARY SEWERS.
4. ALL SANITARY SEWERS SHALL BE PRESSURE TESTED IN ACCORDANCE WITH ARTICLE 31-1.11B(3) OF THE STANDARD SPECIFICATIONS FOR SEWER & WATER CONSTRUCTION IN ILLINOIS, FIFTH EDITION; AND DEFLECTION TESTED IN ACCORDANCE WITH ARTICLE 31-1.11B(4) OF THE STANDARD SPECIFICATIONS FOR SEWER & WATER CONSTRUCTION IN ILLINOIS, FIFTH EDITION. DEFLECTION TESTING SHALL BE DONE NO SOONER THAN 30 DAYS AFTER THE PIPE HAS BEEN BACKFILLED. NO SOONER THAN ONE YEAR AFTER SEWERS HAVE BEEN INSTALLED, THEY SHALL BE INSPECTED BY CLOSED CIRCUIT COLOR TELEVISION TO DETERMINE IF ANY PIPE INSTALLATION DEFECTS HAVE OCCURRED, AND TO DETERMINE THE LOCATION OF SERVICES. ONE COPY OF THE CD/DVD AND WRITTEN INSPECTION REPORT SHALL BE FURNISHED TO THE VILLAGE.
5. SEWER PLUGS SHALL BE INSTALLED AT DOWNSTREAM ENDS OF ALL NEW SEWERS AND LEFT IN PLACE UNTIL VILLAGE ACCEPTS SEWERS. SEWER PLUGS SHALL BE INSTALLED AT UPSTREAM ENDS OF NEW SEWERS AT THE END OF EACH DAY'S WORK.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
SANITARY SEWER INSTALLATION
DATE: OCT. 2005

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STEPS SHALL BE COPOLYMER
POLYPROPYLENE PLASTIC WITH A
CONTINUOUS 1/2-INCH STEEL
REINFORCEMENT AS MANUFACTURED BY
M.A. INDUSTRIES, INC., OR APPROVED EQUAL

2'-0" VERTICAL RISE FOR
CHIMNEY SEAL ON SANITARY MH



PRECAST CONCRETE
6" BASE (TYP.)

4" CA-7 BEDDING

BENCH FOR ALL
MANHOLES

R-2"

FLOW

CONCRETE SECTIONS AND
BOTTOM PER ASTM C478

2'-0"

5" (MIN.)

14"

2'-0"

Drainage fabric 18" wide
Mirolite 140s or
approved equal.

Pavement or
topsoil & soil

Weep holes

Mortar Weep holes lower
than 5" below frame *

12" 12"

CLASS SI
CONCRETE

Fabric

1" Dia. weep holes
(6 each)
at 80" typical *

SECTION

PLAN

*NOTE: FOR STORM SEWER ONLY

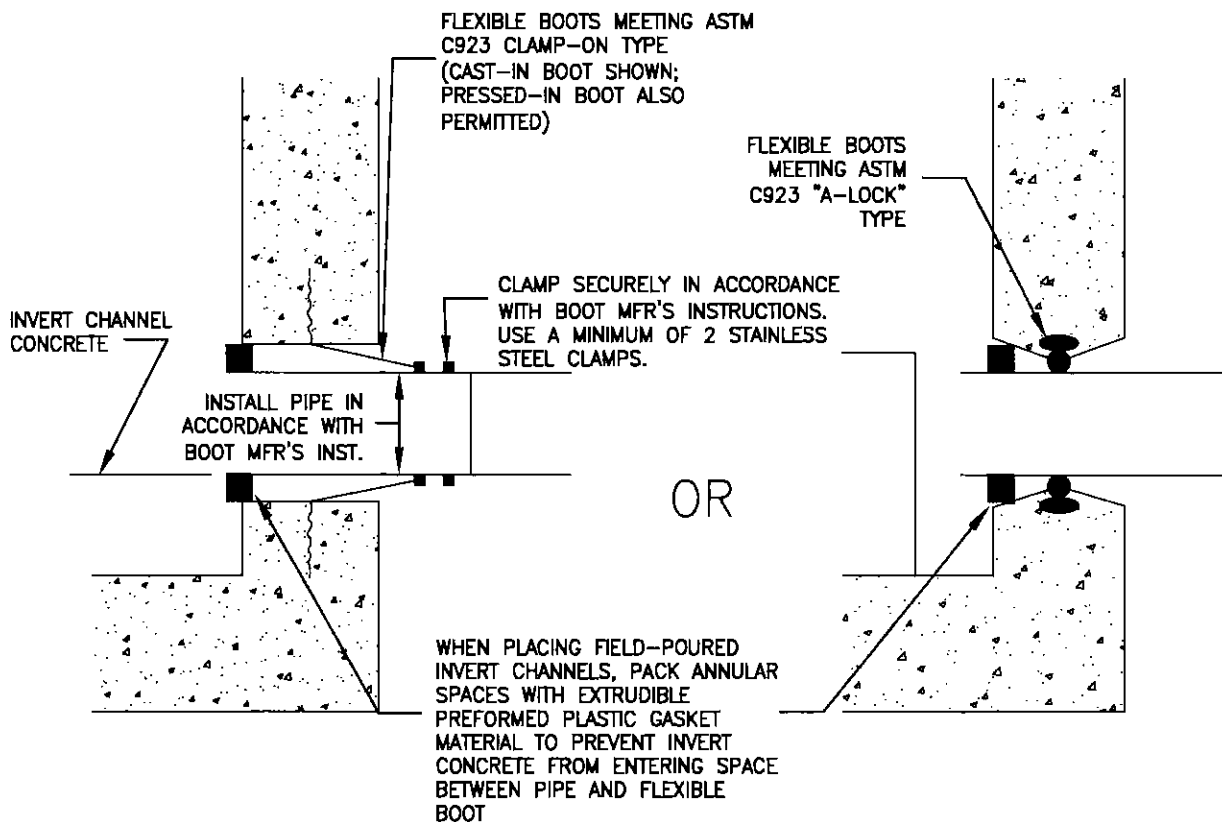
NO SCALE

NOTE:

1. SANITARY MANHOLES SHALL HAVE WATERSTOP GASKETS CAST INTO STRUCTURES AT ALL PIPE PENETRATIONS. (SEE MANHOLE PIPE CONNECTION DETAIL)
2. SANITARY MANHOLES SHALL HAVE CRETEX EXTERNAL CHIMNEY SEALS.
3. SANITARY MANHOLES SHALL HAVE INTEGRAL BASES.
4. MANHOLE BARREL JOINTS SHALL BE TONGUE AND GROOVE TYPE WITH TWO ROWS OF EXTRUDIBLE PREFORMED PLASTIC GASKET MATERIAL (BUTYL ROPE).
5. MACWRAP EXTERNAL JOINT SEALING BANDS IN ACCORDANCE WITH ASTM C-877, OR APPROVED EQUIVALENT, MUST BE PROVIDED AT SANITARY MANHOLE JOINTS.
6. INTERIOR JOINTS SHALL BE "BUTTERED" WITH NON-SHRINK GROUT.
7. STORM MANHOLES SHALL HAVE A WALL THICKNESS OF 6" FOR 5' DIAMETER STRUCTURES AND 7" FOR 6' DIAMETER STRUCTURES
8. SANITARY MANHOLES SHALL PASS VACUUM-TESTING PER ASTM C-1244.
9. SEE CASTING INSTALLATION AND ADJUSTING DETAIL FOR CASTING REQUIREMENTS.

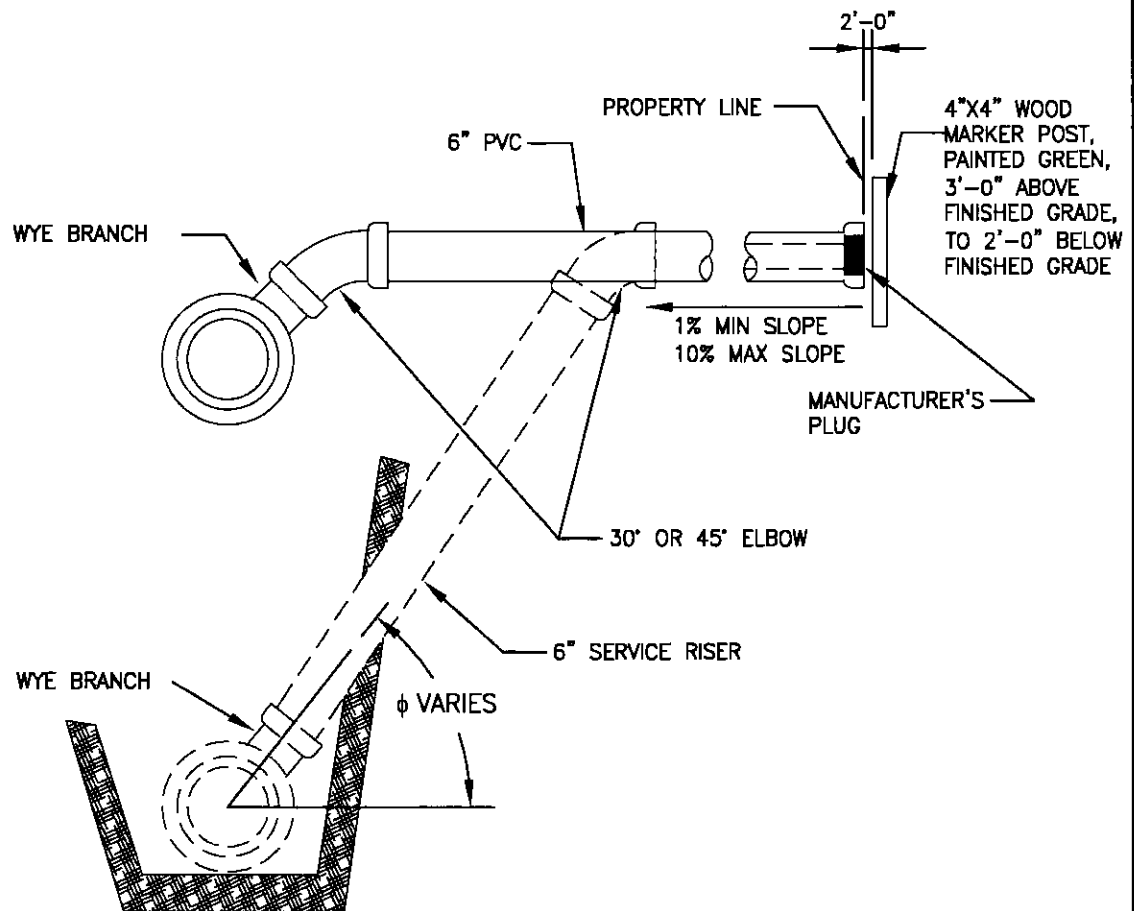
VILLAGE OF BEECHER
STANDARD DETAIL
FOR
MANHOLE TYPE A
DATE: OCT. 2005

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VILLAGE OF BEECHER
STANDARD DETAIL
FOR
SANITARY MANHOLE PIPE
CONNECTION
DATE: OCT. 2005

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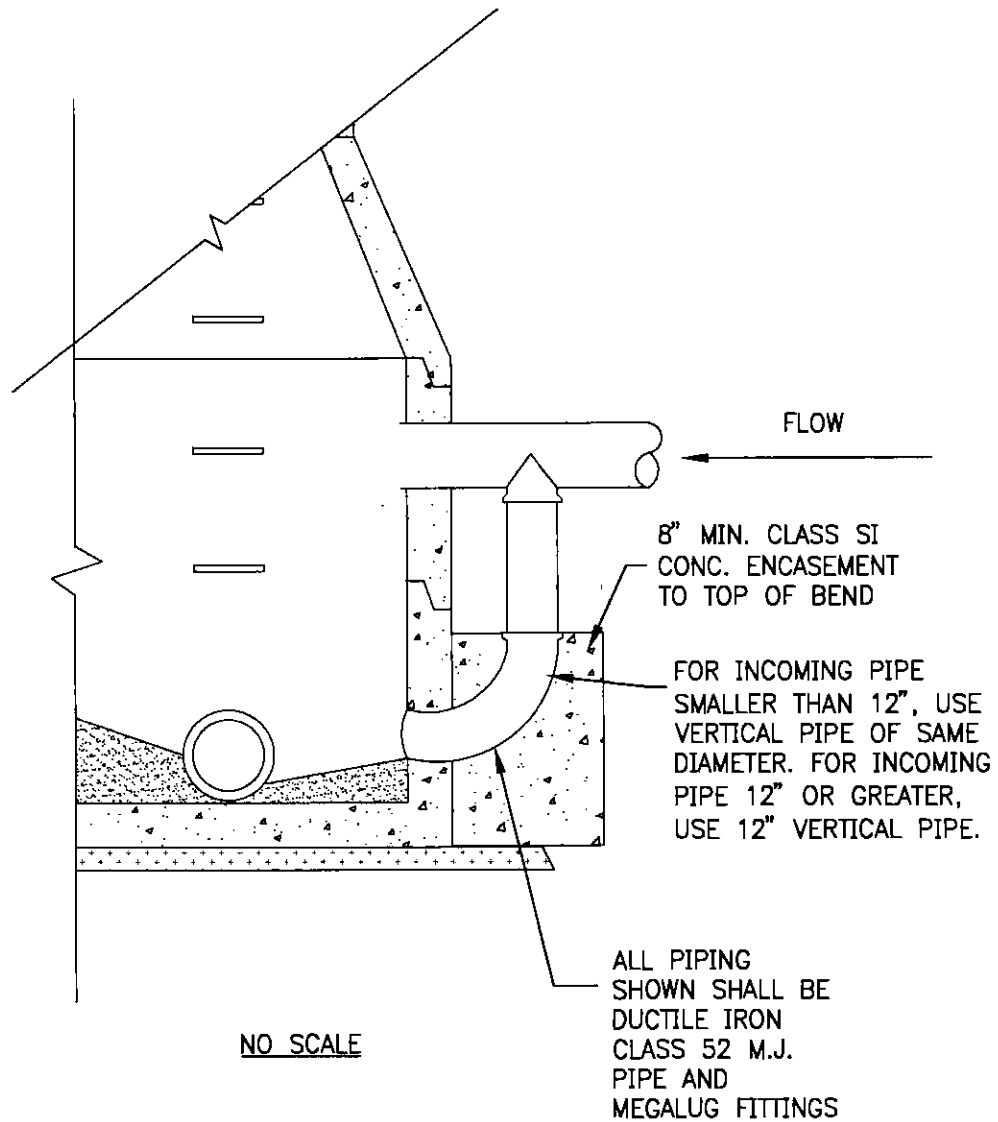


NOTES:

1. IF $\phi < 45^\circ$ USE PVC PUSH-ON JOINT WYE, P.V.C. ELBOW, P.V.C. RISER PIPE & P.V.C. TOP ELBOW.
2. IF $\phi > 45^\circ$ USE DUCTILE IRON M.J. TEE WITH P.V.C./DUCTILE TRANSITION GASKET, DUCTILE IRON RISER PIPE AND DUCTILE IRON TOP ELBOW.
3. ALL PVC PIPE AND FITTINGS SHALL BE ASTM D3034, SDR 26, WITH ELASTOMERIC GASKET TYPE JOINTS COMPLYING WITH ASTM F477 AND ASTM D3212, OR PRESSURE-RATED PIPE AND FITTINGS PER ASTM D2241 AS NOTED ON THE PLANS.
4. A MINIMUM DISTANCE OF 3 FT IS REQUIRED BETWEEN 45° BENDS.
5. TRENCH BACKFILL SHALL BE INSTALLED PER SANITARY SEWER INSTALLATION DETAIL.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
SEWER SERVICE
DATE: OCT. 2005

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VILLAGE OF BEECHER
STANDARD DETAIL
FOR
DROP CONNECTION
DATE: NOV. 2005

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VILLAGE OF BEECHER, ILLINOIS ENGINEERING TECHNICAL STANDARDS

SECTION 5 STORM SEWER SYSTEM

Section 5.01 – General

- A. All residential, commercial, or industrial subdivision of development including single lots shall be served by a storm water management system. Each subdivision or development shall include provisions for the construction of storm sewer and detention facilities as required in accordance with this section and the Village of Beecher Stormwater Drainage and Detention Ordinance No. 1002, and subsequent amendments.
- B. The storm sewer system shall be designed and constructed in accordance with the latest edition of the “Standard Specifications for Water and Sewer Main Construction in Illinois”; The Illinois Department of Transportation’s “Standard Specifications for Road and Bridge Construction in Illinois;” and the Village of Beecher Stormwater Drainage and Detention Ordinance No.1002, unless otherwise modified in the section.
- C. Specification references made herein for manufactured materials, such as pipe, manholes, and fittings refer to designations of the American Society for Testing and Materials (ASTM), and the American National Standards Institute (ANSI).

Section 5.02 – Basic Design Standards

- A. Complete System Requirements:
 - 1. A complete storm and detention system shall be designed to serve the entire development.
 - 2. The storm sewers, streams, or channels shall be designed to accommodate all areas which naturally flow to the area of development and also any additional areas which plan to contribute to the drainage area as identified by the Design Engineer and approved by the Village Engineer.
 - 3. The storm sewer system shall be separate and independent of the sanitary sewer system.
- B. Sizing Requirements:
 - 1. Minimum storm sewer size shall be twelve (12) inch diameter.
- C. Cover Requirements:
 - 1. Sewers shall be sufficiently deep to prevent freezing.
 - 2. Where high ground water conditions are anticipated, buoyancy of sewers shall be considered and adequate provisions made for protection.
- D. Sump Pump and Footing Tile Connections:
 - 1. No water from footing tiles or basement sumps shall be pumped onto the ground surface. Such water shall be discharged into a secondary drainage system or

- directly into the storm sewer system unless otherwise approved by Village Engineer.
2. Pipe material for discharge pipe from the house and the secondary drainage system shall be PVC with a minimum SDR 35 ASTM 3034.
 3. Discharge piping from the house and the secondary drainage system shall be laid on a uniform grade of one-quarter ($\frac{1}{4}$) inch per foot and a minimum depth of cover of (3) feet.
 4. A minimum of three (3) inch diameter pipe shall serve an individual house. This size pipe shall serve up to two (2) houses. A minimum four (4) inch line shall be used when more the two individual house are connected to a secondary drainage line. Computations for sizing of lines shall be provided when more than four (4) houses and connected to a line.
 5. Secondary drainage systems shall be installed within the street right-of-way or in side or back yard easements.
 6. A junction box, eighteen (18) inches in diameter by thirty (30) inches deep shall be provided at all junctions.
 7. Dead-ends of secondary systems shall be provided with a clean-out.
 8. All connections between house discharge sump pump discharge and the secondary drainage system shall be made with factory made fittings, Insert-a-tee, or equal. No cut-in connections will be allowed.
- E. Design Flows:
1. Stormwater design and detention shall be in accordance with the Village of Beecher Stormwater Drainage and Detention Ordinance No. 2001, and subsequent amendments.
 2. A minimum velocity of three (3) feet per second shall be maintained in pipe flowing full, in accordance with the guidelines contained in the Illinois Department of Transportation's Drainage Manual.
 3. Drainage calculations shall be submitted with the development plans.
- F. Vertical and Horizontal Alignment:
1. Sewers shall be laid straight in both horizontal and vertical planes between manholes.
- G. Storm Sewer Size Changes:
1. Storm sewers of different diameter shall join only at manholes.
The invert elevations shall be adjusted to maintain a uniform energy gradient by matching the 0.8 depth points of different diameters.
- H. Stormwater Inlets:
1. Surface drainage shall be provided so that surface water is not carried across any street intersection or park lot drives.
 2. Surface runoff shall not extend a distance more than three hundred (300) feet along the surface of the ground and shall not build up a flow more that two (2) cubic feet per second in a ten (10) year storm before being interrupted by a drainage inlet.
 3. Every residential lot shall have a storm sewer inlet in the backyard within five (5) feet of a property line (in a public utility and drainage easement).

4. Inlets shall discharge into storm sewers, which shall not discharge into side lot or rear lot drainage ditches. Inlets (or other drainage structures) shall be provided at all low points.
5. Stormwater inlets shall have a minimum twenty-four (24) inch inside diameter.
6. At least one adjusting ring shall be used on each inlet barrel to provide a base for the frame and grate. No more than two (2) adjusting rings with six (6) inch maximum height adjustment will be allowed

I. Catch Basins:

1. Catch basins shall be located where required to catch debris that may enter through inlet grates before it is introduced into the main storm sewer piping.
2. Type C catch basins, two (2) foot diameter, shall be used for catch basins no deeper than four (4) feet.
3. Type A catch basins, four (4) foot diameter, shall be used for catch basins deeper than four (4) feet or if pipe size and configuration prohibits the use of a Type C basin.
4. At least one adjusting ring shall be used on each inlet barrel to provide a base for the frame and grate. No more than two (2) adjusting rings with six (6) inch maximum height adjustment will be allowed

J. Storm Manholes:

1. Manholes shall be provided at the following locations:
 - a. Termination of all sewers which do not terminate at a catch basin, inlet, or flared end section.
 - b. Changes in direction, horizontal, or vertical
 - c. Changes in shape or pipe size
 - d. Junctions with other storm sewers.

2. Access spacing shall be:

<u>Sewer Pipe Size</u>	<u>Maximum Interval</u>
12 to 24-inch	350 feet
27 to 36-inch	400 feet
42-inch or larger	500 feet

3. Where flows, pipe size, or other conditions dictate, special manholes or junction chambers shall be designed and constructed, as approved by the Village Engineer.
4. Minimum manhole diameters shall be:

<u>Sewer Pipe Size</u>	<u>Manhole Diameter</u>
18 or less	48 inches
21 to 36-inch	60 inches
Larger than 36-inch	48 inch offset riser

K. Subdrainage:

1. In areas with poorly drained soils and/or high water table perforated pipe subdrains, six (6) inches minimum diameter shall be required. The pipe shall have two rows of perforations and laid with the perforations up. Backfill shall be clean poorly graded crushed rock, CA-7, or equal. Minimum depth of bury shall be forty-two (42) inches unless circumstances do not allow. Minimum trench width

shall be eighteen (18) inches. Pipe material for subdrainage shall be ASTM D-3034 perforated PVC pipe, minimum SDR of 35 with two rows of perforations.

L. Water and Sewer Separation:

1. See Water Main Technical Standards Section 3.02-F.

Section 5.03 Material Specifications

A. Storm Sewer Pipe and Fittings:

1. Reinforced concrete pipe (RCP):
 - a. Comply with ASTM C76.
 - b. Use Class IV unless otherwise designated on Drawings.
2. Elliptical concrete pipe (ECP):
 - a. Comply with ASTM C507.
 - b. Use Class HE-III horizontal elliptical unless otherwise designated on Drawings.
3. Concrete Branch Fittings:
 - a. RCP wye or tee fitting.
 - b. Flexible watertight tee service connector.
 - (1) Acceptable manufacturer's: KOR-N-TEE by NPC systems; or approved equal.
4. Concrete Joints: Use one of the following types:
 - a. Rubber ring gasket complying with ASTM C443.
 - b. Preformed bituminous plastic gasket consisting of a homogeneous blend of refined hydrocarbon resins and plasticizing compound reinforced with inert mineral filler similar to RAM-NEK manufactured by K. T. Snyder Company, or Type CS-208 manufactured by Concrete Sealants, Inc., or equal.
 - c. Bituminous mastic joints of the cold-applied type, consisting of oakum and a homogeneous blend of bitumen, inert filler and suitable solvent of such consistency that it can be applied to the joints with a trowel when the air temperature is between 20 degrees F. and 100 degrees F.

B. Storm Sewer Manholes:

1. Precast:
 - a. Provide precast reinforced concrete manhole sections, bottoms, and flat top slabs complying with ASTM C478.
 - b. Provide eccentric cone section unless otherwise approved by the Village Engineer.
 - c. Design flat slab top for HS-20 loading.
2. Concrete:
 - a. Provide 4000 psi concrete using Type I Portland Cement complying with ASTM C150.
3. Mortar:
 - a. Mix one part Portland Cement to three parts fine aggregate.
4. Joints for precast sections:

- a. Provide tongue and groove joints with either flexible watertight rubber gaskets or preformed bituminous plastic gaskets consisting of a homogeneous blend of refined hydrocarbon resins and plasticizing compound reinforced with inert mineral filler.
 - (1) Acceptable preformed gasket products:
 - i. K. T. Snyder Co., RAM-NEK.
 - ii. Concrete Sealants, Type CS-102.
 - iii. Or equal.
- 5. Steps:
 - a. Provide steps with a minimum width of 12 inches and a minimum projection of 5 inches.
 - b. Use steps consisting of copolymer polypropylene plastic with a continuous ½-inch steel reinforcement as manufactured by M.A. Industries, Inc., cast iron steps, Neenah R-198-1, or approved equal.
- 6. Manhole Frames and covers:
 - a. Provide cast iron frames and covers stamped with the word "STORM" and "VILLAGE OF BEECHER".
 - (1) Acceptable products: East Jordan 1050, or Neenah R-1712 equal.
- 7. Catch Basin and Inlet Frames and covers:
 - a. Catch Basin: Provide open lid cast iron frames and covers with a Type M1 Radial Flat Grate.
 - (1) Acceptable products: East Jordan 1050, or Neenah R-1712 equal.
 - b. Inlets: Provide open lid cast iron frames and covers.
 - (1) Acceptable products: East Jordan 1050, or Neenah R-1712 equal.
 - c. Grassed areas: Provide East Jordan 6527, Neenah R-4340-B, or approved equal.
- C. Pipe Bedding and Backfill:
 - 1. Provide well graded, washed, mixture of gravel or crushed stone aggregate free of clay, loam, dirt, calcareous, or other foreign matter conforming to the IDOT "Standard Specification" gradation No. CA-7.
 - 2. For flexible thermoplastic pipes including sewer pipes: Comply with ASTM D2321, Class I or II as modified below.
 - a. Exclude sharp angular granular materials.
 - b. Limit maximum particle size to 1/2-inch.
 - c. Do not use Class II materials in wet conditions.
 - 3. For rigid pipes comply with ASTM C12, Bedding Class B.
- D. Special Granular Trench Backfill:
 - 1. Provide granular material: Use 100 percent crushed stone or gravel complying with the IDOT "Standard Specification" gradation No. CA-7 material.

Section 5.04 – Construction and Inspection Standards

- A. Approval and Permits:
 - 1. Construction of storm sewers and/or services shall not commence until engineering plans and specifications have been approved by the Village Engineer.

2. No construction shall commence until a copy of all needed permits (IEPA, IDOT, ACOE, IDNR, and other applicable regulatory agencies) are filed with the Village and Village Engineer.
- B. Notification:
1. Prior to beginning the storm sewer installation, the contractor shall give the Village forty-eight (48) hours notice of the intended time of starting work.
- C. Conformance:
1. The installation of storm sewers and appurtenances, including services, shall conform to the requirements of the Illinois Department of Transportation and the Illinois Pollution Control Board.
 2. The contractor shall be responsible for providing a competent individual on site during trenching operations to insure that all OSHA and other applicable safety standards are met by the construction means and methods.
- D. Excavation and Foundation:
1. The trench shall be excavated so that the flow line of the finished sewer shall be at the depth and grade shown on the approved plans. The trench shall be at least twelve (12) inches wider than the external diameter of the pipe. The width of the trench shall not exceed the external diameter of the pipe by more than eighteen (18) inches at the top of the pipe.
 2. If the excavation has deeper than necessary, the foundation shall be brought to proper grade by the addition of well-compacted bedding material. Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unsuitable soil, (unless other special construction methods are called for on the plans or in the special provisions), all such unsuitable soil under the pipe and for the width of the trench shall be removed and replaced with well-compacted bedding material.
 3. The pipe shall be laid so that it will be uniformly supported and the entire length of the pipe barrel will have full bearing. No blocking of any kind shall be used to adjust the pipe to grade except when used with embedment concrete.
- E. Pipe Bedding and Backfilling:
1. Four-inches of CA-7 material shall be used as bedding for the storm sewer pipe.
 2. Backfill CA-7 material to the horizontal centerline of concrete pipe and to twelve (12) above thermoplastic pipe in areas over five (5) feet away from existing or proposed pavements, driveways, or sidewalks. Excavation shall be backfilled with material excavated from the trench, unless such material is determined to be unsuitable by the Village Engineer. The material shall be free from clods and rocks and shall be placed in twelve inch lifts compacting each lift to yield a minimum of 85 percent maximum dry density as determined according to ASTM D1557.
 3. Any pipe installed under or within two (2) feet of an existing or proposed pavements, driveway, or sidewalk shall be backfilled to within one foot of the top of the trench with CA-7 material. Backfill shall be placed in 12 inch lifts compacted to 95 percent maximum dry density as determined according to ASTM D1557. The final twelve (12) inches shall be backfilled with CA-6 material.

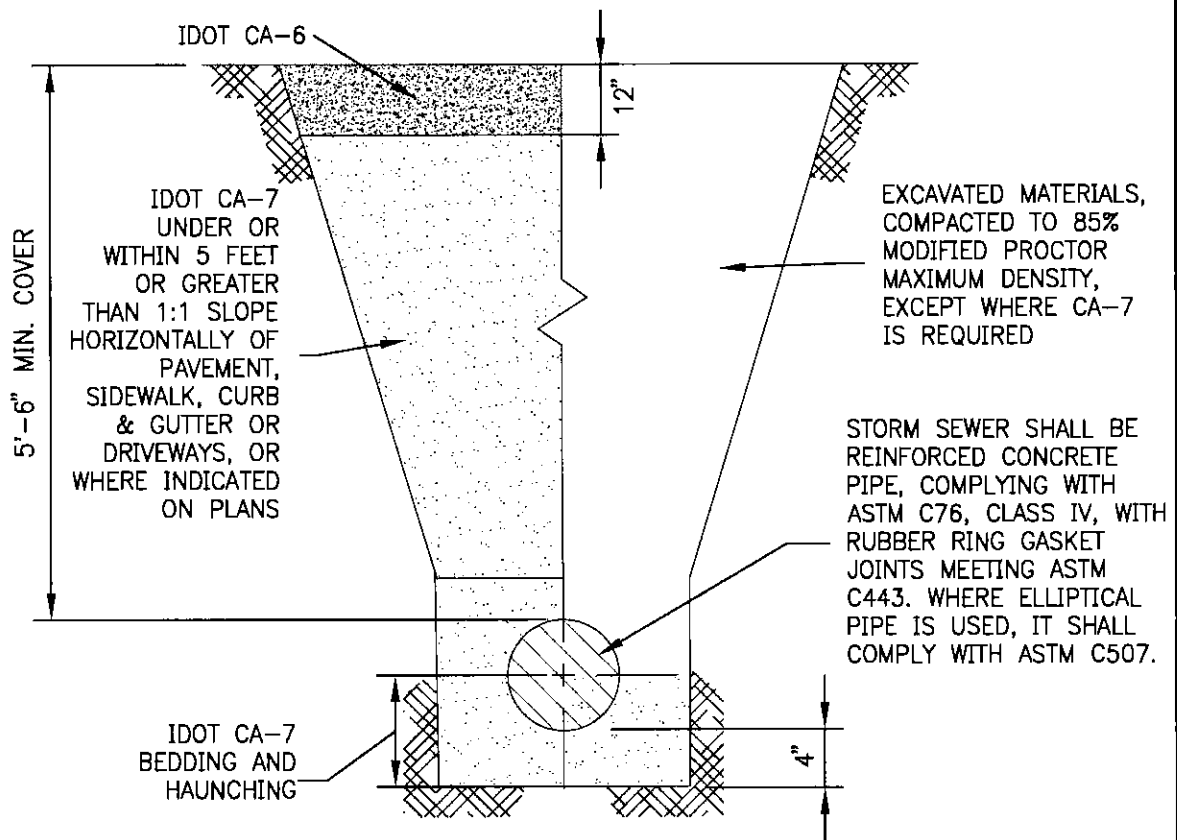
4. Backfilling shall not be done until installation of the sewer has been inspected and approved by the Superintendent of Public Works or Village Engineer.
- F. Pipe Laying:
1. Pipe laying and joining shall be done in accordance with the pipe manufacturer's recommendations.
 2. Pipe shall be laid straight both horizontally and vertically between manholes.
 3. Pipe shall not be dropped from delivery vehicles. All pipe shall be lowered into the trench with a suitable apparatus; in no case shall the pipe be dropped or thrown.

Section 5.05 – Testing and Televising Standards

- A. General:
1. All the required testing and correction of defects of the storm sewer shall be performed before curb and gutter or other permanent type surface improvement work begins.
 2. Any piping defects including cracks, improperly sealed joints, or variations from approved grade, slope, or alignment shall be repaired at the contractor's expense by means approved by the Village Engineer.
 3. The Village Engineer may require leakage compaction, leakage, or other types of testing as a condition of the storm sewer initial acceptance.
- B. Notification and Operation:
1. The Public Works Department and Village Engineer shall be notified of the time of the test a minimum of 48 hours prior to each test.
 2. All tests shall be performed in the presence of the Superintendent of Public Works or Village Engineer.
- C. Storm Sewer Cleaning:
1. Any pipes or structures containing sediment shall be cleaned prior to acceptance.

Section 5.06 – Details

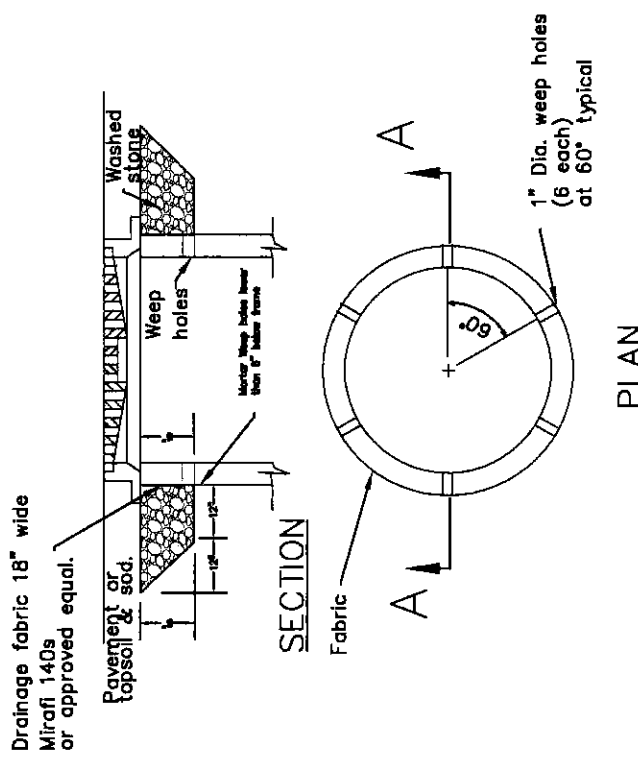
A. Storm Sewer Installation	(ST-001)
B. Catch Basin Type A	(ST-002)
C. Catch Basin Type C	(ST-003)
D. Storm Inlet	(ST-004)
E. Manhole Type A	(ST-005)
F. Flat Top for Storm Manhole Type A	(ST-006)
G. Storm Manhole Type A, 6' Dia.	(ST-007)
H. Flat Top for Storm Manhole Type A, 6' Dia	(ST-008)
I. Pipe Restrictor	(ST-009)
J. Sump Discharge Service Line	(ST-010)
K. Wet Bottom Stormwater Detention Facility	(ST-011)
L. Wet Bottom Stormwater Detention Facility	(ST-012)



NO SCALE

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
STORM SEWER INSTALLATION
DATE: OCT. 2005

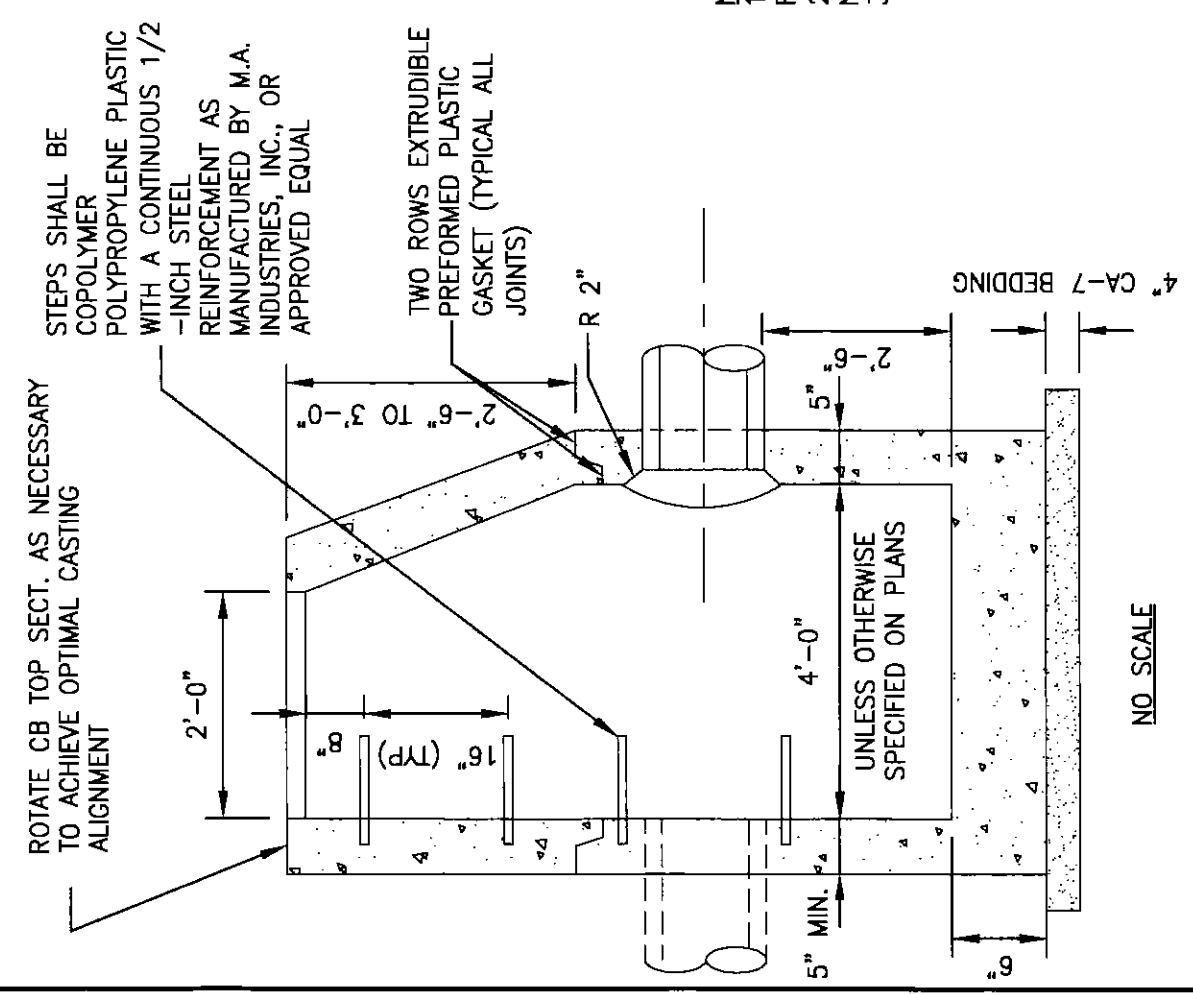
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- NOTES:**
1. SEE CASTING INSTALLATION AND ADJUSTMENT DETAIL FOR CASTING REQUIREMENTS.
 2. INTERIOR JOINTS SHALL BE "BUTTERED" WITH NON-SHRINK GROUT.
 3. STRUCTURE SHALL COMPLY WITH ASTM C478.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
CATCH BASIN TYPE A
DATE: OCT. 2005

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NO SCALE



(CONC. CONE RISER)

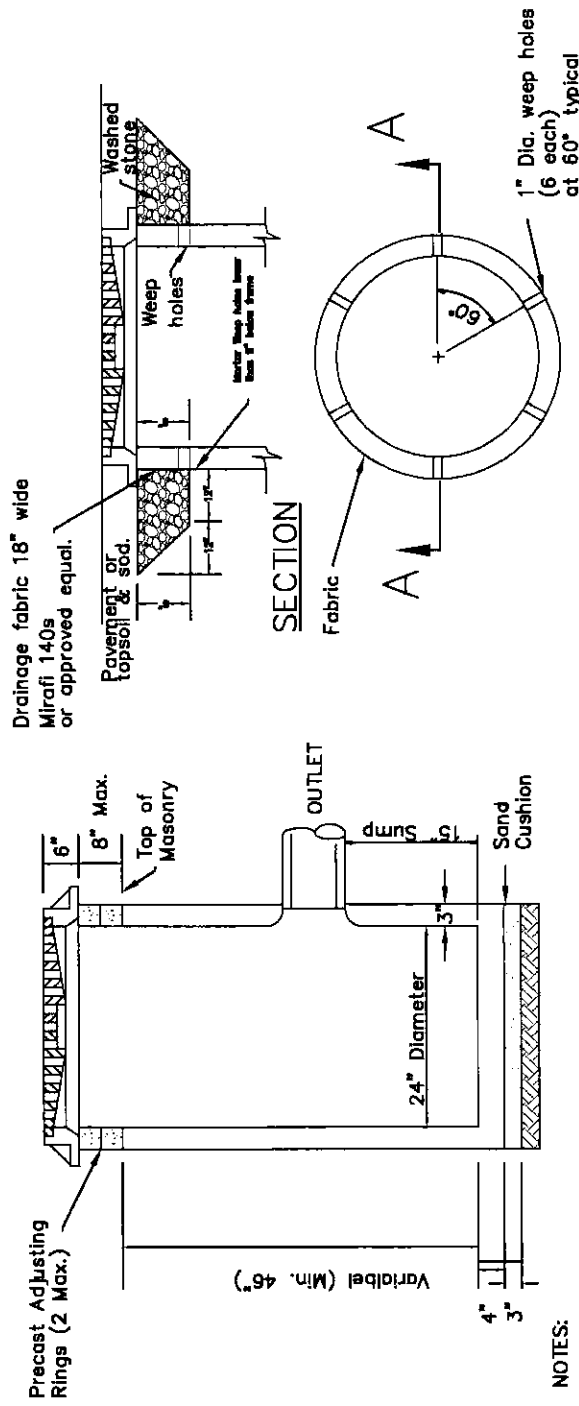
MATERIAL FOR WALLS	D	C	T (Min.)
Precast Reinforced	4'-0"	2'-6"	4"
Concrete Risers	5'-0"	3'-9"	5"



1. Type A Catch Basin shall be furnished frame & lid as shown in general notes.
2. All Catch Basins shall be 4'-0" in diam., unless noted on the plans.
3. Dimension for Precast Reinforced Concrete Risers may vary from the dimension to plus 6".
4. See drawings for elev. of invert & diam. of sewer.
5. Precast Adjusting Rings, 2 ea. max. 8' in height.
6. Steps shall be embedded into the wall with a minimum depth of 3".

VILLAGE OF BEECHER
FOR
CATCH BASIN
STANDARD DETAIL
TYPE A

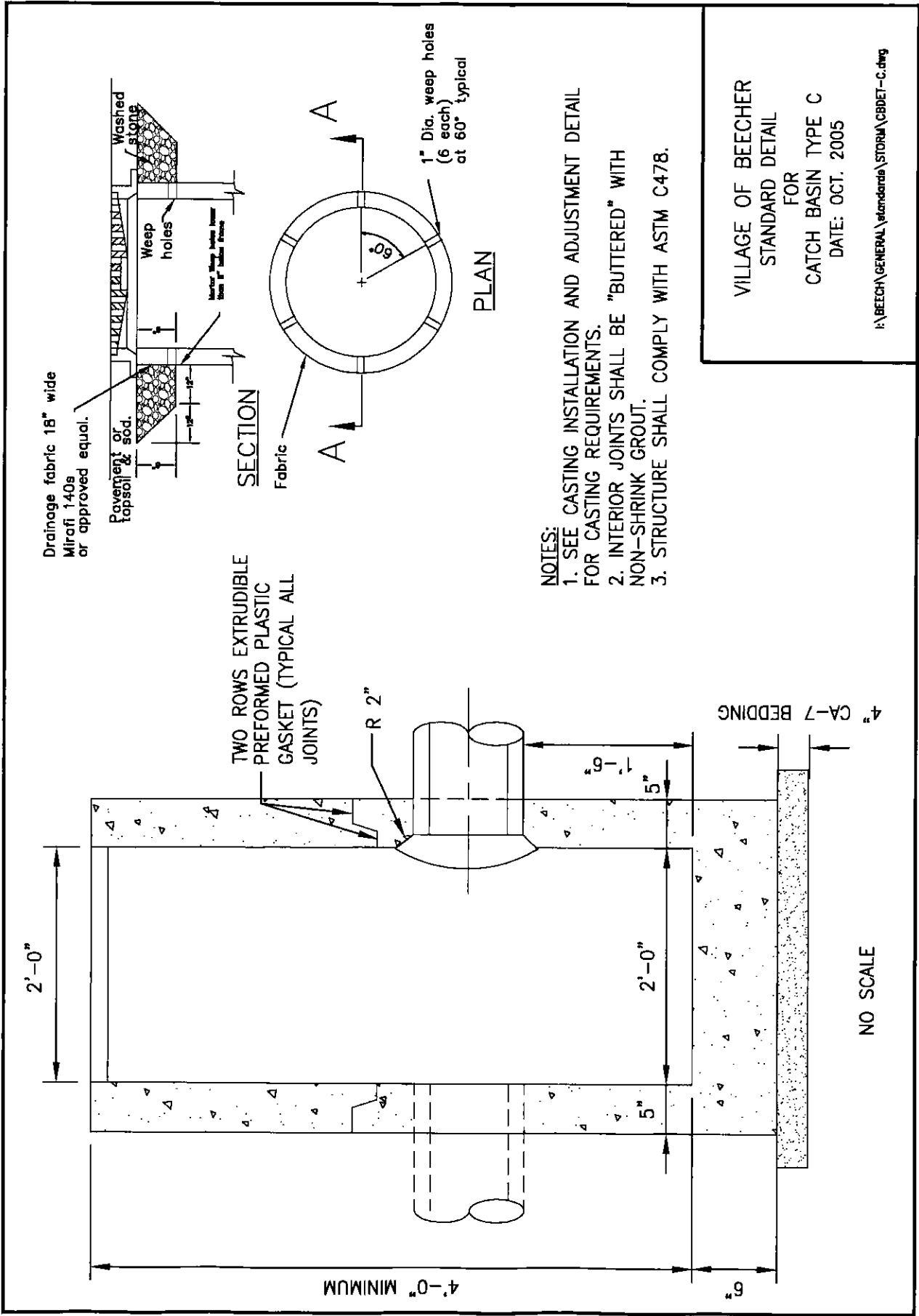
DATE: OCT. 2005



NOTES:

1. Frames and lids to be as shown in general notes.
2. Catch basins to be of precast reinforced concrete construction only.
3. For adjustments, use only precast concrete adjusting rings, maximum of 8" total height.
4. Adjusting rings and frames to be joined with mortar.
5. For rim and pipe invert elevations, refer to plans.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
24" TYPE C
CATCH BASIN
DATE: OCT. 2005



5" MIN. 5" MIN.

2'-0" DIA. R=2"

CAST-IN-PLACE
CONCRETE FILLET
SLOPE TO DRAIN

PRECAST CONCRETE
BOTTOM

4" CA-7
BEDDING

Drainage fabric 18" wide
Miraflo 140s
or approved equal.

Pavement or
topsoil & sod.

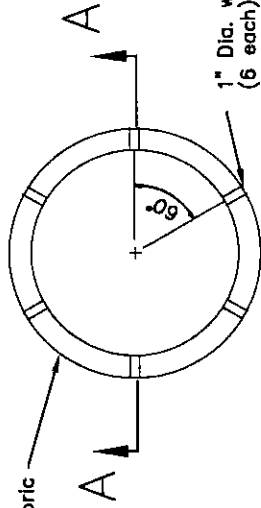
Washed
stone

Weep
holes

Monitor Weep holes lower
down 6" below frame

SECTION

Fabric



NO SCALE

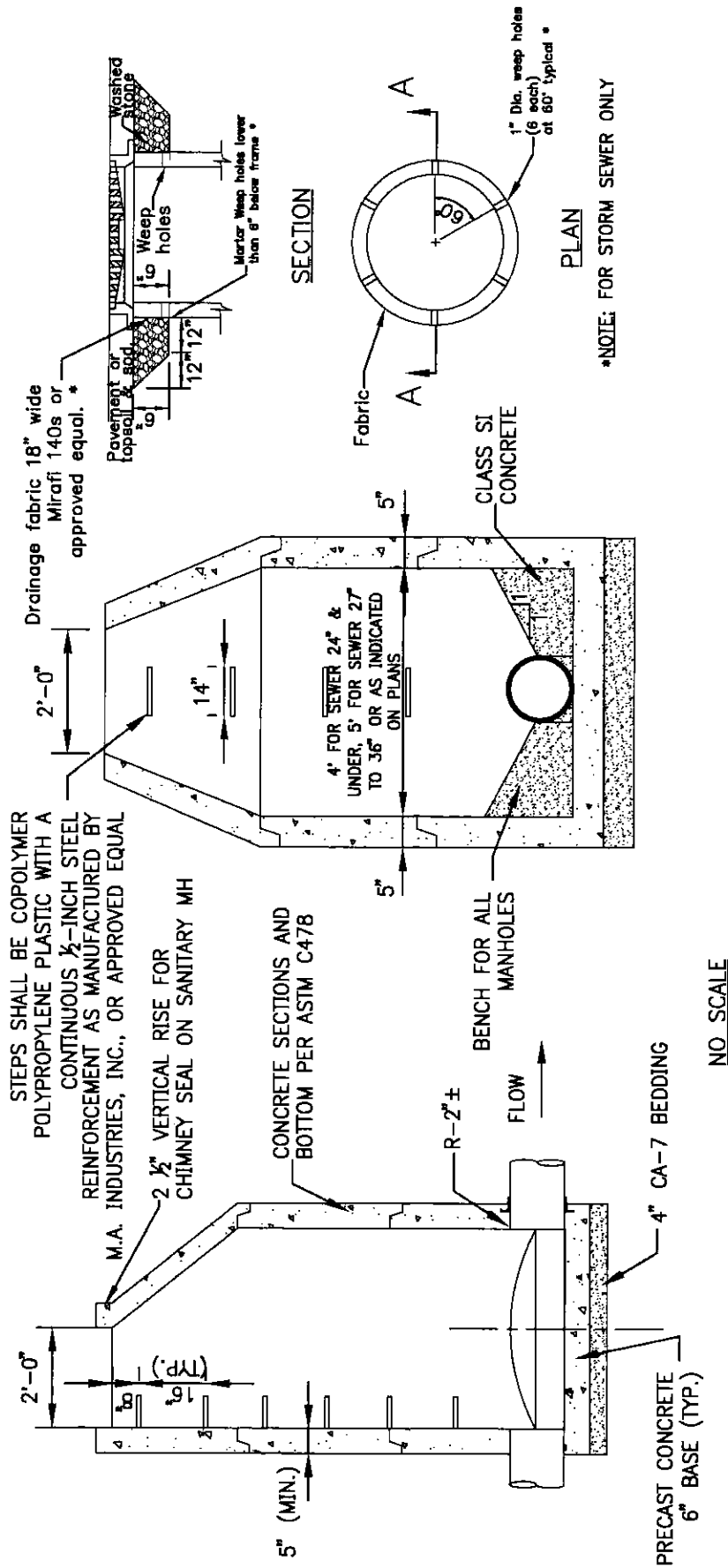
PLAN

NOTES:

1. SEE CASTING INSTALLATION AND ADJUSTMENT
DETAIL FOR CASTING REQUIREMENTS.
2. INTERIOR JOINTS SHALL BE "BUTTERED" WITH
NON-SHRINK GROUT.
3. STRUCTURE SHALL COMPLY WITH ASTM C478.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
INLET
DATE: OCT. 2005

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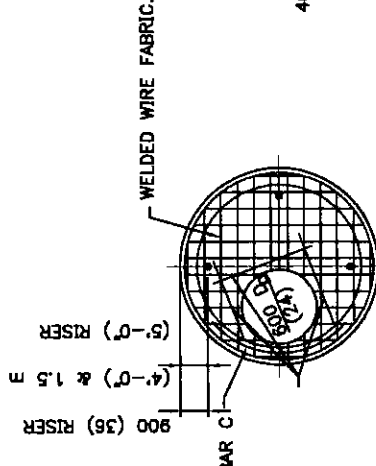
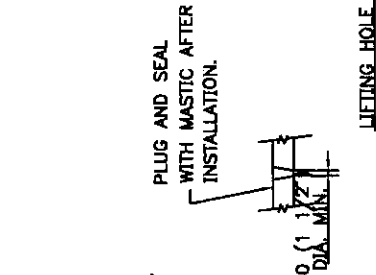
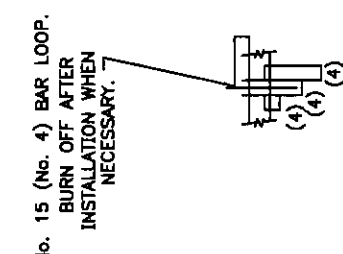
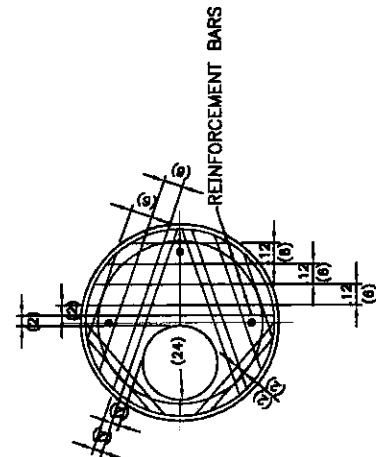
NO SCALE

NOTE:

1. SANITARY MANHOLES SHALL HAVE WATERSTOP GASKETS CAST INTO STRUCTURES AT ALL PIPE PENETRATIONS. (SEE MANHOLE PIPE CONNECTION DETAIL)
2. SANITARY MANHOLES SHALL HAVE CRETEX EXTERNAL CHIMNEY SEALS.
3. SANITARY MANHOLES SHALL HAVE INTEGRAL BASES.
4. MANHOLE BARREL JOINTS SHALL BE TONGUE AND GROOVE TYPE WITH TWO ROWS OF EXTRUDIBLE PREFORMED PLASTIC GASKET MATERIAL (BUTYL ROPE).
5. MACWRAP EXTERNAL JOINT SEALING BANDS IN ACCORDANCE WITH ASTM C-877, OR APPROVED EQUIVALENT, MUST BE PROVIDED AT SANITARY MANHOLE JOINTS.
6. INTERIOR JOINTS SHALL BE "BUTTERED" WITH NON-SHRINK GROUT.
7. STORM MANHOLES SHALL HAVE A WALL THICKNESS OF 6" FOR 5' DIAMETER STRUCTURES AND 7" FOR 6' DIAMETER STRUCTURES
8. SANITARY MANHOLES SHALL PASS VACUUM-TESTING PER ASTM C-1244.
9. SEE CASTING INSTALLATION AND ADJUSTING DETAIL FOR CASTING REQUIREMENTS.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
MANHOLE TYPE A
DATE: OCT. 2005

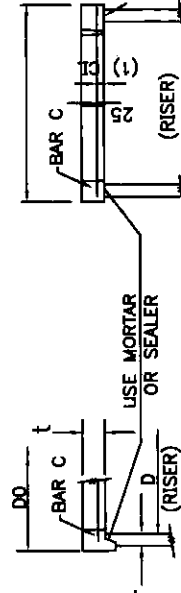
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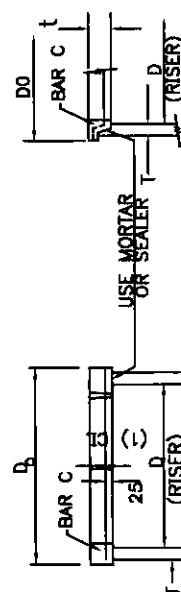
No. 15 (No. 4) BARS
760 (30) LONG

LIFTING HOLE OR LIFTING LOOP
(3 REQUIRED PER SLAB)

PLAN



SECTION A-A



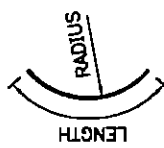
SECTION B-B

GENERAL NOTES

The flat slab top may be used in lieu of the tapered tops at the option of the contractor or when field conditions prohibit the use of tapered tops. All dimensions are in millimeters (inches) unless otherwise shown..

ALTERNATE JOINT CONFIGURATIONS
TABLE

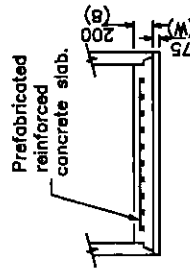
D	T	D0 (MIN)	t	"A" - W.W.F. OR SIZE EACH DIRECTION	No. 15 (No. 4) BAR LENGTH	No. 15 (No. 4) BAR C RADIUS
900 (36)	150 (6)	150 (6)	425 mm 2/ m (.20 IN 2/FT.)	No. 15 (No. 4)	1.2 m (4'-0")	480 (19)
1.2 m (4'-0")	150 (6)	150 (6)	740 mm 2/ m (.35 IN 2/FT.)	No. 15 (No. 5)	1.35 m (4'-5")	660 (26)
1.5 m (5'-0")	200 (8)	200 (8)	740 mm 2/ m (.35 IN 2/FT.)	No. 15 (No. 5)	1.5 m (5'-0")	810 (32)



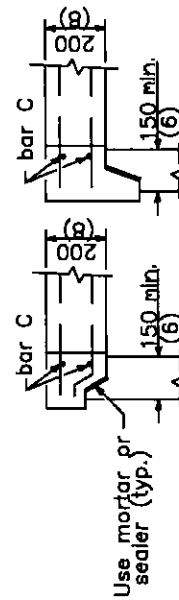
BAR C

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
FLAT TOP FOR
STORM MANHOLE, TYPE A

DATE: NOVEMBER 2005
STORM\FLAT-STMH.dwg



1. Joint configuration and dimensions of flat slab top shall match and fit the riser joint detail.
2. Lifting devices shall be approved by the Engineer.
3. All dimensions are in millimeters (inches) unless otherwise shown.
4. Precast reinforced concrete sections shall be used for materials for walls.

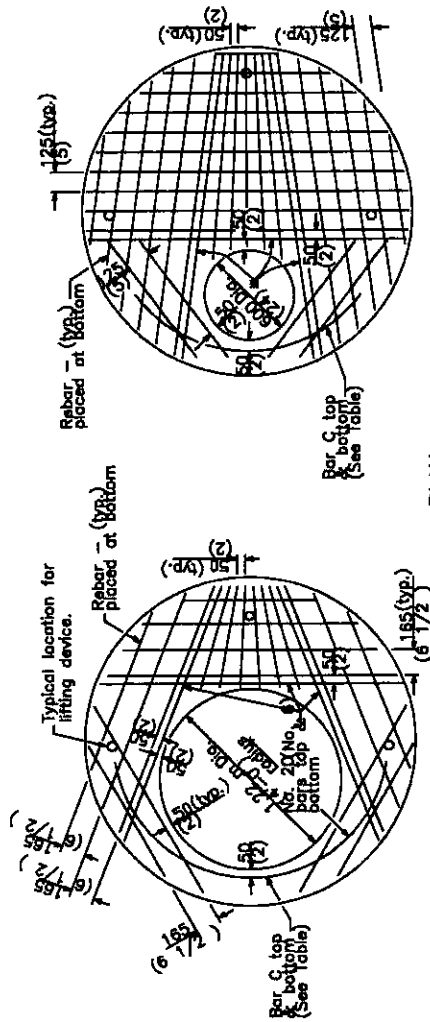


ALTERNATE JOINT CONFIGURATIONS

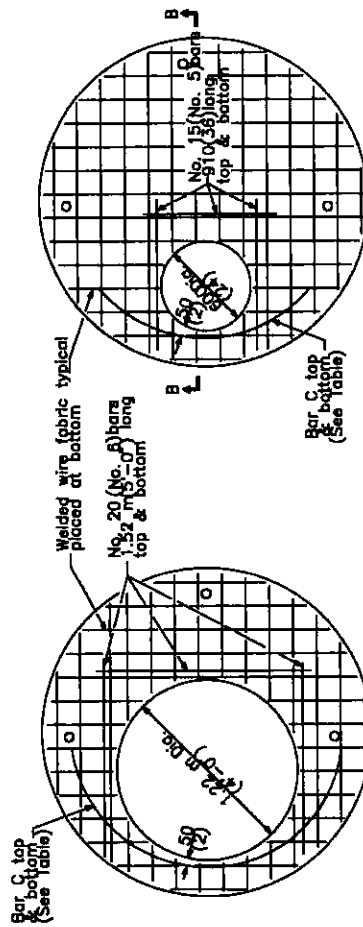
VILLAGE OF BEECHER
STANDARD DETAIL
FOR
STORM MANHOLE,
TYPE A, 6' DIA.
DATE: NOVEMBER 2005

STORM\STMH2.dwg

FLAT TOP FOR STORM MANHOLE, TYPE A, 6' DIA.

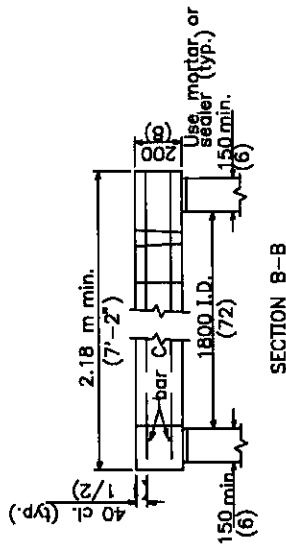


PLAN
Showing Rebar Reinforcement



PLAN
Showing Welded Wire Fabric Reinforcement

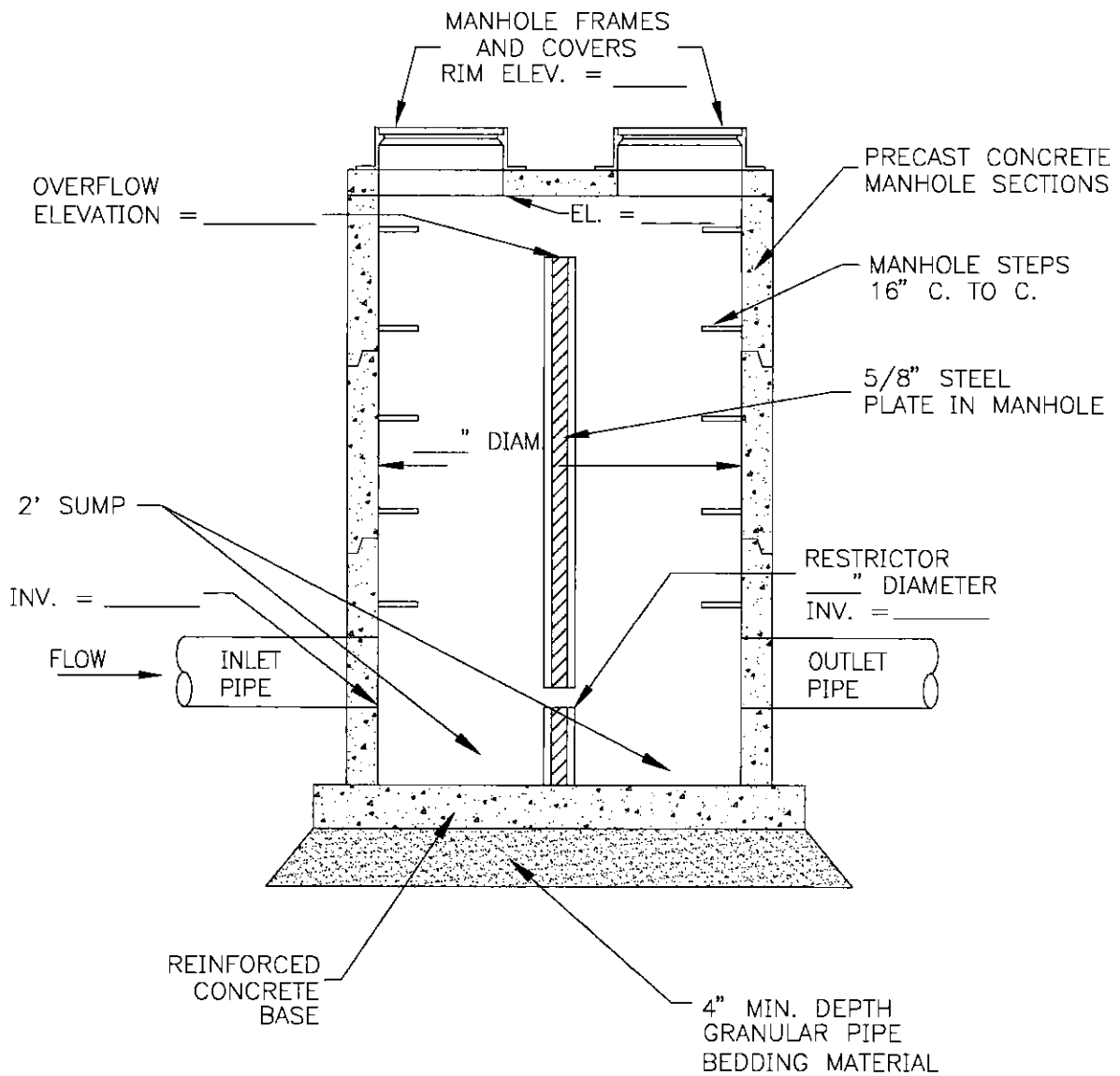
Diameter of opening	Thickness	Reinforcement Each direction	Bar Size	No. 15 (No. 4)
6'00 (24)	200 (8)	2244 sq.in./ft. (1706)	No. 20 (No. 6)	183 (7)
1.2 m (4'-0")	200 (8)	1736 sq.in./ft. (0.82)	No. 20 (No. 6)	274 (11)



All dimensions are in millimeters (inches) unless otherwise shown.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
FLAT TOP FOR
STORM MANHOLE,
TYPE A, 6' DIA.

DATE: NOVEMBER 2005
Storm\STMH.dwg

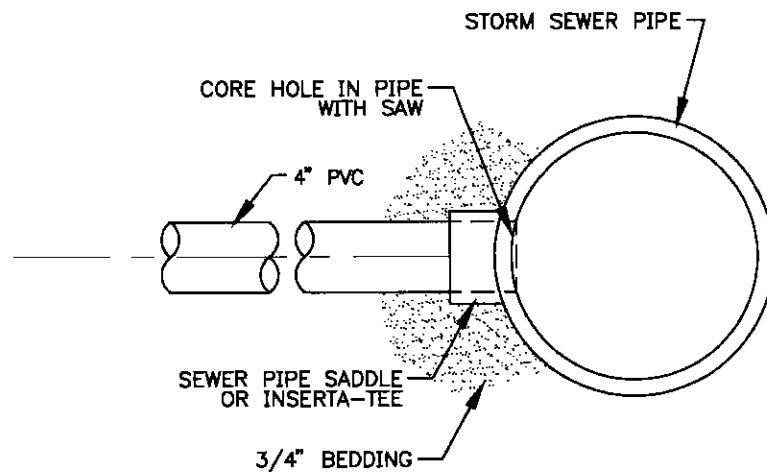


NO SCALE

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
PIPE RESTRICTOR

DATE: MAR. 2006

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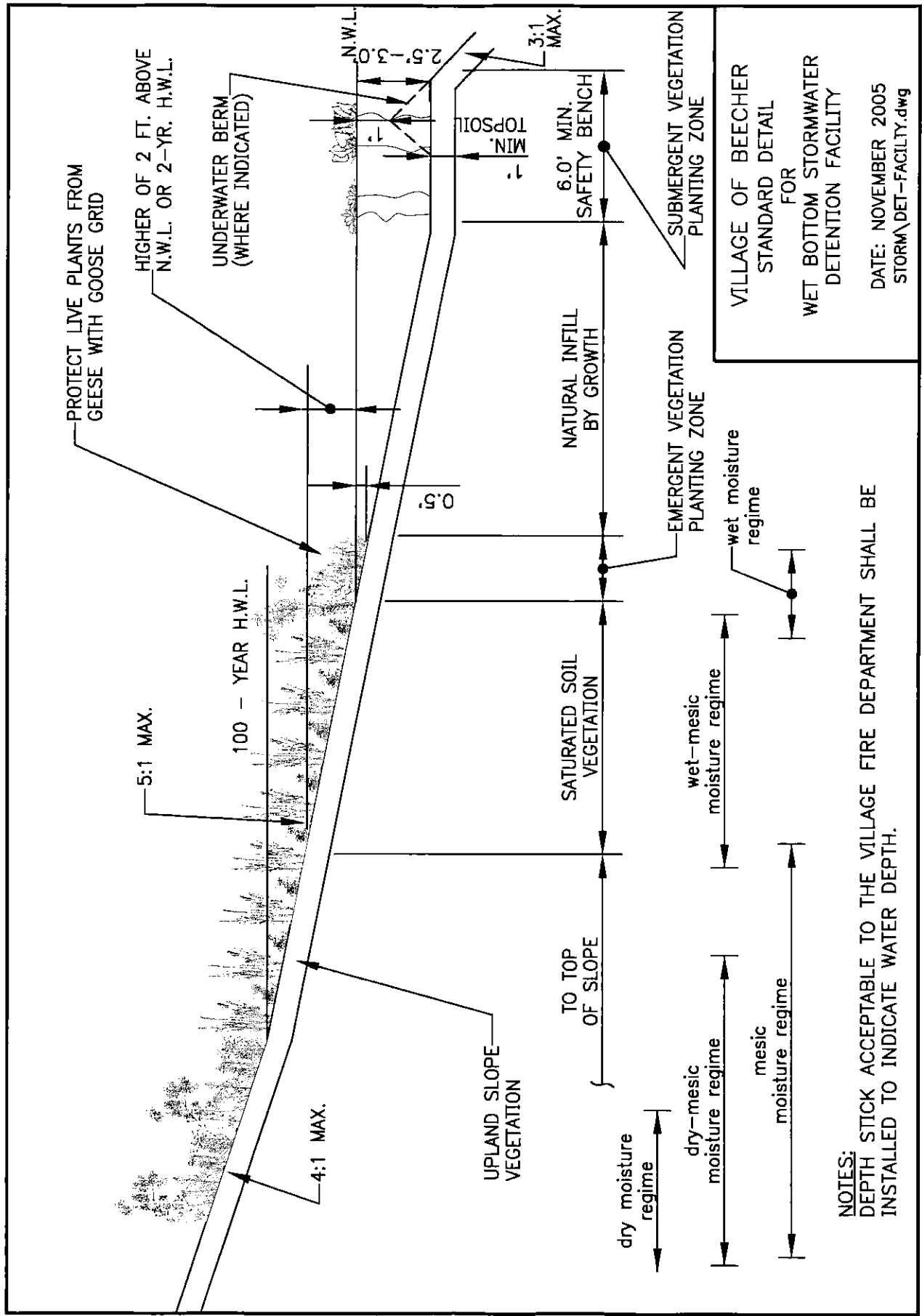
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NOTES:

1. SEWER PIPE SADDLE SHALL BE INSTALLED PER MANUFACTURERS RECOMMENDATIONS FOR PIPE MATERIAL UTILIZED.
2. PVC SUMP DISCHARGE PIPING SHALL NOT EXTEND BEYOND INTERIOR WALLS OF STORM SEWER.

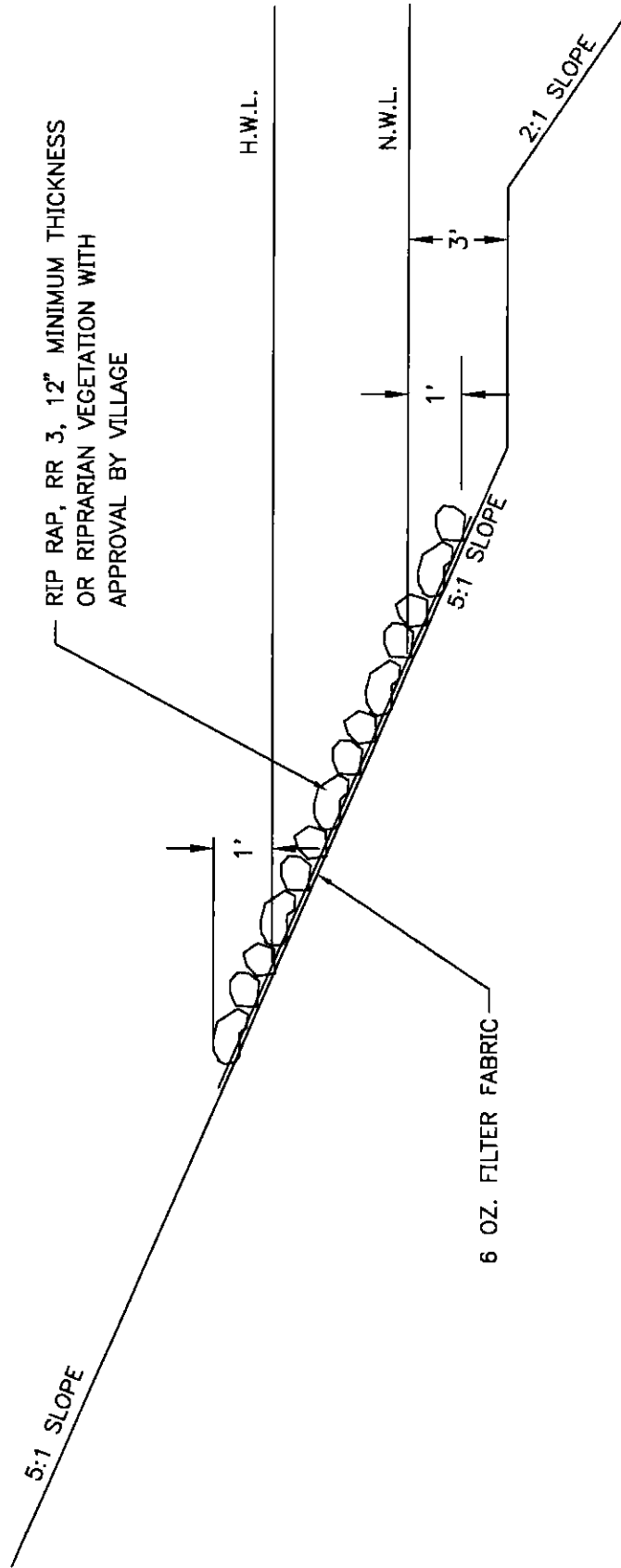
VILLAGE OF BEECHER
STANDARD DETAIL
FOR
SUMP PUMP LINE CONNECTION
DATE: NOV. 2005

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VILLAGE OF BEECHER
STANDARD DETAIL
FOR
WET BOTTOM STORMWATER
DETENTION FACILITY
DATE: NOVEMBER 2005
STORM\DET-FACILITY.dwg

NOTES:
DEPTH STICK ACCEPTABLE TO THE VILLAGE FIRE DEPARTMENT SHALL BE
INSTALLED TO INDICATE WATER DEPTH.



VILLAGE OF BEECHER
STANDARD DETAIL
FOR
WET BOTTOM STORMWATER
DETENTION FACILITY
(ALTERNATE)
DATE: NOVEMBER 2005
STORM\DET-FACILITY-ALT.dwg

NOTES:
DEPTH STICK ACCEPTABLE TO THE VILLAGE FIRE DEPARTMENT SHALL BE
INSTALLED TO INDICATE WATER DEPTH.

VILLAGE OF BEECHER ENGINEERING TECHNICAL STANDARDS

SECTION 6 STREET LIGHTING

6.01 General

It is the Village's preference that Commonwealth Edison street lights be installed in all new developments. If Commonwealth Edison lights are not installed conformance to the following standards shall be required.

- A. All development shall include the design and construction of street lighting facilities for the illumination of all roadways and parking lots which lie in or border the development. The street and parking lot lighting shall be in conformance with the standards and requirements established by the Village Engineer, in accordance with the provisions of the code, and subject to the approval of the corporate authorities of the Village. It shall be the responsibility of the developer or subdivider to provide a guarantee from the date of acceptance, of the street lighting system for a period of three years, except the street light poles shall be guaranteed for five years.
- B. Street lighting improvements shall be designed and installed in accordance with the following standards:
 - 1. American National Standard Practice for Roadway Lighting (ANSI/IES RP8 latest edition).
 - 2. American National Standard Practice for Lighting for Parking Facilities (ANSI/IES RP20 latest edition).
 - 3. The National Electric Code (NEC, NFPA 70, latest edition).
 - 4. Standard Specification for Road and Bridge Construction (by IDOT, latest edition).
 - 5. Local codes, ordinances, and development standards of the Village.
- C. Prior to the installation of any street lighting, the following submittals are required for review and approval by the Village:
 - 1. Layout of the proposed street lighting showing pole locations, right-of-way and any easements, unit duct routing, pedestal locations, mast arm orientation and source of power.
 - 2. Manufacturer's information on poles, luminaires, mast arms, unit duct, wire, conduit and appurtenances.
 - 3. Lighting calculations and design parameters.
- D. Provide to the Village one spare lighting unit for every 20 units installed. In addition, one case of lamps (minimum of [10] ten lamps) of each lamp type and or wattage specified in the design shall be provided.

- E. Each lighting unit shall be mounted on a reinforced concrete foundation as per standard detail.

6.02 Street Lighting Installation Requirements for Residential Areas

- A. Street lighting in residential areas shall consist of a 14-foot single and a 17-foot double lighting unit. Each unit shall be provided and installed at locations as follows:
 - 1. The 14-foot single lighting unit shall consist of a single acorn 150 Watt High Pressure Sodium Type III fixture with a metal top, and three tier louver reflector, of the A25 Series as manufactured by Antique Street Lamps or equal. The pole shall consist of a cast aluminum 14-foot tapered fluted pole of the National Family Style as manufactured by Union Metal or equal. Both pole and fixture shall have a matching black finish. The 14-foot single units shall be installed at mid block, a minimum of 3-foot behind the face of the curb or as field conditions may dictate.
 - 2. The 17-foot double lighting unit shall consist of two fixtures as described for the 14-foot single unit mounted on a cast aluminum 17-foot tapered fluted pole with an arm, for mounting of two fixtures, of the National Family Style as manufactured by Union Metal or equal. The pole, arm and each fixture shall have a matching black finish. The 17-foot double unit shall be installed in the center of the median of all boulevards and at intersections on opposite corners of the intersection where two streets cross and one 17-foot double lighting unit at each "T" intersection on a centerline extended from the terminating street at the top of the "T" a minimum of 3 feet behind the face of the curb or as field conditions may dictate.

6.03 Street Lighting Installation Requirements for Commercial Areas

- A. Street lighting in commercial areas shall consist of a 14-foot single lighting unit, a 30-foot single lighting unit and a 30-foot double lighting unit. Each unit shall be provided and installed at locations as follows:
 - 1. The 14-foot single lighting unit shall be as described for the residential areas. 14-foot single units shall be installed between intersections 3 feet behind the face of the curb or as field conditions may dictate.
 - 2. The 30-foot single lighting unit shall consist of a single light fixture 250 Watt High Pressure Sodium Type III Cutoff, with mast arm adapter, of the Aeris Series as manufactured by Lithonia Lighting or equal. The pole shall consist of a cast aluminum 30 foot tapered fluted pole with one 8 foot arm, of the National Family Style as manufactured by Union Metal or equal. The pole, arm and fixture shall have a matching black finish. The 30-foot single unit shall be installed at intersections, a minimum of 3 foot behind the face of the curb or as field conditions may dictate.
 - 3. 30-foot double lighting unit shall consist of two fixtures as described, for the 30-foot single unit mounted on a cast aluminum 30-foot tapered fluted pole with two

8-foot arms of the National Family Style as manufactured by Union Metal or equal. The pole arms and fixture shall have a matching black finish. The 30-foot double unit shall be installed in the center of the median of a boulevard or at intersections where required to meet lighting requirements.

6.04 Wiring

- A. All wiring installed for street lighting from the power source to the lighting unit and from lighting unit to lighting unit, shall be provided with a ground wire and contained in unit duct manufactured from high density smooth wall polyethylene electrical plastic duct. Direct burial wire and cable in this Section is prohibited.
- B. Where unit duct is routed under streets, driveways, sidewalks or other paved areas, the unit duct shall be installed in rigid steel conduit of large enough size to allow for an easy installation. If streets, driveways, sidewalks or other paved areas are existing the conduit shall be pushed under those surfaces.
- C. All wiring installed for street lighting shall be a minimum of No. 8 AWG and shall be heat and moisture resistant, XLP-Type USE, copper wire, and be suitable for use at 75° C. (167° F.) and shall have insulation rating of 600V.
- D. All runs shall be continuous with out splices in the unit duct or wire, from service to lighting unit and from lighting unit to lighting unit.
- E. All wiring shall be subject to an insulation test to ground after installation. The minimum acceptable resistance to ground shall be 30 meg-ohms. Any section of wiring failing to pass the minimum insulation test for any reason shall be replaced. All shall be tested in the presence of the Village Engineer. All unit ducts shall be installed not less than 30 inches below finish grade.
- F. Electrical service pedestals and weatherproof disconnect switches shall be provided for lights connected directly to a utility transformer or pedestal located in the easement.

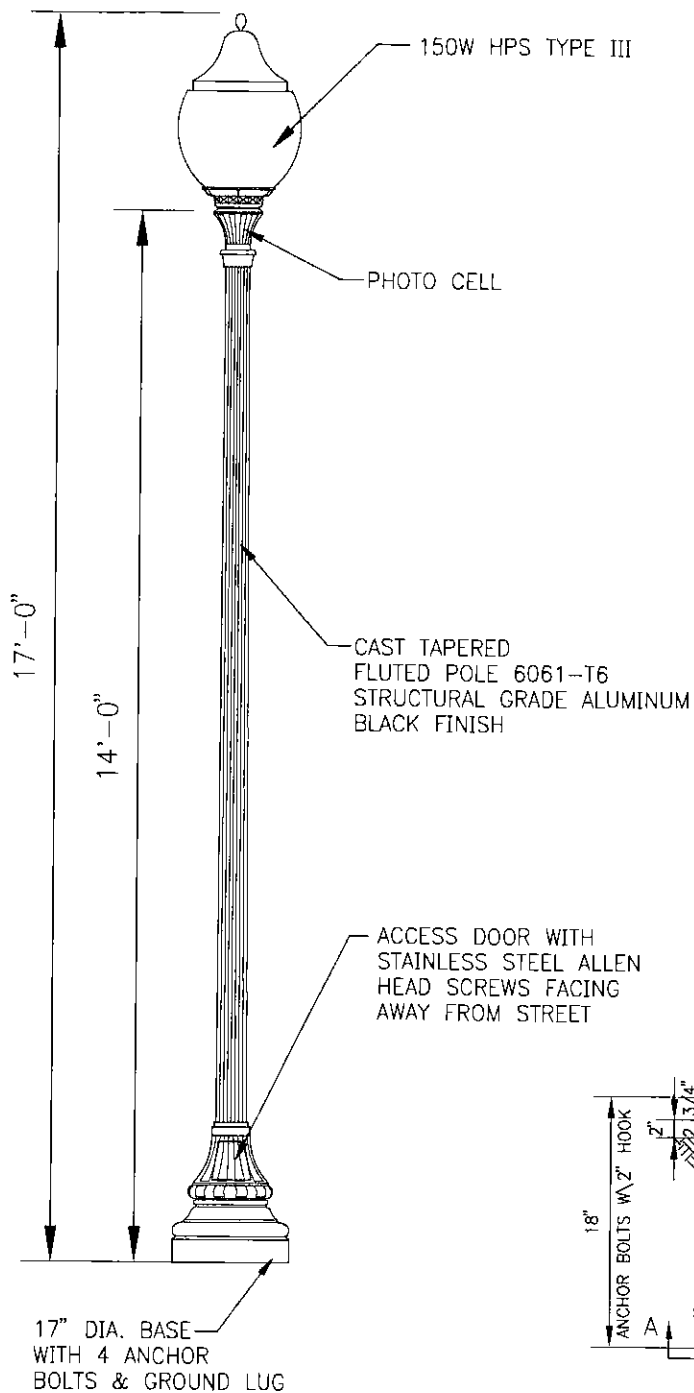
6.05 Grounding

- A. Grounding of the street lighting system shall be provided as shown in the standard details and as required by the National Electrical Code.
- B. Testing.
 - 1. All ground rods shall be subject to a resistance-to-earth test performed using the three-point method of measurement, or other means approved by the Engineer. All ground rods shall be tested individually in the presence of the Village Engineer. The maximum D.C. resistance allowed shall be 10 ohms. If any ground rods fail the test, a second ground rod shall be driven 10 foot away from the first, connect both rods. Together and perform the test again if the resistance is still to high additional rods may need to be installed.

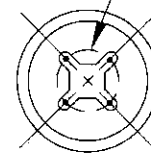
6.06 Details

- A. Residential and Commercial Mid Block Light Pole Standard.
- B. Residential Boulevard and Intersection Light Pole Standard.
- C. Commercial Boulevards and Intersection.

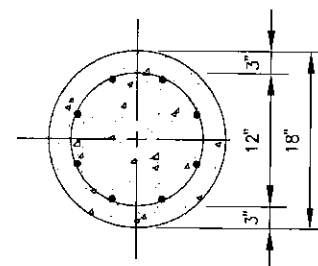
- D. Commercial Intersection Light Pole Standard.
- E. Typical Section – Unit Duct in Trench.



12 1/2" B.C.



BASE FOOTPRINT



SECTION A-A

ACCESS DOOR WITH STAINLESS STEEL ALLEN HEAD SCREWS FACING AWAY FROM STREET

TOP 10" OF ANCHOR BOLTS & HARDWARE SHALL BE GALVANIZED

TOP OF FOUNDATION FORMED MIN. 9" BELOW GRADE LINE

3" P.V.C. DUCT OR 2 1/2" GALVANIZED STEEL, 18" MIN. RAD.

#6 GROUND WIRE

5'-0" MIN.

(6'-0" IF SOIL CONDITIONS DICTATE)

3/4" X 10' COPPERCLAD GROUND ROD

3 ADDITIONAL LOOPS TOP & BOTTOM

CLASS X CONC.

8 #5 REBARS

#4 TIE BARS ON 12" CENTERS OR #4 SPIRAL W/6" PITCH

3" MIN. TOP & BOTTOM

FOUNDATION

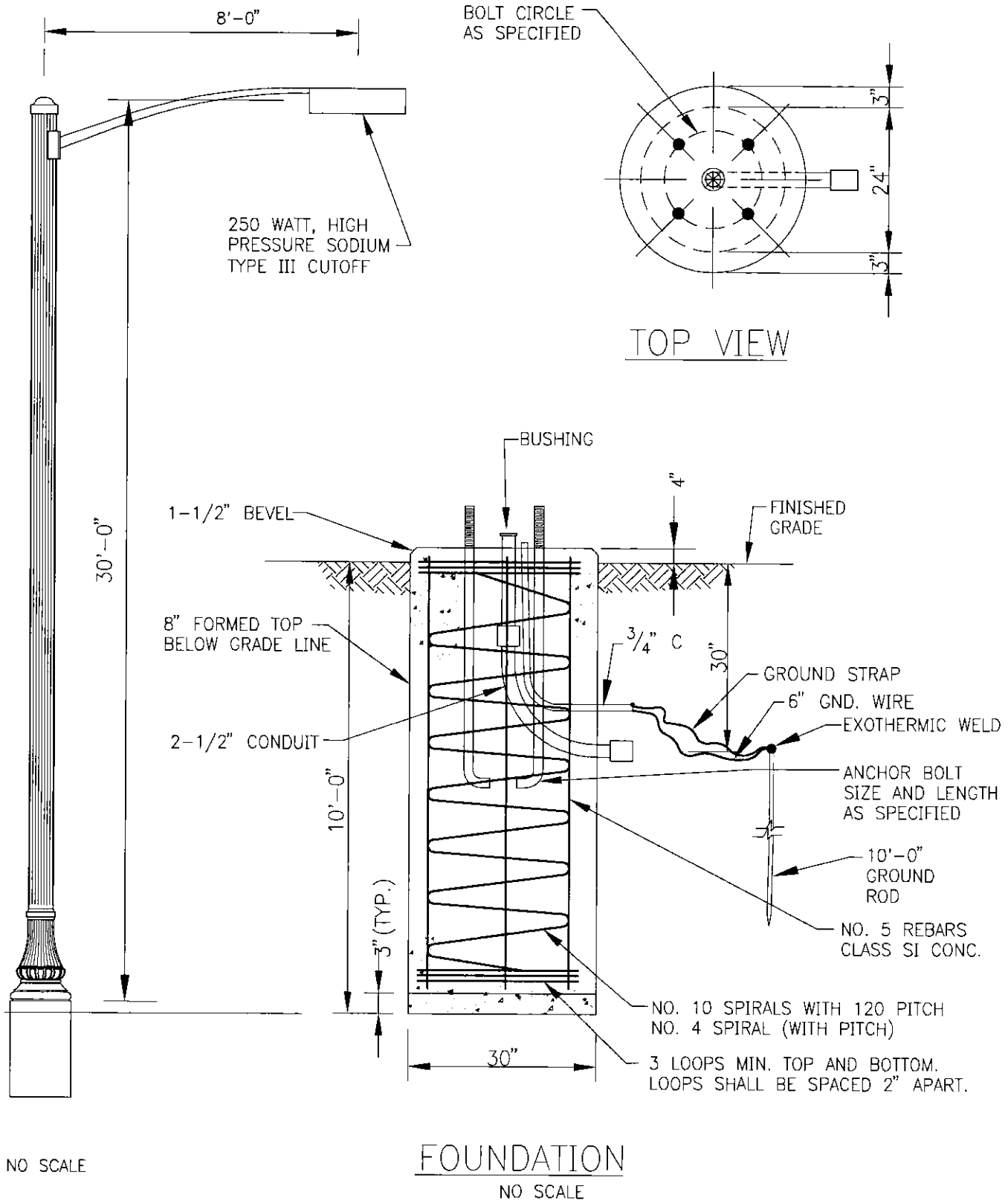


Baxter & Woodman
 Crystal Lake, Illinois
 Burlington, Wisconsin
 Mokena, Illinois
 DeKalb, Illinois

VILLAGE OF BEECHER, ILLINOIS
 RESIDENTIAL & COMMERCIAL MID BLOCK
 LIGHT POLE
 STANDARD

DESIGNED BY JLR	SCALE NO SCALE
DRAWN BY MAC	PROJECT NO. STANDARD
CHECKED BY JTB	SHEET NO.
DATE 08-20-03	

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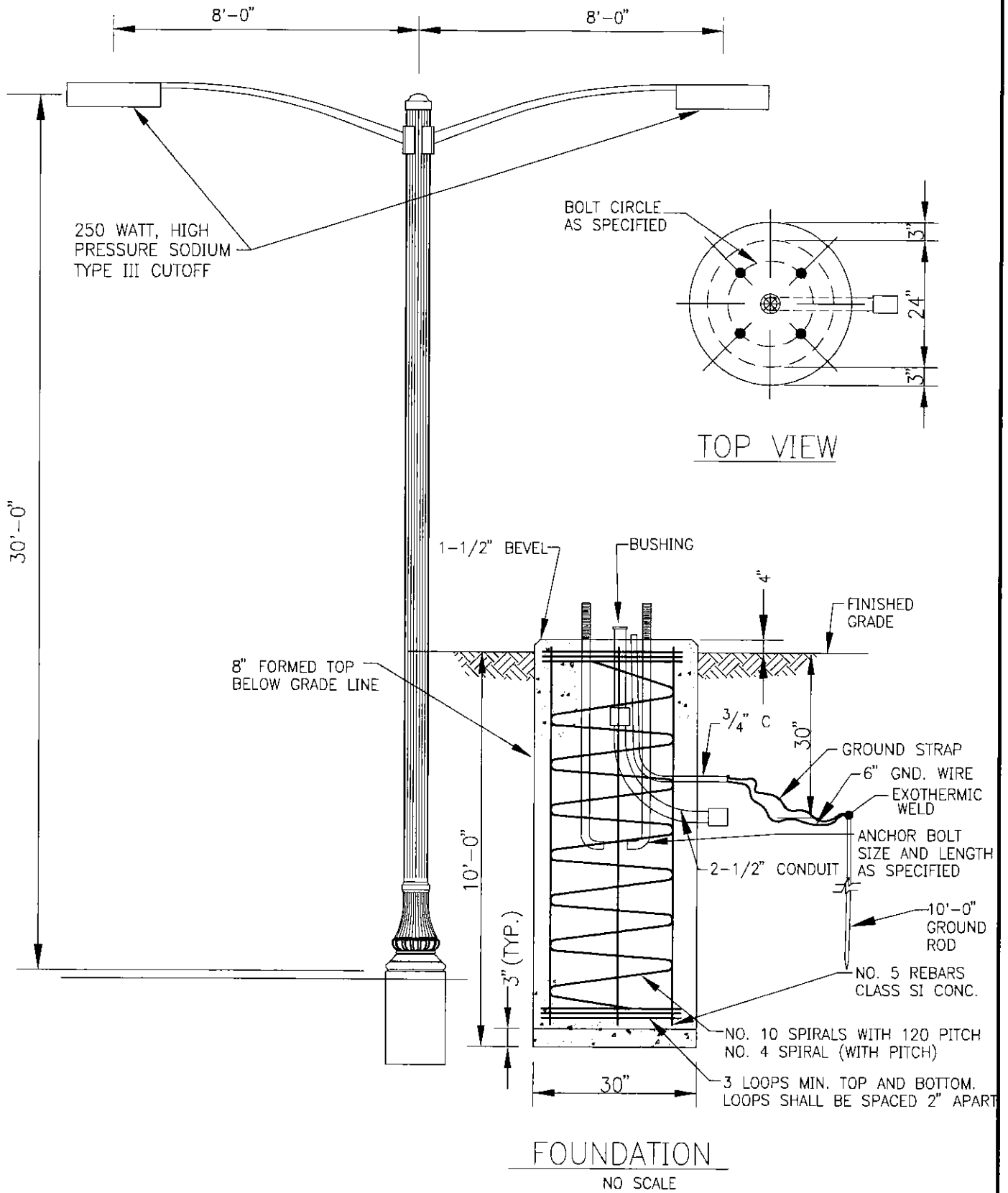


Baxter & Woodman
 Crystal Lake, Illinois
 Burlington, Wisconsin
 Mokena, Illinois
 DeKalb, Illinois

VILLAGE OF BEECHER, ILLINOIS
 COMMERCIAL
 INTERSECTION
 LIGHT POLE
 STANDARD

DESIGNED BY
 JLR
 DRAWN BY
 MAC
 CHECKED BY
 JTB
 DATE
 08-20-03

SCALE
 NO SCALE
 PROJECT NO.
 STANDARD
 SHEET NO.



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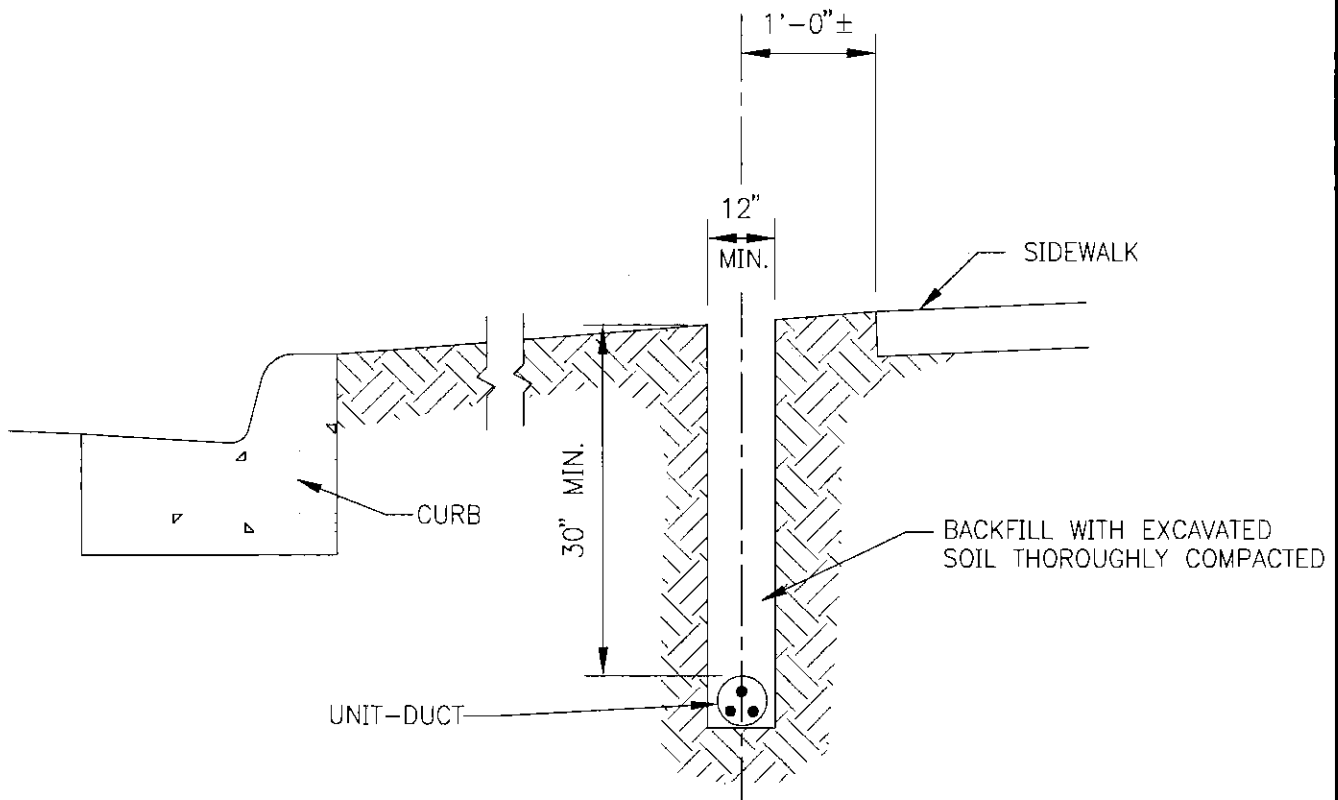


Baxter & Woodman
 Crystal Lake, Illinois
 Burlington, Wisconsin
 Mokena, Illinois
 DeKalb, Illinois

VILLAGE OF BEECHER, ILLINOIS COMMERCIAL BOULEVARDS & INTERSECTIONS

DESIGNED BY JLR	SCALE NO SCALE
DRAWN BY MAC	PROJECT NO. STANDARD
CHECKED BY JTB	SHEET NO.
DATE 08-20-03	

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Mokena, Illinois
DeKalb, Illinois

VILLAGE OF BEECHER, ILLINOIS
TYPICAL SECTION
UNIT DUCT IN TRENCH

DESIGNED BY JLR	SCALE NO SCALE
DRAWN BY MAC	PROJECT NO.
CHECKED BY JLR	STANDARD
DATE 08-02-03	SHEET NO.

**VILLAGE OF BEECHER, ILLINOIS
ENGINEERING TECHNICAL SECTIONS**

**SECTION 7
EROSION CONTROL**

7.01 General

- A. All Erosion Control shall be as specified in the Village of Beecher Ordinance #766, Soil Erosion and Sediment Control.

7.02 Basic Design Standards

- A. All Erosion Control design shall be as specified in the Village of Beecher Ordinance #766, Soil Erosion and Sediment Control, Section 503.

7.03 Material Specifications

- A. Silt Fence
1. Material: Geotechnical fabric of woven or nonwoven filaments of polypropylene, polyester, or polyethylene.
 - a. Non-woven fabric: Needle-punched, heat-bonded, resin-bonded, or a combination thereof.
 - b. Filaments: Dimensionally stable, resistant to delamination, free from chemical treatments or coatings that reduce porosity and permeability, and resistant to ultraviolet radiation.
 - c. Properties:
 - (1) Width: 3.5 feet minimum.
 - (2) Weight: 4.0 ounces per square yard minimum ASTM D-3776.
 - (3) Grab tensile strength: 200 pounds minimum, ASTM D-4632.
 - (4) Grab elongation @ failure: 15 percent minimum ASTM D-4632.
 - (5) Burst strength: 250 psi minimum ASTM D-751.
 - (6) Equivalent opening size (EOS) US Standard sieve number: non-woven - 30 minimum, woven - 50 minimum.
 - d. Acceptable products:
 - (1) Mirafi 100X by Mirafi, Inc., Charlotte, North Carolina.

- (2) Supac 5WS by Phillips Fibers Corp., Greenville, South Carolina.
 - (3) Or equal.
 - 2. Support posts
 - a. Type:
 - (1) Treated wood: 2-inch by 4-inch or 3.0 square inch cross section.
 - (2) Steel: Standard "T" or "U" sections weighing not less than 1.00 pound per linear foot.
 - b. Length: 4-1/2 feet minimum.
 - c. Interval: 5 feet (typical).
 - d. Use existing fence posts where available, if approved by Engineer.
 - 3. Use metal staples, nails, or wire to fasten fabric to posts.
- B. Straw Bale Barrier
 - 1. Material: Clean, weed-free straw, or similar material, from agricultural crops.
 - 2. Bales: Compacted, tightly bound only with twine, not wire.
 - 3. Bale stakes: 1/2-inch diameter steel, or 1-inch diameter wood.
 - a. Length: 4 feet minimum.
- C. Ditch Check
 - 1. Material: Geotechnical fabric of woven or non-woven filaments of polypropylene, polyester, or polyethylene as specified for Silt Fence.
 - a. Acceptable products:
 - (1) Mirafi 100X by Mirafi, Inc., Charlotte, North Carolina.
 - (2) Supac 5WS by Phillips Fibers Corp., Greenville, South Carolina.
 - (3) Or equal.
 - 2. Use woven wire, flexible wooden, or snow fence to support fabric.
 - 3. Posts: Treated wood, 4-inch diameter, 6 feet in length, or metal, 2-inch diameter, 8 feet in length.
- D. Temporary grass

1. Seed: Annual ryegrass, spring oats, or wheat.
- E. Temporary riprap
1. Comply with IDOT Section 1005.01, gradation 3, quality designation C.
- F. Excelsior Blanket
1. Machine-produced mat of wood excelsior from wood properly cured to produce adequately curled and barbed fibers.
 - a. Fiber length: 80 percent minimum at 6 inches or longer.
 2. Properties:
 - a. Width: 24 inches minimum.
 - b. Weight: 0.9 pounds per square yard minimum.
 - c. Length of roll: 150 feet minimum.
 3. Cover the top side of the blanket with a 90-day biodegradable, extruded plastic mesh netting.
 - a. Minimum opening: 5/8-inch by 5/8-inch.
 - b. Maximum opening: 2 inches by 2 inches.
 4. Acceptable products:
 - a. American Excelsior Company.
 - b. Or equal.
- G. Fiber Mat
1. Bulky structure of entangled, nylon monofilaments, melt-bonded at intersections.
 2. Material: Nylon 6 plus a minimum content of 0.5 percent by weight of carbon black.
 3. Properties:
 - a. Filament diameter: 0.016-inch minimum.
 - b. Weight: 0.75 pounds per square yard.
 - c. Thickness: 0.7-inch minimum.
 - d. Tensile strength, ASTM D-4632:
 - (1) Length direction: 7.8 pounds per inch minimum.
 - (2) Width direction: 4.4 pounds per inch minimum.
 - e. Elongation: 50 percent minimum, ASTM D-4632.

4. Acceptable products:
 - a. Mirafi Miramat by Mirafi, Inc., Charlotte, North Carolina.
 - b. Enkamat 7010 or 7020 by American Enka Co., Enka, North Carolina.
 - c. Or equal.

H. Knitted Straw Mat

1. Machine-assembled blanket of clean, weed-free straw from agricultural crops, of approximately 1/2-inch loose thickness.
2. Cover the top side of the mat with a biodegradable plastic mesh with 3/8-inch by 3/8-inch square openings.
 - a. Attach mesh to the mat with biodegradable knitting thread.
3. Supply blanket in protected rolled mat form of 6'-6" width, with a dry weight of 0.70 pounds per square yard minimum.
4. Staples: 11-gage wire, 6 inches long.

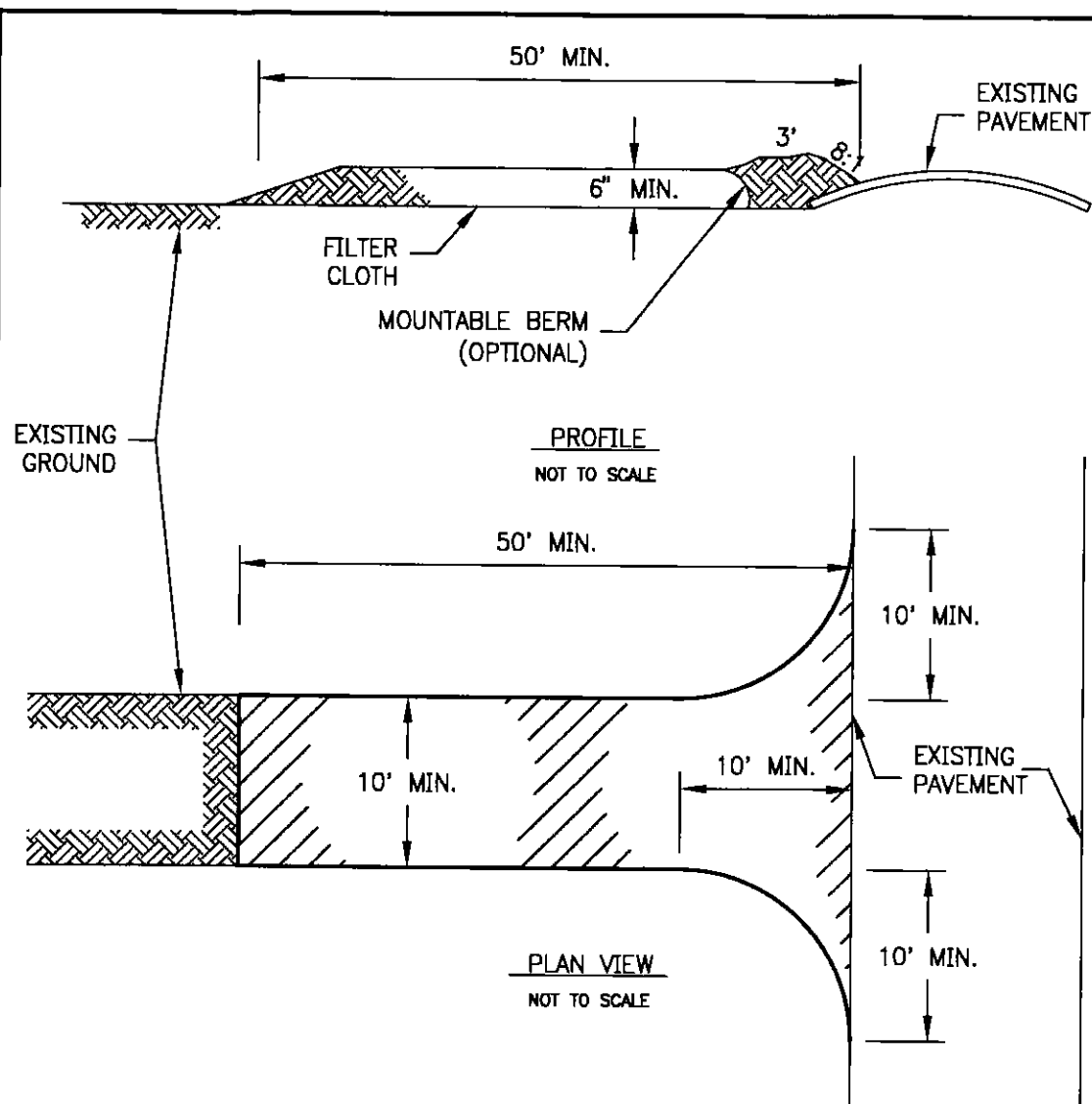
I. RIPRAP

1. Bedding material
 - a. Conform to IDOT Section 1005.01, Gradation 1.
2. Riprap:
 - a. Conform to IDOT Section 1005.01, Gradation 4, Quality Designation A.
3. Filter fabric:
 - a. Geotechnical fabric of non-woven filaments of polypropylene, polyester, or polyethylene.
 - b. Non-woven fabric: Needle-punched, heat-bonded, resin-bonded, or a combination thereof.
 - c. Filaments: Dimensionally stable, resistant to delamination, chemically inert, and rot-proof.
 - d. Properties:
 - (1) Weight: 6.0 ounces per square yard minimum, ASTM D-3776.
 - (2) Grab tensile strength: 160 pounds minimum, ASTM D-4632.
 - (3) Grab elongation @ failure: 20 percent minimum, ASTM D-4632.
 - (4) Burst strength: 250 psi minimum, ASTM D-751.

- (5) Trapezoidal tear strength: 60 pounds minimum, ASTM D-4533.
- (6) Equivalent opening size (EOS) US Standard sieve number: 50 minimum.
- e. Acceptable products:
 - (1) Mirafi 180N by Mirafi, Inc., Charlotte, North Carolina.
 - (2) Supac 8NP by Phillips Fiber Corp., Greenville, South Carolina.
 - (3) Or equal.

7.04 Details

- | | | |
|----|---------------------------------------|----------|
| A. | Stabilized Construction Entrance | (ER-001) |
| B. | Silt Fence | (ER-002) |
| C. | Straw Bales | (ER-003) |
| D. | Straw Bale Installation | (ER-004) |
| E. | Straw Bales Around Drain Area | (ER-005) |
| F. | Flared End Section Erosion Protection | (ER-006) |



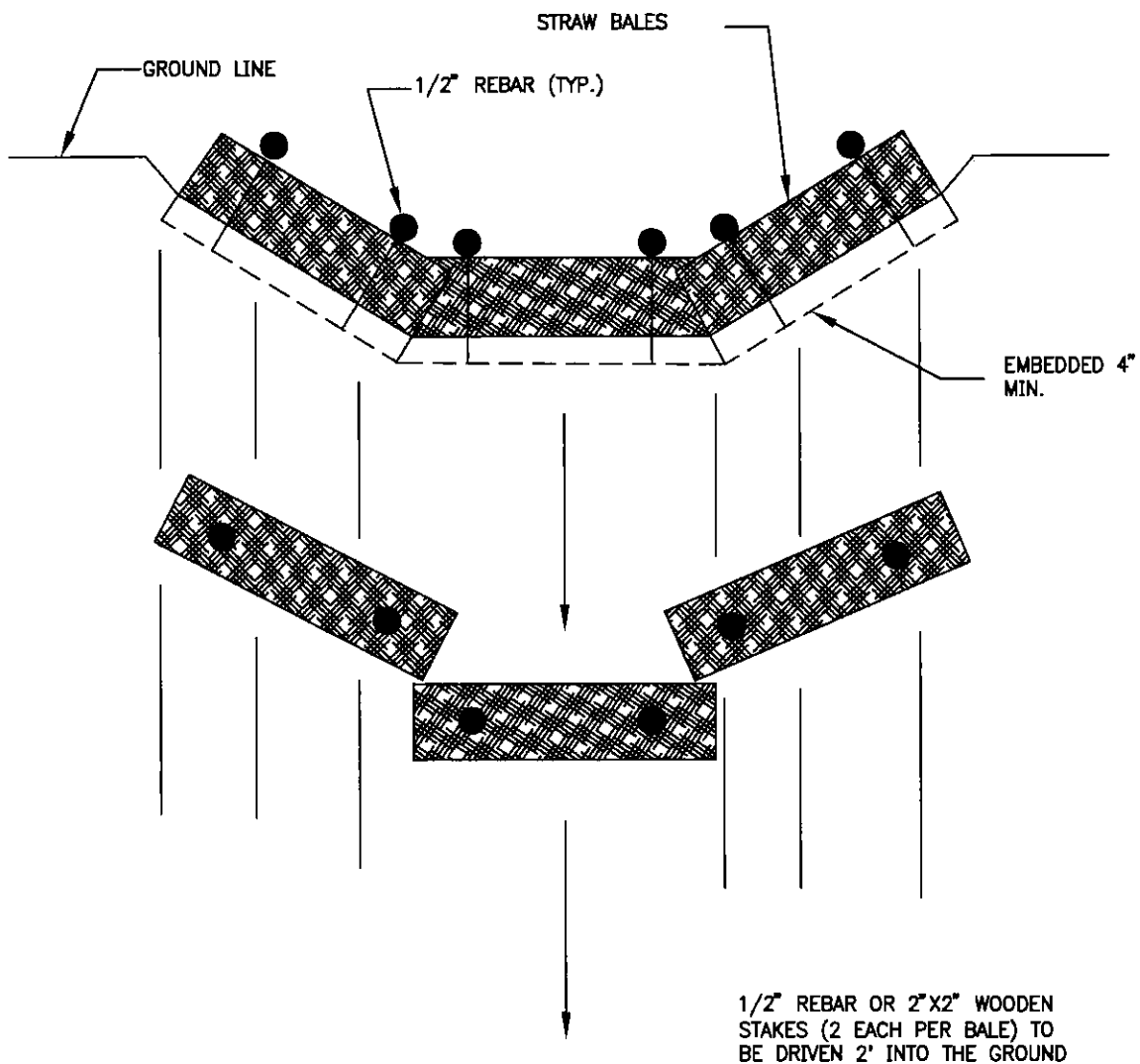
CONSTRUCTION SPECIFICATIONS

1. Storm Size - Use 2" stone, or reclaimed or recycled concrete equivalent.
2. Length - As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum length would apply).
3. Thickness - Not less than six (6) inches.
4. Width - Ten (10) foot minimum, but not less than the full width at points where ingress or egress occurs.
5. Filter Cloth - Will be placed over the entire area prior to placing of stone.
6. Surface Water - All surface water flowing or diverted toward construction entrances shall be piped across the entrance. If piping is impractical, a mountable berm with 5:1 slopes will be permitted.
7. Maintenance - The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, dropped, washed, or tracked onto public rights-of-way must be removed immediately.
8. Washing - Wheels shall be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with stone and which drains into an approved sediment trapping device.
9. Periodic inspection and needed maintenance shall be provided after each rain.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
STABILIZED CONSTRUCTION
ENTRANCE

DATE: NOVEMBER 2005

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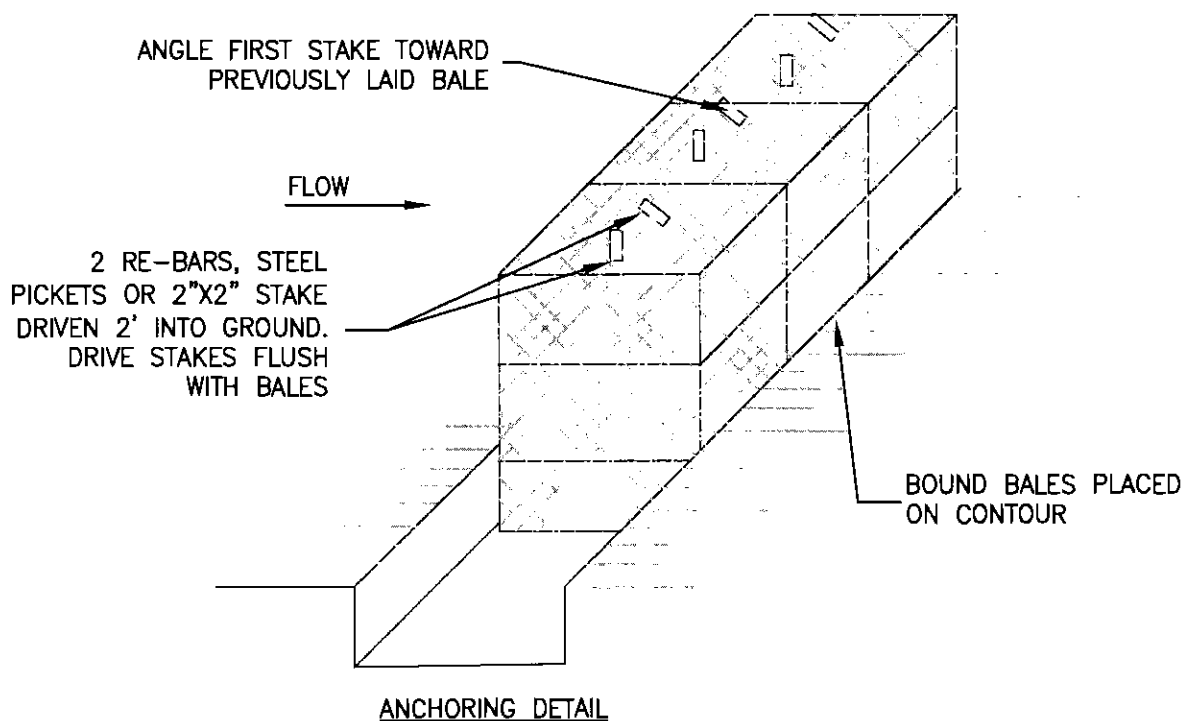
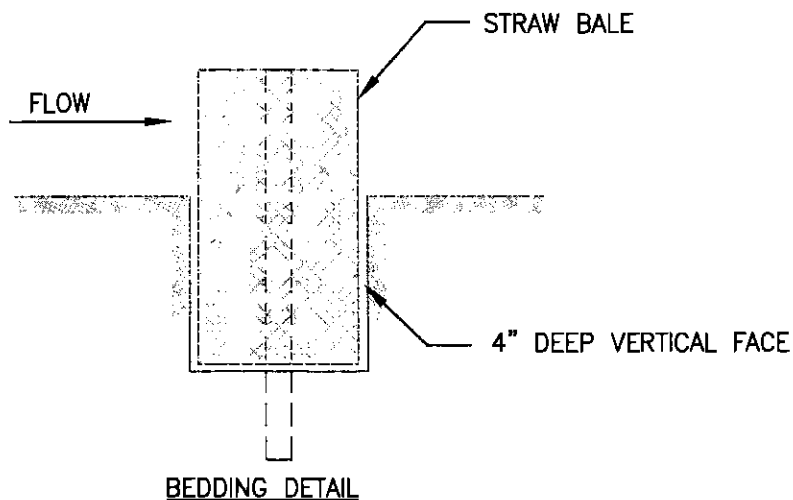
NO SCALE

NOTES:

1. BALES SHALL BE PLACED WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF 4", AND PLACED SO THAT BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR TWO RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
STRAW BALE

DATE: NOVEMBER 2005
SOIL EROSION\STRAWBALE1.DWG



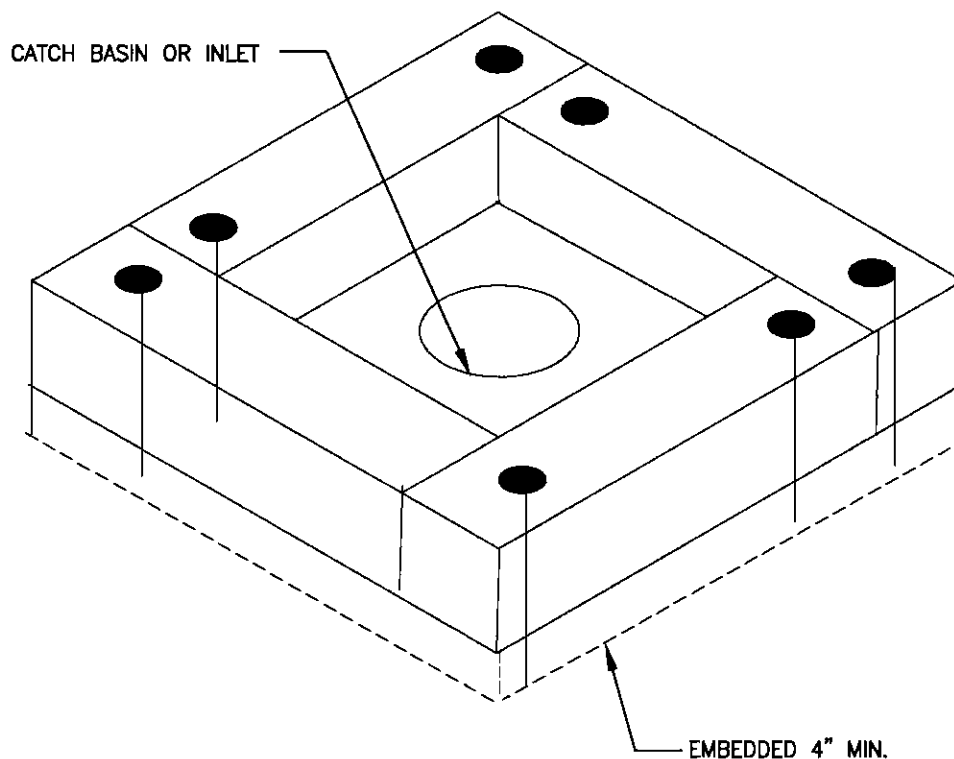
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NOTES:

1. BALES SHALL BE PLACED AT THE TOE OF SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF 4", AND PLACED SO THAT BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR TWO RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
STRAW BALE INSTALLATION
DATE: OCT. 2005

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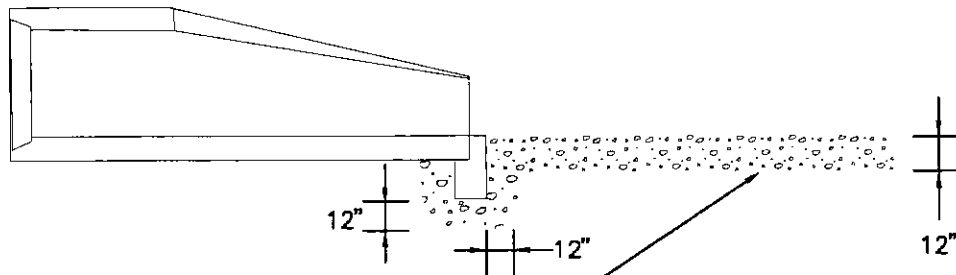


NOTES:

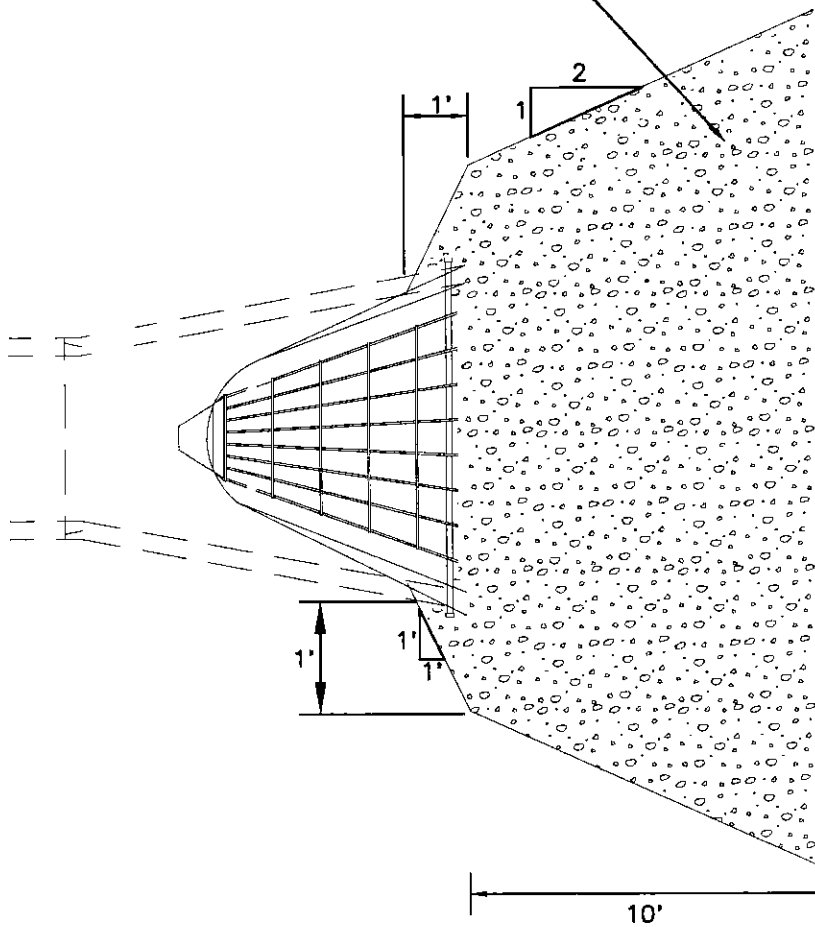
1. BALES SHALL BE PLACED WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF 4", AND PLACED SO THAT BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR TWO RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

VILLAGE OF BEECHER
STANDARD DETAIL
FOR
STRAW BALES AROUND DRAIN
AREA
DATE: OCT. 2005

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RIP-RAP CLASS A3 MINIMUM SIZE
WITH 6 OZ/SY FILTER FABRIC



VILLAGE OF BEECHER
STANDARD DETAIL
FOR
FLARED END SECTION
EROSION PROTECTION
DATE: NOVEMBER 2005
STORM\FES.DWG

VILLAGE OF BEECHER, ILLINOIS

LANDSCAPING STANDARDS

SECTION 8 - LANDSCAPE REQUIREMENTS

Section 8.01- General

- A. Purpose: The purpose of these landscape requirements are to provide orderly, safe, and healthful development of the area within the Village and to promote the health, safety, and general welfare of the community. These requirements are intended to be a benefit to the owners and users of the property, as an asset to the neighborhoods and pride to the Village.
- B. Objective: The objective of these requirements is to establish requirements for the installation and maintenance of landscape elements. The justification for such regulations is as follows:
 - 1. To encourage the preservation of existing native trees and vegetation;
 - 2. To protect and conserve the value of property;
 - 3. To provide visual buffering and enhance the beautification of the Village;
 - 4. To assist in providing adequate light and air and in preventing overcrowding of land;
 - 5. Reduce the impact of development on the community's storm drainage system;
 - 6. To reduce the level of carbon dioxide and return pure oxygen to the air.

Section 8.02 – Planting Size and Material

- A. Planting: It shall be unlawful to plant a tree or shrub within a public street or parkway without first having secured a permit therefore. Applications for such permits shall be made to the Village of Beecher. All tree and shrubs so planted shall be placed subject to the direction and approval of the Village.
 - 1. All planting shall be governed by the following:

2. It shall be unlawful to plant any trees or shrubs that would obstruct, become a general nuisance or in any way hamper views of traffic thereof.
3. Poplar, Cottonwood, Russian Olive, Weeping Willow, Silver Maple, Box Elder, fruit bearing trees and other trees not recommended for planting by the Morton Arboretum. In addition, evergreens, shrubs or multi-trunk trees shall not be permitted in public rights-of-way.
4. Trees shall be spaced evenly along all public streets at forty (40) foot intervals where permissible and no closer than thirty (30) feet.
5. All trees shall be planted at least four (4) feet from the edge of the street or equidistant from sidewalk and street or curb.
6. In newly developed areas where the developer is planting the trees, one softwood or conifer tree and or hardwood tree shall be allowed per lot or alternate lots, whichever meets the distance requirements, preventing sections of the Village having all softwood or all conifer trees therein.

B. Minimum Size of Plants and Other Materials:

A. All planting shall meet these minimum standards:

1. Deciduous Trees – Two and one-half inch (2½”) caliper, measured one (1) foot above the ground. Trees shall be a species having a minimum mature spread of 15-20 feet.
2. Ornamental and Flowering Trees – Two inch caliper, one foot above the ground.
3. Evergreen Trees –Five (5) feet in height.
4. Flowering and Evergreen Shrubs and Hedges – Five gallon size.
5. Vines and Ground Covers – One gallon size.
6. Redwood bark chips or woodchip mulch – Two inches in size at least three inches in depth in areas protected from wind erosion.
7. Synthetic Lawns and Plants – Shall not be used in lieu of plant requirements in this section.

8. Ground Cover – Shall be a minimum of two years old when planted and be spaced so that a complete coverage can be obtained after one growing season.
9. Grass Area - Shall be planted with species indigenous to the area, disease resistant and one that will require low maintenance in cutting and watering. It should be an immediate cover and sod is recommended in areas in which it will grow.

B. Plant and Material Requirements:

1. Plant materials shall be selected for type, size, and quality on the basis of suitability to climate, setting, and compatibility with other development plantings, character and functions. Plant species shall be primarily selected from native species and species considered invasive shall not be allowed.
2. Plant materials should be free of disease and harmful insects. Plants selected which are prone to disease and insect problems or which may jeopardize the health of adjoining plantings will not be acceptable.
3. Proper drainage will be required for all major plantings to insure the establishment of a good root system and a healthy growth.

C. Completion of Landscape:

A final landscape plan shall be submitted to the Plan Commission for approval. A date of completion of all planting and related work shall be included on the plan. Landscaping shall be installed and completed prior to the issuance of a Certificate of Occupancy, weather permitting. In periods of adverse weather conditions, and irrevocable letter of credit will be accepted for the completion of necessary landscaping, said letter of credit to be equal to one and one-quarter (125%) times the cost of the landscaping. A cost estimate for landscaping not installed at the time shall be presented to the Building department for approval. Letters of credit will not be released until all planting and finish materials shown on the approved landscaped plan are installed and accepted.

D. Elimination of Dead and Diseased Trees

All dead and diseased trees shall be removed within one year of notification to the property owner by the Village Tree Superintendent. Such notification shall be by registered letter and a copy filed with the Village Clerk.

No real estate transfer stamps shall be issued by the Village Clerk until such time as the Village Tree Superintendent certifies that any and all dead or diseased trees have been removed. If weather conditions or other unavoidable circumstances prevent the removal of such tree(s) by the closing of the sale, the Clerk shall issue transfer stamps only if the seller and/pr buyer (i) post a cash bond with the Village equal to 125% of the estimated cost of such tree removal and (ii) execute and agreement whereby the buyer agrees to perform such work by date certain (in which case the bond will be returned to the buyer), and authorizes the Village of its contractors to enter upon the property for purposes of performing the work in the event the buyer fails or refuses to perform such work after a 30 day written notice from the Village to do so.

Section 8.03 – Procedure

Except as otherwise provided below, the landscaping requirements of this chapter shall apply to all land, public and private, located in the Village. Unless provided otherwise by this chapter, none of the uses authorized by this Section shall be permitted until such landscaping requirements are installed.

A. Procedures and General Requirements - When site plan approval is required by this code on any land where the landscaping requirements of this chapter are applicable, the site plan shall contain in addition to the information already required, the information listed in paragraphs (2) through (4) below. When an application is made for a building permit application shall be accompanied by a landscape plan. The landscape plan or site plan shall contain the information listed in paragraphs (2) through (4) below, or any additional information as determined by the Department of Community Development, the Tree Superintendent, or Village Council to enable them to determine whether the permit of application of plan should be issued or approved.

B. Landscape Plan Required:

1. Existing and proposed landscaping including landscaping and screening that is required by this code, the location, species, size in circumference one foot above grade, and height of new trees in planting areas to comply with this code; the location and dimensions of planting areas, street yards, parking areas and transitional protective yards; the number, spacing, size and species of planting material, an indication of the size of earth berms and fences; soil stabilization and plant protection.
2. All existing land uses adjoining or adjacent to the site and an indication of the density of development of adjoining tracts containing residential dwellings.

3. The number, location, species, height and size in circumference four and one-half feet above grade of existing trees between the building and public street right-of-way which are to be preserved for credit as per the specifications and table: Conditions and Credits for Preserving Existing Trees on Site; and circumference as specified in the table; and
4. The location and details of any barriers to be erected to protect any vegetation from damage during or after construction; and
5. At the time of a request for a Certificate of Compliance, the required landscaping is not in place and it can be determined by the Village that because of the unavailability of plant material of that requiring completion of the landscaping at the time of such request would jeopardize the health of plant materials or weather conditions prohibit the completion of plants, the developer/owner shall make the following arrangements to secure a Certificate of compliance.
 - a. The developer/owner shall produce a contract, binding for one year from the date of application for a Certificate of Compliance to be approved by the City, for the completion of the landscape work. Such contract shall specify that the work shall be completed before of during is not a party or a third party beneficiary to said contract.
 - b. The developer/owner shall also agree in writing that he, or his successors or assigns, shall provide the required planting within one year as specified above, as a condition for obtaining a Certificate of Occupancy for the principal use so long as the principal use so long as the principal use shall continue. The developer/owner shall also agree that the principal use shall be discontinued should the required planting not be provided as specified in paragraph one above. Violations of these provisions shall constitute an unauthorized illegal occupancy of the principal use.
6. Landscaping in landscaped areas shall not obstruct the view of motorists using any street, private driveway, parking aisles or approach to any street intersection so as to constitute a traffic hazard of a condition dangerous to the public safety upon any such street, driveway, parking aisle, or street intersection, or violates the guidelines set forth by section.
7. Whenever any planting areas required by this chapter are adjacent to parking or vehicular circulation areas, the planting areas shall be protected from vehicular intrusion or damage from vehicular lubricants or fuels.

8. All landscape planting areas shall be stabilized from soil erosion immediately upon planting and shall be maintained for the duration of the premise.

C. New Homes- Groundcover

1. The property owner, builder or developer of single family lots are required to plant street trees which are acceptable and approved by the Village. Trees shall be planted at a minimum forty (40) foot intervals in the public right-of-way.
2. The property owner, builder or developer of single family lots are required to grade and sod the parkway and front yard setback, as well as seed the backyards.

D. Street Yard Landscape Requirements.

1. It is the intent of this subsection to establish a uniform planting area between the public street right-of-way and any use of land. This area will be reserved for the planting of trees and other live vegetation to provide a community of vegetation throughout the Village, to reduce the amount of impervious surface and reduce storm water runoff. To filter air, provide shade, and otherwise improve the microclimate for all the citizens and to reserve a remnant of Mokena's natural vegetation cover.
2. All fences must conform the requirements of this chapter. No more than fifteen percent of the required street yard shall be covered with an impervious surface which may be used without limitation for walkways, fountains or walls, but not parking or storage.
3. This street yard shall contain natural trees, either existing or planted, of at least ten feet in height and two and one-half inches (2½") above grade as follows:
 - a. No street yard shall contain less than one natural tree, and
 - b. Each street yard shall contain at least one natural tree within every fifty linear feet of street year or fraction thereof, as measured from the corner of the lot.
 - c. All required trees in the street yard must be a locally adapted species with an expected mature height of fifty feet or greater and an expected mature crown spread or at least thirty-five feet of greater unless subject to an overhead powerline in which case the mature height may be less.
 - d. All residential development must be screened from trash dumpsters, trash pads, and service areas.

- e. Screening is required where residential dwelling units are proposed within 100 feet of right-of-way of interstate. One evergreen is required for every 4 feet of land abutting the highway. Staggered rows are preferable.
- 4. Any existing stand of vegetation which meets the applicable standards of subsection 5 and 6 will satisfy the planting requirements so long as it is protected in accordance with these provisions.
- 5. Preservation of existing trees between the principal building and the right-of-way can be credited towards the tree planting requirements of this section according to the following ratio: The credit toward the required number of trees shall be a number equal to the value of one-ninth the sum in inches of the circumference(s) of each preserved tree(s) as measured at a height of four and one half feet above grade, level. To be included in the computation for credit for existing trees, a preserved tree must be at least nine inches in circumference.

No credit will be allowed for any tree proposed to be retained if there is any encroachment within the protected areas defined by a circle which is as its center the trunk of the tree and the minimum radius listed in subsection (f) below or if the tree is unhealthy or dead. The death of any preserved tree being used for credit requires the owner/developer to plant new trees equal to the number of credited trees; such plantings shall meet the requirements of this code.

In no case shall credits for preserved trees eliminate the requirement of (C) (1); no street yard shall contain less than one natural tree.

For the purpose of this Section, an encroachment is defined as any change in the natural grade, construction of impervious surfaces, trenching or excavation, storage of equipment, materials or earth and the temporary or permanent parking or circulation of vehicles or equipment.

- 6. Preservation of existing trees can be credited towards the tree planting requirements of this section in accordance with the specifications and ratios described in the table, "Conditions and Credits for Preserving Existing Trees on Site".

E. Conditions and Credits For Preserving Existing Trees On Site.

These credits may be applied towards the required tree planting of the street yard.

Tree Size * (Circumference)	# of trees credited	Minimum radius (feet)
9"	1	8
18"	2	10
27"	3	15
45"	5	17.5
63"	7	20
72"	8	25
90"	10	30

*All trees shall be measured at four and one-half feet above grade.

Section 8.04 – Commercial, Industrial and Multi-Family Requirements

A. Intent and Purpose.

It is the intent of this section to modify and reduce the deleterious visual, environmental and aesthetic effects of existing and proposed parking lots, parking areas and vehicle storage areas.

The landscape requirements herein have been developed to: filter and reduce the glare of headlight and reflected sunlight from parked automobile onto the public street right-of-way and adjoining property; to visually modify the appearance of parking areas and vehicle storage areas, to encourage the construction of such necessary areas in a manner that more closely follows the existing natural contours of the land; to distribute planting areas around and within the parking area in such a manner that approximately twenty percent of all surface area receive the benefit of shade; to modify the rate of stormwater runoff and increase the capability of groundwater recharge in urbanizing area; to provide shade, filtering and air and other beneficial environmental effects to the microclimate of the parking area and its environs, to prevent the overcrowding of land and to break the visual blight created by large expanses of barren asphalt.

A combination of deciduous, coniferous and ornamental trees, shrubs, hedges, flowers, sod, ground cover and other natural materials shall cover all areas of the site, (including detention ponds) not used for structures, drives, sidewalks or parking on all commercial, industrial or multi-family property. This landscaping shall include: Parking Lot Landscaping, Street Trees, Foundation Planting and Open Space Landscaping.

1. Parking Lots Greater Than 5 Spaces

- a. In any aisle in excess of 30 parking stalls, an interior landscaped island shall be provided.
 - b. Landscaped island shall be provided at each end of all rows of parking stalls in parking stalls in parking lots in excess of 40 parking stalls. All landscape islands shall be protected by a six inch (6") curb.
 - c. Landscaped medians shall be placed periodically to prevent vehicular movement across parking aisles.
 - d. One tree per 8,000 square foot of paved surface is required of which 75% must be deciduous, overstory trees.
 - e. The following requirements apply to all parking lot islands or medians:
 - f. Each island shall contain at least one deciduous shade tree.
 - g. Each island shall not contain any shrub over 18 inches in height.
 - h. Islands and medians shall be a minimum of 8 feet in width.
 - i. The remainder shall be planted with approved groundcover in the appropriate density to achieve complete cover within two (2) years. Mulch may be substituted for other groundcover if it is applied to 100% of the landscaping area at a thickness of at least two (2) inches. .
2. Any remaining parking lot trees or shrubs not planted in medians or end-caps shall be placed along the perimeter of the parking surface.
3. Streetscape
- a. Minimum spacing for street trees shall be every 40 feet along the right-of-way adjacent to the parcel, as located by the Tree Superintendent.
 - b. Street trees shall be of the following species: Locust, Hardwood Maple, Linden or other genera approved by the Tree Superintendent. The appropriateness of allowing additional species of street trees will be determined on an individual basis by the Tree Superintendent.
 - c. An opaque landscaping feature a minimum 30 inches in height is required between any parking lot or driveway and the adjacent street. Said feature shall be one of the following.
 - (i) Eight foot wide landscaped strip which must screen at least 70% of the length of the lot frontage with an opaque barrier 30 inches high

- (ii) A 30 inch high architecturally appropriate wall constructed of similar materials as the building façade. Said wall to be located in a 3 foot wide landscaped strip. Long expanses of wall should be broken up with intermittent landscaping.
 - (iii) An opaque fence a minimum of 30 inches high. Said fence to be located in a 3 foot wide landscaped strip. Long expanses of fence should be broken up with intermittent landscaping.
 - (iv) Landscaped berms at least 3 feet in height measured from the top of street curb adjacent to the berm at a slope no greater than 1 in 3. Berms may be terraced and/or undulate.
 - (v) Any approved combination of the above.
4. Property Adjacent to Residential or Institutional Uses.
- a. All off-street parking, loading facilities and driveways shall be effectively screened from adjacent residential, public or institutional uses by a fence, wall, berm or densely planted landscape buffer. Said screen shall be opaque year round and a minimum 6 feet tall at time of planting. Plantings may be along a terraced and/or undulating berm with the total height requirement at six feet above established grade.
 - b. Where dissimilar uses exist adjacent to one another, the required open space landscaping shall be concentrated on the common line.
 - c. When choosing tree species to plant in a landscape buffer, it is important to choose the proper combination of forms in order to effectively screen a view. This fact will be taken into consideration by the Tree Superintendent in the Site Plan review process.
5. Foundation Planting: A foundation planting area, a minimum 6 feet in width, including ornamental and/or coniferous trees, shrubs and flowers shall be provided between the building face and any public or private street.
6. Quantity and Mix of Open Space Landscaping: Open space landscaping will be required, in addition to foundation, parking lot and street tree landscaping. These plantings will be placed in the open space remaining after the other requirements have been met.
- a. One tree per 50 feet of lot perimeter is required.
 - b. One shrub per 40 feet of lot perimeter is required.

- c. At least 30% of the required open space trees shall be coniferous and no more than 30% may be ornamental.
7. Visual Clearance: No fence, wall, dense landscaping, sign, vehicle, or other visual obstruction above a height of 30-inches from the established street grade shall be permitted within 15 feet of either side of an entrance or exit of off-street parking and loading facilities, measured at the property line. Nor may such obstruction be permitted within the triangular area formed by a straight line drawn between points on the property lines at a distance of 30 feet in each direction from the intersection of any street or alley right-of-way.
8. Utility Clearance – Access to utilities (manhole covers, fire hydrants, electrical transformer, etc.) must be maintained.
9. Permitted Tree Species: All trees required as a result of the stipulations within this ordinance shall be specifically approved by the Tree Superintendent. A variety of tree genera shall be used to avoid monoculture problems. In no case shall the following genera of trees be permitted as parking lot or street trees:

Scientific name	Common Name	Problem
Abies sp.	Fir	visibility obstruction
Acer negundo	Box elder	weak wood, invasive seeds
Acer sacharrinum	Silver Maple	weak wood, poor form, invasive seed
Betula papyrifera	White Paper Birch	borer insects, poor survival
Catalpa sp.	Catalpa	messy fruit
Diospyros virginiana	Persimmon	messy fruit
Elaeagnus angustifolia	Russian Olive	disease prone
Juglans sp.	Walnut, Butternut	messy fruit
Juniperus sp.	Juniper	visibility obstruction
Liriodendron tulipifera	Tulip Tree	weak wood
Malus sp(unimproved var)	Common Crabapple	messy fruit
Maclura pomifera	Osage orange	messy fruit
Morus alba	White mulberry	messy fruit
Picea sp.	Spruce	visibility obstruction
Pinus sp.	Pine	visibility obstruction
Populus deltoids	Common Cottonwood	weak wood, messy seed
Populus sp.	Lombardy Poplar	weak wood
Prunus sp.	Common Cherry	messy fruit, insects

Robinia psuedoacacia	Black Locust	shallow roots, insects, cankers
Salix sp	Willow	weak wood, messy
Thuja, sp	Arborvitae	visibility obstruction
Ulmus Americana	American Elm	disease problems
Ulmus rubra	Red, Slippery Elm	disease problems
Ulmus pumila	Siberian Elm	disease problems

Other trees may be added to this list if/when they are determined to host invasive or exotic species that may cause harm.

10. Planting Sizes

- a. Deciduous – 2 ½’ trunk diameter, measured one foot above ground.
- b. Ornamental – 2” trunk diameter, measured one foot above ground.
- c. Coniferous- 8” tall, with a minimum 5’ spread.
- d. Shrubs 0 5 gallons.

11. Landscape Plan Requirements: The landscape Plan *shall* be separate from the Site Plan and include the following:

- a. Location of site, scale north arrow, location of building(s), light fixtures, above ground utilities, parking and any existing features.
- b. The landscape drawing must clearly indicate the exact location and spacing of all plants such as trees, shrubs, ground covers, vines, flowers, sod. And other materials used in the design. Earth mounds or berms must be indicated as to location, width and height.
- c. The plant list must show the following:
 - (i) Quantity of plants for each species.
 - (ii) Botanical plant name.
 - (iii) Common plant name.
 - (iv) Climatic zones in which the plant can grow (per USDA Plant Hardiness Zone Map).
 - (v) Sizes or height of plants at time of planting.

- (vi) Whether plants are to be container grown or will be balled and burlapped.
- (vii) Spacing of shrubs used in hedges and ground covers must be indicated on the list or on the landscape drawing.
- (viii) List of quantities and types of all other materials used; i.e., 300 sq. ft of Redwood bark, 2" in depth.
- (ix) Any other relevant information

Said Landscape Plan should also include any additional requirements imposed by this ordinance.

Section 8.05 – Tree Protection

A. Tree Preservation

1. All existing tree with a trunk size of 4 inches or greater, measured one foot (1') above the ground, shall be maintained and integrated into the Landscape Plan.
2. Where the Tree Superintendent indicates an existing tree 4 inches or greater in diameter may be removed, it shall be replaced at a 2 to 1 ratio with 3 inches tree of approved species or at a ratio directed by the Tree Superintendent.

B. Tree Protection During Construction

During construction, the following provisions shall be met:

1. A protective barrier erected one foot beyond the drip line, but no larger than 12 feet in diameter, shall encircle the tree (s) on the property
 - a. Four inches or greater in diameter measured one foot above grade; and
 - b. Any other tree which is to remain permanently on the site. Tree(s) to remain shall be identified by painting, flagging, etc.
2. The barrier shall be constructed of upright posts and railings connected by ribbon, flags or other easily visible connecting material.
3. No excess soil or additional fill, building materials or debris shall be placed any closer to the tree than the protective barrier.
4. No tractor or heavy machinery shall be allowed to work within the barrier area.

5. No attachments or wires, other than protective guy wires, shall be attached to any of the trees which have a protective barrier.

Section 8.06 – Tree and Shrub Installation

The trees and shrubs that are planted shall be the species and size specified on the approved plans unless substitutions have been approved by the Village prior to Planting. Undesirable substitutions that have been planted without prior approval by the Village shall be removed and replaced by acceptable species if required by the Village.

A. Material

1. Trees and shrubs shall be nursery grown unless otherwise approved and be species appropriate to this climatic zone and the immediate planting environment. These should be healthy and vigorous plants, free from defects, decay disfiguring roots, sun-scaled, injuries, abrasions of the bark, plant diseases, insect pest eggs, bores and all forms of objectionable infestations as determined by the Village. Plants shall be in accordance with the current Morton Arboretum standards and conform in general to representative species. Plant species shall be primarily selected from native species, and species considered invasive shall not be allowed.
2. Balled and burlapped trees and shrubs shall be dug with firm, and natural balls of earth of adequate size as specified by the American Association of Nurserymen,” American Standard for Nursery Stock, “with balls securely wrapped.
3. Container grown stock shall have grown in a container long enough for the root system to have developed sufficiently to hold its soil together.
4. All street trees shall be balled and burlapped with a minimum diameter ball of 32 inches.

B. Delivery and Temporary Storage

1. Insofar as is practicable, trees and shrubs shall be planted on day of delivery. If this is not possible, the contractor shall protect unplanted trees by keeping them in shade, well protected with soil, mulch or other acceptable material and shall keep trees well watered.
2. Trees and shrubs shall not remain unplanted for more than two weeks.

C. Planting

1. Sites must be cleared of all construction debris and contaminants prior to any planting.
2. All trees and shrubs shall be planted in such a manner as to ensure their survival. This shall include the planting of intact balls, planting at proper depth, properly backfilling and watering, and construction of a planting saucer. (Exhibit H).
3. Any rope or wire binding the ball shall be cut prior to the conclusion of backfilling operations to prevent girdling of the tree trunk.
4. Prior to installation, the roots of container grown stock shall be separate or split to ensure proper root development.

D. Guying and Staking: All trees shall be properly guyed or staked to keep them in a vertical position.

E. Wrapping: The trunks of all trees except for low branching conifers shall be properly wrapped with waterproofed tree wrapping paper.

F. Mulching

1. All trees and shrubs shall be properly mulched after planting, to a minimum depth of 3 inches, with any appropriate mulch such as pine bark, pine needles, wood chips, or shredded bark.
2. Mulch shall cover the entire plant saucer.

G. Authorization to Plant: It shall be unlawful to plant any tree or shrub in any street right-of-way or other public space without first having secured permission from the Tree Superintendent.

Section 8.07 – Landscape Maintenance

- A. All trees shall be maintained in a healthy state (alive, disease and insect free) by the property owner.
- B. All foliage, branches and sucker of trees shall be pruned to a height of eight 810 feet from street level or ground level, whichever is greater.
- C. All diseases or dead trees shall be removed by the owner at his expense when tree is so designated by the Village or his duly authorized agents

- D. If any of the above is not maintained as indicated, the Village, upon proper notification, shall remove, trim or spray or cause to be removed, trimmed or sprayed to correct said infringements of the above, at the owner's expense.
- E. It shall be unlawful to remove or cut down any tree or shrub in any such public place without having secured a permit. Applications for such permits shall be made to the Village Clerk and approved by the Village before issuance.
- F. Injury: It shall be unlawful to injure any tree shrub planted or growing in any such public place.
- G. Advertisements or Notices: It shall be unlawful to attach any sign, advertisement or notice to any trees or shrub in any public place.
- H. Utilities
 - 1. It shall be unlawful to attach any wire or rope to any tree or shrub in any public street, parkway or other public place without the permission of the Village.
 - 2. Any person or company which maintains poles and wire in the streets, or in other public places, shall in the absence of provisions in the franchise concerning the subject, keep such wires and poles free from and away from any trees and shrubs in such places so far as may be possible and shall keep all such trees and shrubs near such wires and poles properly trimmed, subject to the supervision of the Tree superintendent, so that no injury shall be done either to the poles or wires or to the shrubs and trees by their contact.
- I. Tree Topping: It shall be unlawful as a normal for any person, firm or Village Department to top any Street Tree, Park Tree or any other tree on public property. Topping is defined as the severe cutting back of limbs to stubs larger than three inches in diameter within the tree's crown to such a degree so as to remove the normal canopy and disfigure the tree. Trees severely damaged by storms or other causes, or certain trees under utility wires or other obstructions where pruning practices are impractical may be exempt from this ordinance to determination of the Village.
- J. Removal of Stumps: All stumps of Street Trees and Park Trees shall be removed below the surface of the ground so that the top of the stump shall not project above the surface of the ground.
- K. Excavations: In making excavations in streets or other public places proper care shall be taken to avoid injury to the roots of any tree or shrub, whenever possible.
- L. Interference with Village: It shall be unlawful for any person to prevent, delay or interfere with the Village, or any of his agents, while engaging in and about

planting, cultivating, mulching, pruning, spraying or removing any Street Tree, Park Trees or trees on private grounds, as authorized in this ordinance.

- M. Arborists License and Bond: It shall be unlawful for any person or firm to engage in the business or occupation of pruning, treating or removing Street or Park Trees within the Village without first applying for and obtaining a license; provided however that no license shall be required of any public service company or Village employee doing such work in the pursuit of their applicant shall first file evidence of possession of liability insurance for bodily injury and property damage indemnifying the Village or any person injured or damaged resulting from the pursuit of such endeavors as herein described.

Section 8.08- Landscaping Guidelines: Detention Ponds

The Village has a stormwater drainage and detention ordinance to diminish threats to public health, safety and welfare caused by runoff of excessive stormwater from new development and redevelopment. Wet-bottom and dry-bottom detention basins are two ways to fulfill the requirements of the ordinance. To promote environmental and ecological benefits of these basins, the Village has established these landscaping guidelines. These guidelines are divided into two categories: wet-bottom ponds and dry-bottom basins.

WET-BOTTOM PONDS

These guidelines are to be used for ponds that can support a fishery. As a general rule, ponds that support fisheries must be at least 1 acre in size and at least 25 percent of the pond 10-to-12 feet. These ponds must also have stormwater best management practices upstream of the pond to reduce and minimize siltation, high nutrient loads, and other water quality concerns.

Wet-bottom basins that are specifically designed for wetland mitigation or wetland conservation are not covered in these guidelines. The design for wetland mitigation projects should follow the U.S. Army Corps of Engineers wetland mitigation guidance documents.

The pond shall be designed with respect to its position in the overall landscape. The following are guidelines that can be used, but site-specific conditions, goals and criteria shall be developed during the design. The pond design shall be reviewed by the Village in conjunction with the overall site planning.

Pond Shape

The ordinance describes engineering attributes that need to be incorporated into a wet-bottom pond design. For landscaping, there are two important engineering attributes:

pond slope and topsoil thickness. The ordinance requires the pond slope to be 5 Horizontal: 1 Vertical (5H:1V) or flatter at the normal pool elevation and no steeper than 3H:1V for other slopes of the pond. The ordinance also requires a level safety ledge at least 8 feet in width at 2.5-to-3.0 feet below the normal water depth. The Village recommends a minimum of 12 inches of topsoil for areas of the pond that will be vegetated. A typical pond cross-section is shown Section 5, Storm Sewer Details.

Vegetation

The Village requires the use of native plants in and around the pond. Only plants native to northeastern Illinois may be used. Genetically modified plants are not allowed. A list of suitable native plants is presented on Table A. A similar list and quality reference that can be used for Plainfield projects is provided in Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois by the USDA Natural Resources Conservation Service. The developer may submit additional native plants to the Village for approval.

These guidelines describe four vegetation zones that may be applicable to the pond design: submergent vegetation zone; emergent vegetation zone; saturated soil zone; and upland slope buffer.

Submergent Vegetation Zone

This aquatic plant community is generally submersed below the water surface or has floating leaves. This plant community provides important habitat for fish and wildlife, but too much cover of this plant community can choke a pond and decrease fish habitat. The Village recommends random plantings of submergent plants. Between 10 and 30 percent of the safety ledge can be planted with submergent plants. Areas of gravel on the safety ledge will help the fish to spawn.

Emergent Vegetation Zone

Emergent vegetation grows in periodic or permanently flooded areas and the plant's leaves and stems extend above the water's surface. For purposes of this guideline, emergent vegetation is found in the zone from the normal water's edge to a water depth of 6 inches. Survival rate is best when installing live plant parts rather than seeds, therefore, the Village recommends the planting of live plant parts for this zone. Similar plants are recommended to be planted near each other in small clusters, spacing of 1-to1.5 feet on-center. A minimum of 4,500 plugs per acre is recommended. Also, a goose grid to keep foraging geese from destroying these plants is recommended for the emergent vegetation zone. When choosing the plant list, consider the plant's tolerance of siltation, salinity, and nutrient load and light preference expected to be found at the site. The Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois provides a good description of the plant's preferences.

Saturated Soil Vegetation Zone

Plants that can grow under saturated soil conditions are included in this zone. This zone, along with the emergent vegetation zone, is important to stabilizing the shoreline, a common soil erosion problem area. For purposes of this guideline, saturated soil vegetation zone extends from the normal water's edge to approximately two feet above the normal water level or the 2-year flood water level, whichever is greater. This zone can be seeded, but additional random planting of live plants is recommended. A minimum of 10 pounds of pure live seed per acre shall be seeded. The seed mix shall contain a variety of grasses, sedges, rushes and forbs. A minimum of five grasses, sedges, and rushes and eight forbs are recommended. A nurse crop of annual plants shall also be used to help stabilize the soils and provide conditions suitable for the germination and growth of perennial plants.

Upland Slope Buffer

Plants that can grow in the upland slope buffer zone occur on well-drained slopes or soils and are rarely inundated by water. Any inundation is also short-lived. This zone is on the upland side of the saturated soil vegetation zone. This zone can be seeded, and a minimum of 10 pounds of pure live seed per acre is recommended. The seed mix shall contain a variety of grasses and forbs. A minimum of four grasses and 10 forbs are recommended. A nurse crop of annual plants shall also be used to help stabilize the soils and provide conditions suitable for the germination and growth of perennial plants. A list of potential plants is presented in Tables A and B Section 8.10.

Fish Structure

In addition to pond shape and vegetation, additional habitat features are recommended to increase fish habitat. To help with fish spawning, random placement of pea gravel on the safety bench is recommended. Each pea gravel spawning area should be approximately 25 square feet in size and 4 inches thick.

Random placement of rock piles and/or bundles of wood branches should be placed at pond depths of 8-to-12 feet. The Illinois Department of Natural Resources has guidelines for assembling these types of fish structures.

Finally, fishing access along the shoreline is recommended. The access area should have a hard bottom, such as ledger stone/flagstone and access areas should be placed at a minimum of once every 250 feet of shoreline. There should be paths to the access areas, and can consist of crushed rock or similar.

DRY-BOTTOM BASINS

There are two basic land uses for dry-bottom basins: active management for multipurpose activities or passive use for aesthetics and wildlife. A dry-bottom basin that will accommodate athletic fields and playgrounds must have an underdrain system to keep the fields dry. This area is suitable for turf grasses that can be mowed regularly. A mixture of at least 3 turf grasses is required. Common turf grasses include Kentucky bluegrass, perennial ryegrass, creeping red fescue, tall fescue, redtop, and timothy. The first four species are best for higher traffic areas. Traffic-tolerant cultivars are recommended.

For dry-bottom basins intended to be used for aesthetics and wildlife, then native plants should be used. Deep-rooted plants are recommended to encourage infiltration of the water into the ground. A mixture of wet mesic and mesic plants should be used within the dry-bottom basin. This zone can be seeded, and a minimum of 10 pounds of pure live seed per acre is recommended. The seed mix shall contain a variety of grasses, sedges, rushes and forbs. A minimum of five grasses, sedges, and rushes and ten forbs are recommended. A nurse crop of annual plants shall also be used to help stabilize the soils and provide conditions suitable for the germination and growth of perennial plants.

Section 8.09 – Recommended Plantings by the Morton Arboretum

A. Recommended Trees

1. Baldcypress
2. River or Red Birch
3. Amur Chokecherry
4. Sargent Cherry
5. English Elm
6. Regal Elm
7. European Filbert
8. Lavalle Hawthorn
9. Thornless Honeylocust
10. Red Horsechestnut
11. American Linden
12. Bigleaf Linden

13. Silver Linden
14. Northern Red Oak
15. English Oak
16. Swamp Maple
17. Black Maple
18. Hedge of Field Maple
19. Norway Maple
20. Red or Swamp Maple
21. Sourgum
22. Blackhaw Viburnum

B. Recommended Shrubs

1. Five-leaved Aralia
2. Bottlebush Buckeye
3. Red Chokeberry
4. Flowering Quince
5. Cotoneaster Species
6. Deutzia Species
7. Forsythia Species
8. Juniper Species
9. Kerria
10. Rhododendron & Azaleas
11. Viburnum Species