Decatur Stormwater Utility

Stormwater Technical Standards Manual

Adopted and Approved By
The Board of Public Works

Effective February 3, 2015

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MANUAL FOR STORM DRAINAGE CONTROL

WITHIN THE INCORPORATED LIMITS OF DECATUR INDIANA

1. Purpose

   The purpose of this manual is to reduce the hazard to public health and safety caused by excessive stormwater runoff, to enhance the economic objectives, and to protect, conserve and promote the orderly development of land and water resources within the regulatory area.

   This manual regulates:

   a. Stormwater drainage improvements related to development of lands as defined within this manual located within the incorporated boundaries of the City of Decatur and any extra territorial boundaries.

   b. Drainage control systems installed during new construction and grading of developments as defined within this manual.

   c. The design, construction and maintenance of stormwater drainage facilities and systems.

2. Conflicting Manuals

   The provisions of this manual shall be deemed as additional requirements to minimum standards required by other ordinances of the City of Decatur. In case of conflicting requirements, the most restrictive shall apply.

3. Compliance with this and other ordinances

   In addition to the requirements of this manual, compliance with the requirements set forth in the Zoning Ordinance of the City of Decatur, Subdivision Control Ordinance of the City of Decatur, and other applicable ordinances with respect to submission and approval of preliminary and final Subdivision Plats, improvement plans, building and zoning permits, construction, inspections, appeals and similar matters, and compliance with applicable State of Indiana statues and regulations shall be required.

4. Definitions and Abbreviations

   For the purpose of this manual, the following definitions and abbreviations shall apply. Although not all of the definitions and abbreviations listed below are used in this manual, the additional terminology is provided to assist ordinance administrators, other community officials, residents and permit applicants in understanding technical terminology associated with the subject matter of this manual.

   <u>Definitions:</u>

   Antecedent Runoff Condition
   : The index of runoff potential before a storm event. The index, developed by the Soil Conservation Service (SCS), is an attempt to account for the variation of the SCS runoff curve number (CN) from storm to storm. The antecedent moisture condition is the moisture found within a soil due to a previous storm event.

   Acre-Foot (AF)
   : A measure of water volume equal to the inundation of a flat one-acre area to a depth of one foot (43,560 cubic feet).

   Amortization Period
   : The length of time used to repay a debt or mortgage to depreciate an initial cost.

   Backflow Preventer
   : A device that allows liquids to flow in only one direction in a pipe. Backflow preventers are used on sewer

pipes to prevent a reverse flow during flooding situations.

Backwater

The rise in water surface elevation caused by some obstruction such as a narrow bridge opening, buildings or fill material that limits the area through which the water shall flow. Backwater may also be considered as that water elevation found in a tributary that is based on the receiving stream's existing water elevation.

Base Flood Elevation (BFE)

The water surface elevation corresponding to a flood having a one percent probability of being equaled or exceeded in a given year.

Basement

Any area of the building having its floor subgrade on all sides.

Benchmark

A marked point of known elevation from which other elevations may be established.

Best Management Practices

Design, construction, and maintenance practices and criteria for stormwater facilities that minimize the impact of stormwater runoff rates and volumes, prevent erosion, and capture pollutants.

Adams County Drainage Board

The Adams County Drainage Board of Adams County, Indiana and any subordinate employee to whom they shall specifically delegate a responsibility authorized by this manual.

Building

See "Structure"

Capacity of a Storm Drainage Facility

The maximum flow that can be conveyed or stored by a storm drainage facility without causing damage to public or private property.

Centerline of Channel

The middle point or baseline of a channel.

Channel

A natural or artificial watercourse which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. It has a defined bed and banks which serve to confine the water.

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 typically involving relocation of the existing channel (e.g., straightening).

Compensatory Storage

An excavated volume of storage within a floodplain used to balance the loss of natural flood storage capacity when fill or substructures are placed within the floodplain. Such excavated volume has to be available for inundation by and accessible to the flood waters.

Contiguous
Adjoining or in actual contact with.

Contour
Imaginary line on the earth's surface which connects points of equal elevation.

Contour Line
Line on a map which represents a contour or points of equal elevation.

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.

Convolution
The process of translating precipitation excess into a runoff hydrograph.

Crawl Space
Low space below the first floor of a house where there has not been excavation deep enough to be defined as a basement, but where there is often access for pipe, ducts and utilities.

Cross-Section
A graph or plot of ground elevation across a stream valley or a portion of it, usually along a line perpendicular to the stream or direction of flow

Crown of Pipe
The elevation of top of pipe.

Cubic Feet Per Second (CFS)
A unit of measure for flow rate in a pipe or channel. Approximately equivalent to 7.5 gallons per second.

Culvert
A closed conduit used for the conveyance of surface drainage water under a roadway, railroad, canal or other impediment.

Curve Number (CN)
The Soil Conservation Service index that represents the combined hydrologic effect of soil, land use, land cover, hydrologic condition and antecedent runoff condition.

Dam
All obstructions, wall embankments or barriers, together with any abutments and appurtenant works, constructed to store, direct water or create a pool (not including underground water storage tanks).

Damage
Measurable rise in flood heights on buildings currently subject to flooding, flooding of buildings currently not subject to flooding and increases in volume or velocity to the point where the rate of land lost to erosion and scour is substantially increased.

Datum
Any level surface to which elevations are referred, usually using Mean Sea Level.

Depressional Storage Areas
Non-riverine depressions in the earth where stormwater collects. The volumes are often referred to in

units of acre-feet

Design Storm

A selected storm event, described in terms of the probability of occurring once within a given number of years, for which stormwater or flood control improvements are designed and built

Detention Facility

A facility designed to detain a specified amount of stormwater runoff assuming a specified release rate. The volumes are often referred to in units of acre-feet.

Detention Storage

The temporary detaining of storage of stormwater in storage facilities, on rooftops, in streets, parking lots, school yards, parks, open spaces or other areas under predetermined and controlled conditions, with the rate of release regulated by appropriately installed devices.

Development

Any man-made change to improved or unimproved real estate as defined below:

a. A subdivision as defined by the City of Decatur Subdivision Control Ordinance.
b. All new development on sites of 0.5 acres or more and exceeding 15,000 square feet of impervious surface.
c. Any highway, street or road construction that adds impervious surface over and above the existing condition and in the opinion of the City Engineer adds significantly to the storm water runoff so as to require the application of this manual

"Development" does NOT include such activities as the maintenance of existing buildings and facilities such as painting, re-roofing, milling and resurfacing of roads, gardening, plowing and similar agricultural practices that do not involve filling, grading excavation or the construction of permanent structures. In addition "Development" does not include the reconstruction or maintenance of municipal utilities or the replacement of existing crossings, culverts, streams, sewers or structures by the City of Decatur, Adams County Drainage Board, the Adams County Highway Department, the Indiana Department of Transportation (INDOT), other governmental agencies or their agents.

Discharge

Normally, the rate of flow into or out of a sewer, stormwater storage facility, or from a land surface. Discharges are customarily measured in cubic feet per seconds (CFS).

Drainage Area

The area from which water is carried off by a drainage system, a watershed or catchment area.

Drop Manhole

Manhole having a vertical drop pipe connecting the inlet pipe to the outlet pipe.

Dry Bottom Detention Facility

A facility designed to be completely dewatered after having provided its planned detention of runoff during a storm event.

Duration

The time period of a rainfall event.

Elevation Certificate

A form published by the Federal Emergency Management Agency that is used to certify the 100-year or base flood elevation and the lowest elevation of usable space to which a building has been constructed.

Elevation Reference Mark (ERM)

Elevation benchmark tied to the National Geodetic Vertical Datum of 1929 and identified during the preparation of a Flood Insurance Study prepared for the Federal Emergency Management Agency.

Energy Dissipater

A device used to reduce the energy of flowing water.

Erosion

Wearing away of the land by running water and waves, abrasion, temperature changes, ice and wind.

Extraterritorial Jurisdiction *(ETI)*

Areas located outside the corporate limits of a community over which the community has statutory development authority.

Farm or Field tile

A small diameter clay, plastic or pipe of some other accepted material installed in an agricultural area to allow drainage of farmland.

FEMA

The Federal Emergency Management Agency.

Flood or Flood Waters

A general and temporary condition of partial or complete inundation of normally dry land areas from the overflow, the unusual and rapid accumulation, or the runoff of surface waters from any source.

Flood Boundary and Floodway Map (FBFM)

A map prepared by the Federal Emergency Management Agency that depicts the FEMA designated floodways within a community. This map also includes the delineation of the 100-year and 500-year floodplain boundaries and the location of the Flood Insurance Study cross-sections.

Flood Crest

The maximum stage or elevation reached or expected to be reached by the waters of a specific flood at a given location.

Flood Duration

The length of time a stream is above flood stage or overflowing its banks.

Flood Easement

Easement granted to identify areas inundated by the 100-year flood and prohibit or severely restrict development activities.

Flood Elevation

The elevation at all locations delineating the maximum level of high waters for a flood of given return period.

Flood Fighting

Actions taken immediately before or during a flood to protect human life and to reduce flood damages such as evacuation, emergency sandbagging and diking.

Flood Forecasting

The process of predicting the occurrence, magnitude and duration of an imminent flood through meteorological and hydrological observations and analysis.

Flood Frequency

A statistical expression of the average time period between floods equaling or exceeding a given magnitude. For example: “100-year flood”.

Flood Insurance Rate Map (FIRM)

A map prepared by the Federal Emergency Management Agency that depicts Special Flood Hazard Areas within a community. This map also includes the 100-year or Base Flood Elevation at various locations along the watercourses. More recent versions of the FIRM may also show the FEMA designated floodway boundaries and the location of the Flood Insurance Study cross-sections.

Flood Insurance Study (FIS)

A study prepared by the Federal Emergency Management Agency to assist a community participating in the National Flood Insurance Program in its application of the program regulations. The study consists of a text which contains community background information with respect to flooding, a floodway data table, summary of flood discharges, flood profiles, a Flood Insurance Rate Map, and a Flood Boundary and Floodway Map.

Flood Hazard Boundary Map (FHBM)

A map prepared by the Federal Emergency Management Agency that depicts Special Flood Hazard Areas. There are no study text, base flood elevations or floodways associated with this map. These maps are no longer current and have been replaced by the appropriate Flood Insurance Rate Maps.

Floodplain

The channel proper and the areas adjoining any lake or watercourse which have been or hereafter may be covered by the regulatory or 100-year flood. The floodplain includes both the floodway and the floodway fringe districts.

Floodplain Management

The operation of a program of corrective and preventive measures for reducing flood damage, including, but not limited to, flood control projects, floodplain land use regulations, flood proofing of buildings, and emergency preparedness plans.

Flood Protection Grade (FPG)

The elevation of the regulatory or 100-year flood plus two feet.

Floodplain Regulations

General term applied to the full range of codes, ordinances and other regulations relating to the use of land and construction within floodplain limits. The term encompasses zoning ordinances, subdivision regulations, building and housing codes, encroachment laws and open area (space) regulations.

Flood Profile

A graph showing the relationship of water surface elevation to a specific location, the latter generally expressed as distance above the mouth of a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific magnitude of flooding, but may be prepared for conditions at any given time or stage.

Flood Protection Grade (FPG)

The elevation of the regulatory or 100-year flood plus two (2) feet at any given location in the Special Flood Hazard Area or 100-year floodplain.

Flood Resistant Construction (Floodproofing)

Additions, changes or adjustments to structures or property that are designed to reduce or eliminate the

potential for flood damage.

Flood Storage Areas

Depressions, basins, or other areas that normally stand empty or partially empty, but fill with rainfall runoff during storms to hold the runoff and reduce downstream flow rates. The volumes are often referred to in units of acre-feet.

Floodway

The channel of a river or stream and those portions of the floodplains adjoining the channel which are reasonably required to carry and discharge efficiently the peak flow of the regulatory flood of any river or stream.

Floodway Fringe

Those portions of the floodplain lying outside the regulatory floodway.

Footing Drain

A drain pipe installed around the exterior of a basement wall foundation to relieve water pressure caused by high groundwater elevation.

Freeboard

An increment of height added to the base flood elevation to provide a factor of safety for uncertainties in calculations, unknown local conditions, wave actions and unpredictable effects such as those caused by ice or debris jams. (See Flood Protection Grade).

French Drain

A drainage trench backfilled with a coarse, water-transmitting material; may contain a perforated pipe.

Gabion

An erosion control structure consisting of a wire cage filled with rocks.

Grade

The inclination or slope of a channel, canal, conduit, etc. or natural ground surface usually expressed in terms of the percentage the vertical rise (or fall) bears to the corresponding horizontal distance.

Groundwater Recharge

The infiltration of water into the earth. It may increase the total amount of water stored underground or only replenish supplies depleted through pumping or natural discharge.

High Water

Maximum designed, permitted, or regulated water level for an impoundment.

Hydraulics

A branch of science that deals with the practical application of the mechanics of water movement. A typical hydraulic study is undertaken to calculate water surface elevations.

Hydraulic Grade line (HGL)

For open channel flow, the HGL is equal to the water surface whereas for pressure flow it is the piezometric surface

Hydrodynamic Loads

Forces imposed on structures by floodwaters due to the impact of moving water on the upstream side of the structure, drag along it sides, and eddies or negative pressures on its downstream side.

Hydrograph

For a given point on a stream, drainage basin or a lake, a graph showing either the discharge, stage (depth), velocity or volume of water with respect to time.

Hydrology

The science of the behavior of water, its dynamics, composition and distribution in the atmosphere, on the surface of the earth, and underground. A typical hydrologic study is undertaken to compute flow rates associated with specified flood events.

Hydrometeorologic

Water-related meteorologic data such as rainfall or runoff.

Hydrostatic Loads

Those loads or pressures resulting from the static mass of water at any point of floodwater contact with a structure. They are equal in all directions and always act perpendicular to the surface on which they are applied. Hydrostatic loads can act vertically on structural members such as floors, decks and roofs, and can act laterally on upright structural members such as walls, piers and foundations.

Impact Areas

Areas defined or mapped by the Adams County Surveyor or the Decatur City Engineer which are unlikely to be easily drained because of one or more factors including but not limited to any of the following: soil type, topography, land where there is not adequate outlet, a floodway or floodplain, land within 75 feet of each bank of any regulated drain or within 75 feet from the center line or any regulated tile ditch.

Impervious Surface

Any hard-surfaced, man-made area that does not readily absorb or retain water, including but not limited to building roofs, parking and driveway areas, graveled areas, sidewalks and pave recreation areas, identified with a runoff coefficient of 0.8 or greater.

Infiltration

Passage or movement of water into the soil.

Infiltration Swales

A depressed earthen area that is designed to promote infiltration.

Inlet

An opening into a storm sewer system for the entrance of surface stormwater runoff, more completely described as a storm sewer inlet.

Junction Chamber

A converging section of conduit, usually large enough for a person to enter, used to facilitate the flow from one or more conduits into a main conduit.

Land Surveyor

A person licensed under the laws of the State of Indiana to practice land surveying.

Lateral Storm Sewer

A sewer that has inlets connected to it but has no other storm sewer connected.

Life Cycle Cost

Cost based on the total cost incurred over the system life including research, development, testing, production, construction, operation and maintenance. Costs are normally determined on present worth or equivalent annual cost basis.

Low Entry Elevation

The elevation in a structure where overbank flooding can enter the structure.

Lowest Floor

Refers to the lowest of the following:

- The top of the basement floor slab;
- The top of the garage floor, if the garage is the lowest level of the building;
- The top of the first floor of the buildings constructed on a slab or of buildings elevated on pilings or constructed on a crawl space with permanent openings; or
- The top of the floor level of any enclosure below an elevated building where the walls of the enclosure provide any resistance to the flow of flood waters unless;
    - The walls are designed to automatically equalize the hydrostatic flood forces on the walls by allowing for the entry and exit of flood waters.
    - Such enclosed space shall be usable only for the parking of vehicles or building access.

Major Drainage System

Drainage system carrying runoff from drainage area of one (1)or more square miles.

Manhole

Storm sewer structure through which a person may enter to gain access to an underground storm sewer or enclosed structure.

Manning Roughness Coefficient or Manning's "N" Value

A dimensionless coefficient ("n") used in the Manning's equation to account for channel wall frictional losses in steady uniform flow.

Minor Drainage System

Drainage system caring runoff from a drainage area less than one (1) square mile.

National Flood Insurance Program (NFIP)

The NFIP is a Federal program enabling property owners to purchase flood insurance. The Federal Emergency Management Agency administers the NFIP in communities throughout the United States. The NFIP is based on an agreement between local communities and the Federal government which states that if a community will implement floodplain management measures to reduce future flood risks to new construction and substantially improved structures in flood hazard areas, the Federal government will make flood insurance available within the community as a financial protection against flood losses that do occur.

National Pollution Discharge Elimination System (NPDES)

Permit system under the authority of the U.S. Environmental Protection Agency regarding point and non-point sources of water pollution.

Nonpoint Source Pollution

Pollution that enters a water body from diffused origins on the watershed or drainage basin and does not result from discernible, confined or defined conveyances or discharge points.

Off-site

Everything not located at or within a particular site.

Off-site Land Areas

Those areas which by virtue of existing topography must outlet through the developing property.

100-Year Frequency Flood

See "regulatory flood".

On-Site

Located within the controlled or urbanized area where runoff originates.

Open Channels

Open channels include not only those which are completely open overhead, but also closed conduits which are flowing partly full. Examples of such closed conduits are tunnels, storm sewers, sanitary sewers, and various types of pipelines. Flow in open channels involves a free surface.

Orifice

A device which controls the rate of flow from a detention basin.

Outfall

The point or location where storm runoff discharges from a sewer or drain. Also applies to the outfall sewer or channel which carries the storm runoff to the point of outfall.

Overland Flow

Consists of sheet flow, shallow concentrated flow and open channel flow.

Peak Flow

The maximum rate of flow of water at a given point in a channel or conduit resulting from a predetermined storm or flood.

Planimetric Data

Horizontal measurements involving distances or dimensions on a diagram, map, plat of Surveyor or topographic map. Normally in units of feet.

Plat of Survey

A scaled diagram showing boundaries of a tract of land or subdivision. This may constitute a legal description of the land and be used in lieu of a written description.

Probable Maximum Flood

The most severe flood that may be expected from a combination of the most critical meteorological and hydrological conditions that are reasonably possible in the drainage basin. It is used in designing high-risk flood protection works and siting of structures and facilities that shall be subject to almost no risk of flooding. The probable maximum flood is usually much larger than the 100-year flood.

Professional Engineer

A person licensed under the laws of the State of Indiana to practice professional engineering.

Radius of Curvature

Length of radius of a circle used to define a curve.

Rainfall Intensity

The cumulative depth of rainfall occurring over a given duration, normally expressed in inches per hour. In the Rational Formula, this represents the average rainfall intensity over a duration equal to the time of concentration for the catchment.

Reach

Any length of river, channel or storm sewer.

Recurrence Interval

A statistical expression of the average time between floods equaling or exceeding a given magnitude.

Re-development

See the definition for "Development".

Regulated Area

All areas within the incorporated area of the City of Decatur including any and all extra-territorial boundaries.

Regulated Drain

A drain subject to the provisions of the Indiana Drainage Code, I.C.36-927.

Regulatory or 100-Year Flood

The flood having a one percent (1%) probability of being equaled or exceeded in any given year, as calculated by a method and procedure which is acceptable to and approved by the Indiana Department of Natural Resources and the Federal Emergency Management Agency. If a permit from the Indiana Department of Natural Resources -Division of Water (IDNR-DOW) for construction in the floodway is required, then the regulatory flood peak discharge should be calculated by a method acceptable to the IDNR_DOW. The "regulatory flood" is also known as the "base flood".

Regulatory Floodway

See "Floodway"

Release Rate

The amount of stormwater released from a stormwater control facility per unit of time.

Reservoir

A natural or artificially created pond, lake or other space used for storage, regulation or control of water. May be either permanent or temporary. The term is also used in the hydrologic modeling of storage facilities.

Retention Facility

A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration or pumping. The volumes are often referred to in units of acre-feet.

Return Period

The average interval of time within which a given rainfall event will be equaled or exceeded once. A flood having a return period of 100 years has a one percent probability of being equaled or exceeded in any one year.

Right-of-Way for a County Drain

Land over which a regulated county drain passes and is controlled without restriction or interruption by the property owner.

Rip-Rap

Large rock that when installed along an erodible surface reduces the erosion potential.

Riverine

Relating to, formed by, or resembling a stream (including creeks and rivers).

Runoff

The waters derived from melting snow or rain falling within a tributary drainage basin that exceed the

infiltration capacity of the soils of that basin, flow over the surface of the ground or are collected in channels or conduits.

Runoff Coefficient

A decimal fraction relating the amount of rain which appears as runoff and reaches the storm sewer system to the total amount of rain falling. A coefficient of 0.5 implies that 50 percent of the rain falling on a given surface appears as stormwater runoff.

Sanitary Backup

The condition where a sanitary sewer reaches capacity and surcharges into the lowest area, normally a basement.

Scour

The clearing and digging action of flowing water.

Sediment

Material of soil and rock origin, transported, carried or deposited by water.

Sedimentation

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

Seepage

The passage of water or other fluid through a porous medium, such as the passage of water through an earth embankment or masonry wall.

Silt Screen Fence

A fence constructed of wood or steel supports and either natural (e.g. burlap) or synthetic fabric stretched across area of flow during site development to trap and retain on-site sediment due to rainfall runoff.

Siphon

A closed conduit or portion of which lies above the hydraulic grade line, resulting in a pressure less than atmospheric and requiring a vacuum within the conduit to start flow. A siphon utilizes atmospheric pressure to effect or increase the flow of water through a conduit. An inverted siphon is used to carry stormwater flow under an obstruction such as a sanitary sewer.

Special Flood Hazard Area (SFHA)

Those lands within the jurisdiction of a community which are subject to inundation by the regulatory or 100-year flood. Special Flood Hazard Areas are usually designated on a Flood Hazard Boundary Map as Zone A. After detailed evaluation of local flooding characteristics, the Flood Insurance Rate Map will refine this categorization into Zones A, AE, AH, AO and AI-30.

Spillway

A waterway in or about a hydraulic structure, for the escape of excess water.

Standard Project Flood

A term used by the U.S. Army Corps of Engineers to designate a flood that may be expected from the most severe combination of the meteorological and hydrological conditions that are considered reasonable characteristics of the geographical area in which the drainage basin is located, excluding extremely rare combinations. The peak flow for a standard project flood is generally 40 to 60 percent of the probable maximum flood for the same location.

Stilling Basin

A basin used to slow water down or dissipate its energy.

Storm Duration

The length of time that water may be stored in any stormwater control facility, computed from the time water first begins to be stored.

Storm Sewer

A closed conduit for conveying collected stormwater.

Stormwater Facility

All ditches, channels, conduits, levees, ponds, natural and manmade impoundments, wetland, tiles, swales, sewers and other natural or artificial means of draining surface and subsurface water from land.

Stormwater Runoff

The water derived from rains falling within a tributary basin, flowing over the surface of the ground or collected in channels or conduits.

Structure

Refers to 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 or a prefabricated building. The term also includes recreational vehicles to be installed on a site for more than 180 days.

Structural Engineer

A person licensed under the laws of the State of Indiana to engage in the designing or supervising of construction, enlargement or alteration of structures or any part thereof, for others, to be constructed by persons other than himself or herself.

Structural Floodplain Management Measures

Those physical or engineering measures employed to modify the way floods behave, e.g., darns, dikes, levees, channel enlargements and diversions.

Subarea/Subbasin

Portion of a watershed divided into homogenous drainage units which can be modeled for purposes of determining runoff rates. The subareas/sub-basins have distinct boundaries, as defined by the topography of the area.

Substantial Improvement

Any reconstruction, rehabilitation, addition or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure at the time of the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage" regardless of the actual repair work performed. The term does not include improvements of structures to correct existing violations of state or local health, sanitary or safety code requirements or any alteration of a "historic structure", provided that the alteration will not preclude the structures continued designation as a "historic structure".

Sump Failure

A failure of the sump pump that results in inundation of a crawl space or basement.

Sump Pump

A small pump that discharges seepage from foundation footing drains.

Surcharge

Backup of water in a sanitary or storm sewer system in excess of the design capacity of the system.

Tailwater

The water surface elevation at the downstream side of a hydraulic structure (ie. culvert, bridge, weir, dam, etc.)

Thalweg

The deepest point of a channel.

Time of Concentration

The travel time of a particle of water from the most hydraulically remote point in the contributing area to the point under study. This can be considered the sum of an overland flow time and times of travel in street gutters, storm sewers, drainage channels and all other drainage ways.

Topographic Map

Graphical portrayal of the topographic features of a land area, showing both the horizontal distances between the features and their elevations above a given datum.

Topography

The representation of a portion of the earth's surface showing natural and manmade features of a give locality such as rivers, streams, ditches, lakes, roads, buildings and most importantly, variations in ground elevations for the terrain of the area.

TP-40 Rainfall

Design storm rainfall depth data for various durations published by the National Weather Services in their Technical Paper 40 dated 1961.

Transition Section

Reaches of the stream or floodway where water flows from a narrow cross-section to a wide cross-section or vice-versa.

Tributary

Based on the size of the contributing drainage area, a smaller watercourse which flows into a larger watercourse.

Underdrain

A small diameter perforated pipe that allows the bottom of a detention basin to drain.

Unit Hydrograph

A unit hydrograph is the hydrograph that results from one inch of precipitation excess, generated uniformly, over the watershed at a uniform rate during a specified period of time.

Urbanization

The development, change or improvement of any parcel of land consisting of one or more lots for residential, commercial, industrial, institutional, recreational or public utility purposes.

Watercourse

Any river, stream, creek, brook, branch, natural or man-made drainage way in or into which stormwater runoff or floodwaters flow either regularly or intermittently.

Watershed

The land area drained by contributing water to a specific point that could be along a stream, lake or other stormwater facility. Watersheds are often broken down into subareas for the purpose of hydrologic

modeling.

Watershed Area

The total area from which surface runoff is carried away by a drainage system.

Weir

A device which is used to restrict the flow of water, thereby, limiting the discharge rates. A weir can also facilitate calculation or measurement of the discharge rates. These are often used to control the rate of flow out of stormwater storage facilities.

Wet Bottom Retention Facility

A facility designed to retain a permanent pool of water after having provided its planned detention of runoff during a storm event.

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 in saturated soil conditions.

Abbreviations

BFE	Base Flood Elevation
CFS	Cubic Feet Per Second
CLOMR	Conditional Letter of Map Revision (from FEMA)
CLOMR-F	Conditional Letter of Map Revision Based on Fill (from FEMA)
CN	Curve Number
COE	United States Army Corps of Engineers
ERM	Elevation Reference Mark
ETJ	Extraterritorial Jurisdiction
FBFM	Flood Boundary and Floodway Map
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Map
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FPG	Flood Protection Grade
FPS	Feet Per Second HGL Hydraulic Grade Line
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
LAG	Lowest Adjacent Grade
LOMA	Letter of Map Amendment (from FEMA)
LOMR	Letter of Map Revision (from FEMA)

LOMR-F	Letter of Map Revision Based on Fill (from FEMA)
NFIP	National Flood Insurance Program
NAVD	North American Vertical Datum of 1988
NPDES	National Pollution Discharge Elimination System
SFHA	Special Flood Hazard Area
Tc	Time of Concentration

5. Stormwater Control Policy

It is recognized that the watercourses serving Adams County and the City of Decatur do not have sufficient capacity to receive and convey stormwater runoff resulting from continued urbanization. Accordingly, the storage and controlled release rate of excess stormwater runoff shall be required for the following instances:

- Development of Agricultural zoned land within the extraterritorial boundary of the City of Decatur, if the proposed development, disturbed area, is one acre or more AND exceeds 15,000 square feet of total impervious surface.
- All new developments on sites of 0.5 acres or more AND exceeding 15,000 square feet of impervious surface.
- All subdivisions of land unless a waiver is granted, in writing, by the City Engineer.
- Any new highway, street, road, trail, railroad or similar public works project construction that adds impervious surface over and above the existing condition and, in the opinion of the City Engineer, adds to the storm water runoff, so as to require the application of this manual.

Exemption

- Site development or construction where stormwater collection and control is provided by an approved system where by the stormwater runoff has been previously accounted for by engineering, design and construction of the existing stormwater collection and detention system.

Individual construction or development phases, as part of a larger common plan of development or sale, shall be treated as a single overall project development.

The release rate of storm water from developments and redevelopments may not exceed 0.20 cfs per developed acre.

6. Information Requirements

The following information and data prepared by a licensed professional engineer or land surveyor, where exempt by state statute, engaged in storm drainage design shall accompany plans for each regulated development lying within the Regulated Area prior to Final Plat Approval by the City of Decatur Plan Commission as follows:

a. Topographic Survey (Existing Conditions):

A topographic map of the land to be subdivided / developed and such adjoining land whose topography may affect the layout or drainage of the development. On this map, the following information should be shown:

i. The location of regulated drains, farm drains, inlets and outfalls, if any of record.

ii. Storm, sanitary and combined sewers and outfalls, if any of record.

iii. Seeps, springs, flowing and other wells that are visible or of record.

iv. Establish existing site contours at one (1) foot intervals, with intermediate contours established every five (5) feet.

v. Establish spot elevations, within the survey limits, in a manner appropriate to the scale of the project area.

vi. Elevations on paved and/or other hard surfaces shall be to the nearest 0.01 ft., on other surfaces to the nearest 0.1 ft.

vii. Establish the location of visibly apparent structures, improvements, features, above and below ground man-made objects, paved areas, non-paved areas and natural features within the survey limits.

viii. Show parking areas, striping and type (handicapped, motorcycle, regular, etc.).

ix. Establish the finished floor elevations of any buildings within the survey limits, including elevations at each accessible entrance, opening and/or areaway.

x. State the current flood plain designation and/or notation for the survey limits, as the location plots by scale on the Federal Emergency Management Agency – National Flood Insurance Program – Flood Insurance Rate Map for the subject area.*

xi. Determine the elevation of water present in any river, lake, pond, stream, ditch and/or body of water within the survey limits.

xii. Locate existing trees four (4) inches and over in caliper and shrubs greater than 30" in diameter within the project area. In thickly and/or heavily wooded areas only the perimeter of the woods need be established.

xiii. Show the location of all visibly apparent water controls, valves and fire hydrants within the survey limits.

xiv. Show the location of all visibly apparent gas controls, valves and metering equipment within the survey limits.

xv. Show the location of all visibly apparent electric/utility poles, transformers and equipment within the survey limits.

xvi. Show the location of all visibly apparent evidence of buried tanks, septic systems, pump stations and/or lift stations including rim elevations, pipe types, pipe sizes, inverts of each pipe and elevation of floats.

xvii. Show the location of all visibly apparent sanitary sewer systems, including manholes with rim elevations, pipe types, pipe sizes and inverts of each pipe within the survey limits.

xviii. Show the location of all visibly apparent storm sewer systems, including manholes and catch basins with rim elevations, pipe types, pipe sizes and inverts of each pipe within the survey limits.

xix. Show the location of all other visibly apparent utilities within the survey limits.

xx. The base bench mark shall be established utilizing the North American Vertical Datum of 1988 (NAVD 1988). The datum, description and elevation of the base bench mark utilized shall be clearly stated and referenced on the drawing.

xxi. Survey shall be provided in North American Datum (NAD) 1983, Indiana East state plane.

*NOTE: the regulatory floodway may be measured from the current FEMA map. However, floodplain boundaries shall be determined based on the 100-year base flood elevation/profile and the topographic survey map prepared according to this section.

b. Preliminary Drainage Plans

A comprehensive plan, in preliminary form (or in combined preliminary and final form), designed to safely handle the stormwater runoff and detain the increased stormwater runoff. The plan shall provide or be accompanied by maps or other descriptive materials indicating the feasibility of the drainage plan and show the following:

i. The extent and area of each upstream, off-site watershed tributary to the subject site. Required materials for preliminary review include:

1. Exhibit showing each upstream, off-site drainage area tributary to the subject site on USGS quadrangle maps or topographic maps.

2. Preliminary plan to convey upstream, off-site runoff through the subject property shown on the preliminary drainage plan for the site.

ii. The capacity of the downstream, off-site receiving system (outlet). Information must be submitted to show that the downstream, off-site drainage system has the capacity to convey the expected runoff from the subject property and any upstream, off-site areas. The City Engineer may also determine the capacity of the downstream drainage system.

iii. The general drainage plan for the subject property must include the following items:

1. The extent and area of each watershed on the subject property in the existing condition. Calculations to determine the allowable release rate from the subject property should also be included.

2. The extent and area of each watershed affecting the design of detention facilities as shown on USGS Quadrangle Maps or other more detailed topographic maps.

3. Contour and elevation data in accordance with this manual “Information Requirements” Section 6.a.

4. The estimated location and percentage of impervious surfaces expected to be constructed when the development is completed.

5. Existing detention/retention facilities to be maintained, enlarged or otherwise altered and new ponds or basins to be built and the basis of their design.

6. The estimated depth mid amount of storage required by design of the new facilities.

7. The preliminary layout and design of street storm sewers, where proposed, and other storm drains to be built, the outfall and outlet locations and approximate elevations, the receiving stream or channel and its 100-year return period water elevation.

8. The preliminary layout of swales which collect runoff from on-site and/or off-site watersheds.

9. Proposed culverts and bridges to be built, their material, elevations, waterway openings and basis of their design.

10. Identification of overland flow routes to detention/retention facilities.

iv. Existing streams and floodplains to be maintained and new channels to be constructed, their locations, cross-sections and profiles.

v. Any interim drainage plan which is to be incorporated into the development pending completion of the development and the final drainage plan.

vi. A copy of the effective FEMA map, annotated to show the project location and property boundaries in relation to the regulatory floodplain and floodway.

vii. The location of any regulatory wetlands on the subject property.

viii. A report summarizing the hydraulic design parameters and detailing how this design satisfies this manual.

c. Valley Cross Sections

One or more typical cross-sections of all existing and proposed channels or other open drainage facilities carried into the overbank to a point above the 100-year flood elevation. These shall also show the elevation of the existing land and the proposed changes thereto, together with the high water elevations expected from the 100-year flood under the controlled conditions called for by this manual, and the relationship of structures, streets and other facilities. Cross-sections must be represented perpendicular to the expected flow path.

d. Site Engineering Plans

Site engineering plans shall be drawn to scale and show the dimensions and features of the proposed development. The minimum requirements for the site plan contents and format are as follows:

The set of plans shall contain:

i. Title Sheet with project name and location map. The title sheet shall also include the name, office address, telephone number and seal of the registered professional engineer or surveyor preparing the plans.

ii. Topographic survey map, see “Required Information” 6.a.

iii. Geometric plan showing all dimensions of existing property boundaries and necessary data to layout the proposed development.

iv. Grading and drainage plan which identifies all existing and proposed drainage characteristics such as swales, drainage break points, storm sewers and detention facilities.

Each plan sheet shall include:

i. A title block in the lower right hand corner or right hand border that inclues the project name, number, sheet title, sheet number, date or preparation and the latest revision date and description.

ii. North arrow

iii. Graphic scale bar with scale identified. Plans to be prepared at engineer scale (1”=XX’)

iv. A legend clearly identifying all symbols indicated on the plan sheet.

v. Plan sheets shall be ARCH-D in size, twenty-four inches (24”) by thirty-six inches (36”), unless previous arrangements have been made with the office of the City Engineer.

vi. Topographic benchmarks

vii. Delineation of all existing and proposed easements for underground and overhead utilities and drainage.

e. Final Drainage Plans

Upon approval of the preliminary drainage plans by the City Engineer, final drainage plans shall be submitted to the City Engineer. In addition to data provided on the preliminary drainage plans, the final plans shall provide or be accompanied by calculations, maps and other descriptive material including the following:

i. A set of plan drawings stamped by an Indiana Registered Professional Engineer or an Indiana Registered Land Surveyor showing all proposed detention areas, storm sewers, inlets, outfall structures, open ditches, culverts (including driveway crossings) and bridges. At the minimum, these plan drawings should show or accompany the following:
    a. The extent and area of each watershed area tributary to the drainage channels in the development.
    b. Elevations in North American Vertical Datum of 1988 (NAVD).
    c. Proposed contours and where they tie into existing contours at the property boundaries.
    d. The street storm sewers and other storm drains to be built, the basis of their design, outfall and outlet locations, invert elevations, receiving stream or channel and its 100-year flood conditions.
    e. The parts of the proposed street system where pavements are planned to be depressed sufficiently to convey or temporarily store overflow from storm sewers and over the curb runoff resulting from the heavier rainstorms and the outlets for such overflow.
    f. Existing streams and 100-year floodplains to be maintained, and new channels to be constructed, their locations, cross-sections and profiles.
    g. Proposed culverts and bridges to be built, their materials, elevations, waterway openings and basis of their design.
    h. Existing detention/retention facilities to be maintained, enlarged or otherwise altered and new facilities to be built and the basis of their design.
    i. The estimated location and percentage of impervious surfaces existing and expected to be constructed when the development is completed.
    j. The slope, type and size of all sewers and other waterways.

ii. A written report stamped by an Indiana Registered Professional Engineer or an Indiana Registered Land Surveyor shall be included with each preliminary and final drainage plan. The report will contain a summary description of the following:
    a. The significant drainage problems associated with the project.
    b. The analysis and procedure used to evaluate these problems and propose solutions.
    c. Any assumptions or special conditions associated with the use of these procedures, especially the hydrologic or hydraulic methods.
    d. The proposed design of the drainage control system.
    e. Inlet capacity calculations.
    f. Stormwater collection system capacity calculations.
    g. The results of the analysis of the proposed drainage control system showing that it does solve the project's drainage problems.
    h. As an appendix to the report, a hydraulic report detailing existing and proposed drainage patterns on the subject site. The report should include a description of the

present land use as well as proposed land use. Any offsite drainage entering the site should also be addressed. This report should be comprehensive and detail all the steps which the design engineer took during the design process. All hydrologic and hydraulic computations should be included in the submittal. These calculations should include, but not be limited to: development of runoff curve numbers or runoff coefficients; runoff calculations; stage-discharge relationships for detention/retention facility outfalls; times of concentration; and storage volume. A map showing any drainage subareas used in the analysis shall accompany the report.

i. Copies of all computer model runs used in the drainage analyses. These computer runs should include both the model inputs and the outputs. Electronic formats may be acceptable if compatible with Department software.

j. For all detention/retention facilities, a plot or tabulation of storage volumes with corresponding water surface elevations and a plot or tabulation of the facility outflow rates for those water surface elevations.

iii. In addition to the criteria and requirements set in this manual, the plans and calculations should also meet the following criteria:

a. If road side ditches are used rather than storm sewers, the bottom of the ditch should be low enough to install adequately sized driveway culverts without creating "speed bumps".

b. Driveway culvert inverts shall be designed to adequately consider upstream and downstream culvert elevations.

c. Minimum swale and yard slopes are 0.3% unless otherwise approved by the Plan Commission.

d. Maximum yard slopes are 3: I unless otherwise approved by the Plan Commission.

e. Top of foundation no less than 0.5 feet above finished grade.

f. Spot elevations shown at the drainage break points.

g. Pipes have adequate slope to maintain 2.5 feet per second (fps) velocity (cleaning velocity).

h. When changing pipe size from a smaller to a larger pipe, match the 8/10ths point of pipes.

i. Inlets are placed such that the tributary flows are in accordance with the grate capacity (i.e. depth of inundation above rim is tolerable in 10-year and 100-year storms).

f. Submittal and Consideration of Plans

Preliminary and final drainage plans and/or construction plans shall be submitted to the City Engineer's Office twenty-eight (28) days prior to the requested Plan Commission meeting. All preliminary plans, final plans and construction plans in compliance with the standards of this manual shall be approved by the City Engineer. The City Engineer shall stamp such approval on a copy of such plans and deliver the same to the applicant. The Plan Commission shall approve or disapprove any preliminary plans, final plans and construction plans within sixty (60) days of submission unless applicant consents to a continuance or extension. All approvals and disapprovals with written reasons shall be incorporated into the Plan Commission minutes.

The City Engineer is authorized to either review or appoint someone to review engineering summaries of projects and based upon the same, grant exemptions from any and all requirements of this manual and/or waive any requirements of this manual upon approval of the City Board of Public Works and Safety. Any applicant may appeal the decision of the City Engineer or Board of Public Works and Safety

which shall also be authorized to grant exemptions from any and all requirements of this manual and/or waive any requirements of this manual in its discretion.

7. Determination of Runoff Quantities

   Runoff quantities shall be computed for the area of the parcel under development plus the area of the watershed flowing into the parcel under development. The quantity of runoff which is generated as the result of a given rainfall intensity shall be computed by a method as approved by the City Engineer.

8. Amount of Runoff to be Accommodated by the Drainage Facility

   Various parts of the drainage system shall accommodate runoff water as follows:

   a. Minor Drainage System

      The minor drainage system such as inlets, catch basins, street gutters, swales, sewer and small channels which collect stormwater shall accommodate at a minimum the peak runoff from a 10-year frequency storm.

      These minimum requirements shall be satisfied:

      i. The allowable spread of water on collector streets is limited to maintaining two clear 10-foot moving lanes of traffic. One lane is to be maintained on local roads, while other access lanes (such as a subdivision cul-de-sac) can have a water spread equal to one-half of their total width.

      ii. Open channels carrying greater than 30 cubic feet per second shall be capable of accommodating peak runoff for a 24-hour, 50-year return frequency storm within the drainage easement.

      iii. Culverts shall be capable of accommodating peak runoff from a 24hour, 50-year return frequency storm when crossing under a road which is part of the INDOT rural functional classification system.

      iv. Rear and side lot swales shall not carry more than 4 cfs and only 2 cfs if a swale crosses a sidewalk.

   b. Major Drainage System

      Major drainage systems are defined in Section 4 and shall be designed in a method approved by the City Engineer.

9. Level of Projection

   a. The lowest floor elevations of all residential, commercial or industrial buildings shall be such that all floors, **including** basement, shall be at the flood protection grade and therefore have 2 feet of freeboard above the 100-year flood elevation, together with a freeboard of two feet, as applies to ponds and swales, whichever is greater. Pad elevations shall be a minimum of 15 inches above an adjacent road centerline elevation.

   b. The low entry elevation for residential buildings outside the 100-year floodplain shall be based upon the maximum flood of record or upon the 100-year flood, whichever is greater, together with a freeboard of two feet, as applies to ponds and swales. Pad elevations shall be a minimum of 15 inches above an adjacent road elevation.

10. Storm Sewer Design Standards

    All storm sewers, whether private or public, and whether constructed on private or public property shall conform to the design standards and other requirements contained herein.

a. Minimum Size for Storm Sewers

The minimum diameter of all storm sewers shall be 12 inches. Subdrains and single downspout leaders are exempt from this requirement.

b. Pipe Cover and Grade

Sewer grade shall be such that, in general, a minimum of one and one-half (1.5) feet of cover is maintained over the top of the pipe. If the pipe is to be placed under pavement, then the minimum pipe cover shall be two (2.0) feet. Pipe cover less than the minimum may be used only upon approval of the City Engineer. All pipe crossings involving a County Highway, street or road shall require the approval of the County Engineer. Uniform slopes shall be maintained between inlets, manholes and inlets to manholes. Final grade shall be set with full consideration of the capacity required, sedimentation problems and other design parameters. Minimum and maximum allowable slopes shall be those capable of producing velocities of between 2.5 and 15 feet per second, respectively, when the sewer is flowing full.

c. Alignment

Storm sewers shall be straight between manholes.

d. Manholes

Manholes shall be installed to provide access to continuous underground storm sewers for the purpose of inspection and maintenance. Manholes shall be provided at the following locations:

i. Where two or more storm sewers converge
ii. Where pipe size changes
iii. Where a change in horizontal alignment occurs
iv. Where a change in grade occurs
v. At intervals in straight sections of sewer, not to exceed the maximum allowed:

Size of Pipe (Inches)	Maximum Distance (Feet)
12 through 42	400
48 and Larger	600

e. Inlets

Inlets or drainage structures shall be utilized to collect surface water through grated openings and convey it to storm sewers, channels or culverts. The inlet grate opening provided shall be adequate to pass the culverts. The inlet grate opening provided shall be adequate to pass the design 10-yearflow with 50% of the sag inlet areas clogged. An overload channel from sag inlets to the overflow channel or basin shall be provided at sag inlets, so that the maximum depth of water that might be ponded in the street sag shall not exceed 7 inches. Inlet design and spacing may be done using the hydraulic equations provided by manufacturer or orifice/weir equations. Gutter spread on continuous grades may be determined using equations or methods approved by the City Engineer.

f. Materials

i. This subsection is required on all public works projects, work within the public right-of-way or utilities to be dedicated over to the municipality in a public utility easement.
ii. DUCTILE-IRON, CULVERT PIPE AND FITTINGS
    1. Pipe: ASTM A 716, for push-on joints.

2. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
3. Compact Fittings: AWWA C153, for push-on joints.
4. Gaskets: AWWA C111, rubber.

iii. DUCTILE-IRON, PRESSURE PIPE AND FITTINGS
1. Push-on-Joint Piping:
   a. Pipe: AWWA C151, for push-on joints.
   b. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
   c. Compact Fittings: AWWA C153, for push-on joints.
   d. Gaskets: AWWA C111, rubber, of shape matching pipe and fittings.

iv. STEEL PIPE AND FITTINGS
1. Corrugated-Steel Pipe and Fittings: ASTM A 760/A 760M, Type I with fittings of similar form and construction as pipe.
   a. Special-Joint Bands: Corrugated steel with O-ring seals.
   b. Standard-Joint Bands: Corrugated steel.
   c. Coating: Aluminum or Zinc.

v. ABS PIPE AND FITTINGS
1. ABS Sewer Pipe and Fittings: ASTM D 2751, with bell-and-spigot ends for gasketed joints.
   a. NPS 3 to NPS 6: SDR 35.
   b. NPS 8 to NPS 12: SDR 42.
   c. Gaskets: ASTM F 477, elastomeric seals.

vi. PE PIPE AND FITTINGS
1. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
   a. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
2. Corrugated PE Pipe and Fittings NPS 12 to NPS 60 : AASHTO M 294M, Type S, with smooth waterway for coupling joints.
   a. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

vii. PVC PIPE AND FITTINGS
1. PVC Profile Sewer Piping:
   a. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
   b. Fittings: ASTM D 3034, PVC with bell ends.
   c. Gaskets: ASTM F 477, elastomeric seals.
2. PVC Type PSM Sewer Piping:
   a. Pipe: ASTM D 3034, minimum SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
   b. Fittings: ASTM D 3034, PVC with bell ends.
   c. Gaskets: ASTM F 477, elastomeric seals.
3. PVC Pressure Piping:
   a. Pipe: AWWA C900, minimum Class 150 PVC pipe with bell-and-spigot ends for gasketed joints.
   b. Fittings: AWWA C900, minimum Class 150 PVC pipe with bell ends
   c. Gaskets: ASTM F 477, elastomeric seals.

viii. CONCRETE PIPE AND FITTINGS
1. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.
   a. Bell-and-spigot ends and sealant joints with ASTM C 990, bitumen or butyl-rubber sealant
   b. Class II, Wall B.

ix. ENCASEMENT FOR PIPING
1. Standard: ASTM A 674 or AWWA C105.
2. Material: Linear low-density polyethylene film of 0.008-inch (0.20-mm) or high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm) minimum thickness.
3. Form: Sheet or tube.
4. Color: Black or natural.

x. MANHOLES
1. Standard Precast Concrete Manholes:
   a. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   b. Diameter: 48 inches minimum, unless otherwise indicated.
   c. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
   d. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   e. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
   f. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
   g. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
   h. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
   i. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP], wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
   j. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.
2. Designed Precast Concrete Manholes:
   a. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
   b. All other standards to meet those of Standard Precast Concrete Manholes.
3. Manhole Frames and Covers:
   a. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange and 26-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER - DUMP NO WASTE DRAINS TO WATERWAY".
   b. Material: ASTM A 536, Grade 60-40-18 ductile or ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

xi. CONCRETE
1. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:
   a. Cement: ASTM C 150, Type II.
   b. Fine Aggregate: ASTM C 33, sand.
   c. Coarse Aggregate: ASTM C 33, crushed gravel.
   d. Water: Potable.
2. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
   a. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
   b. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

3. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
    a. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
        i. Invert Slope: 1 percent through manhole.
    b. Benches: Concrete, sloped to drain into channel.
        i. Slope: 4 percent.
4. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
    a. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
    b. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

xii. STORMWATER INLETS OR CATCH BASINS
1. Standard Precast Concrete Inlets or Catch Basins:
    a. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
    b. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
    c. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
    d. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
    e. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
    f. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch diameter frame and grate.
    g. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
    h. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
2. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.
    a. All other standards to meet those of Standard Precast Concrete Manholes.
3. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
    a. Size: 24 by 24 inches minimum unless otherwise indicated.
    b. Grate Free Area: Approximately 50 percent unless otherwise indicated.
    c. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER - DUMP NO WASTE DRAINS TO WATERWAY".
4. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7 to 9-inch riser with 4-inch minimum width flange and 26-inch diameter flat grate with small square or short-slotted drainage openings.
    a. Grate Free Area: Approximately 50 percent unless otherwise indicated.
    b. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER - DUMP NO WASTE DRAINS TO WATERWAY".

g. Workmanship

i. This subsection is required on all public works projects, work within the public right-of-way or utilities to be dedicated over to the municipality in a public utility easement.

ii. PIPING INSTALLATION
   1. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements and other installation requirements.
   2. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is required.
   3. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
   4. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process or microtunneling.
   5. Install gravity-flow, non-pressure drainage piping according to the following:
      a. Install piping pitched down in direction of flow.
      b. Install piping with 36-inch minimum cover.
      c. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
      d. Install corrugated steel piping according to ASTM A 798/A 798M.
      e. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
      f. Install PE corrugated sewer piping according to ASTM D 2321.
      g. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
      h. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
      i. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
   6. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
      a. Ductile-iron pipe and fittings.
      b. Expansion joints and deflection fittings.

iii. PIPE JOINT CONSTRUCTION
   1. Join gravity-flow, nonpressure drainage piping according to the following:
      a. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
      b. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
      c. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
      d. Join corrugated aluminum sewer piping according to ASTM B 788/B 788M.
      e. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
      f. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
      g. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
      h. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
      i. Join dissimilar pipe materials with non-pressure-type flexible couplings.

iv. MANHOLE INSTALLATION
   1. General: Install manholes, complete with appurtenances and accessories.
   2. Install precast concrete manhole sections with sealants according to ASTM C 891.
   3. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
   4. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

v. CATCH BASIN INSTALLATION
   1. Set frames and grates flush to 1/4 inch below surrounding pavement surface elevation.

vi. CONCRETE PLACEMENT
   1. Place cast-in-place concrete according to ACI 318.

vii. CLOSING ABANDONED STORM DRAINAGE SYSTEMS
   1. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
      a. Close open ends of piping with at least 12-inch thick, brick masonry bulkheads.
      b. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
   2. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
      a. Remove manhole or structure and close open ends of remaining piping.
      b. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
      c. Backfill to grade according to City standards.

viii. IDENTIFICATION
   1. This subsection is required on all public works projects, work within the public right-of-way or utilities to be dedicated over to the municipality in a public utility easement.
   2. Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
      a. Use **warning tape** over ferrous piping.
      b. Use detectable warning tape over nonferrous piping and over edges of underground structures.

ix. FIELD QUALITY CONTROL
   1. This subsection is required on all public works projects, work within the public right-of-way or utilities to be dedicated over to the municipality in a public utility easement.
   2. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
      a. Defects requiring correction include the following:
         i. Alignment: Less than full diameter of inside of pipe is visible between structures.
         ii. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
         iii. Damage: Crushed, broken, cracked, or otherwise damaged piping.
         iv. Infiltration: Water leakage into piping.
         v. Exfiltration: Water leakage from or around piping.
      b. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
      c. Re-inspect and repeat procedure until results are satisfactory.
   3. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
      a. Do not enclose, cover, or put into service before inspection and approval.
      b. Test completed piping systems according to requirements of authorities having jurisdiction.
      c. Schedule tests and inspections by authorities having jurisdiction with at least 48 hours' advance notice.
      d. Submit separate report for each test.

e. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   i. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
   ii. Option: Test plastic piping according to ASTM F 1417.
   iii. Option: Test concrete piping according to ASTM C 924.
4. Leaks and loss in test pressure constitute defects that must be repaired.
5. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

x. CLEANING
1. Clean interior of piping of dirt and superfluous materials.
2. Flushing of sewers without capture of sediments entering downstream sewers is prohibited.

11. Open Channel Design Standards

All open channels, whether private or public, and whether constructed on private or public land, shall conform to the design standards of the City of Decatur

a. Channel Cross-Section and Grade

The required channel cross-section and grade are determined by the design capacity, the material in which the channel is to be constructed, and the requirements for maintenance. A minimum depth may be required to provide adequate outlets for subsurface drains, tributary ditches or streams. The channel grade shall be such that the velocity in the channel is high enough to prevent siltation but low enough to prevent erosion. Velocities less than 1.5 feet per second should be avoided since siltation will take place and ultimately reduce the channel cross-section. The maximum permissible velocities in vegetal-lined channels are shown in Table 1. Developments through which the channel is to be constructed shall be considered in the design of the channel section.

b. Side Slopes

Earthen channel side slopes shall be no steeper than 2 horizontal to 1 vertical (2: 1). Flatter slopes may be required to prevent erosion and for ease of maintenance. Where channels will be lined, side slopes shall be no steeper than 1-1/2 horizontal to 1 vertical (1.5: 1) with adequate provisions made for weep holes. Side slopes steeper than 1-1/2 horizontal to 1 vertical (1.5:1) may be used for lined channels provided that the side lining is designed and constructed as a structural retaining wall with provisions for live and dead load surcharge.

Table 1

Maximum Permissible Velocities in Grass Lined Channels (1/)

Cover	Side Slope Range (3/) (Percent)	Permissible Velocity(2/) Erosion Resistant Soils (ft/sec) (6/)	Permissible Velocity(2/) Erosive Soils (ft/sec) (4/)
Bermuda Grass	0-5 5-10 Over 10	8 7 6	6 5 4
Bahia / Buffalo Grass / Kentucky Bluegrass / Smooth Brome/ Blue Grama	0-5 5-10 Over 10	7 6 5	5 4 3
Grass Mixture Reed Canary Grass	0-5 (3/) 5-10	5 4	4 3
Lespedeza Sericea / Weeping Lovegrass / Yellow Bluestem / Redtop / Alfalfa / Red Fescue	0-5 (4/) 5-10	3.4	2.5
Common Lespedeza (5/) / Sundangrass (5/)	0-5 (6/)	3.5	2.5

1/ From Soil Conservation service, SCS-TP-61, "Handbook of Channel Design for Soil and Water Conservation.

2/ Use velocities exceeding 5 feet per second only where good channel ground covers and proper maintenance can be obtained.

3/ Do not use on slopes steeper than 10 percent except for vegetated side slopes in combination with a stone, concrete, manufactured E.C. system or highly resistant vegetative center section.

4/ Do not use on slopes steeper than 5 percent except for vegetated side slopes in combination with a stone, concrete, manufactured E.C. system or highly resistant vegetative center section.

5/ Annuals – use on mild slopes or as temporary protection until permanent covers are established.

6/ Use on slopes steeper than 5 percent is not recommended.

c. Channel Stability

Characteristics of a stable channel are:

i. It neither promotes sedimentation or degrades the channel bottom and sides beyond tolerable limits.

ii. The channel banks do not erode to the extent that the channel cross-section is changed appreciably.

iii. Excessing sediment bars do not develop.

iv. Excessive erosion does not occur around culverts, bridges, outfalls or elsewhere.

v. Gullies do not form or enlarge due to the entry of uncontrolled flow to the channel

Channel stability shall be determined for an aged condition and the velocity shall be based on the design flow or the bank full flow, whichever is greater. In no case is it necessary to check channel stability for discharges greater than that from a 100-year frequency storm.

d. Drainage of Waterways

Vegetated waterways that are subject to low flows of long duration or where wet conditions prevail shall be drained with a tile system or by other means such as paved gutters. Tile lines may be outletted through a drop structure at the ends of the waterway or through a standard tile outlet.

e. Appurtenant Structures

The design of channels will include provisions for maintenance and the proper functioning of all channels, laterals, travelways and structures associated with the project. Recessed inlets and structures needed for entry of surface and subsurface flow into channels without significant erosion or degradation shall be included in the design of channel improvements. The design will also provide for necessary flood gates, water level control devices and any other appurtenance structure affecting the functioning of the channels and the attainment of the purpose for which they are built.

The effects of channel improvements on existing culverts, bridges, buried cables, pipelines and inlet structures for surface and subsurface drainage on the channel being improved and laterals thereto shall be evaluated to determine the need for modification or replacement. Culverts and bridges which are modified or added as part of channel improvement projects shall meet reasonable standards for the type of structure and shall have a minimum capacity equal to the design discharge or governmental agency design requirements, whichever is greater.

f. Disposition of Spoil

Spoil material resulting from clearing, grubbing and channel excavation shall be disposed of in such a manner which will:

i. Minimize overbank wash.

ii. Provide for the free flow of water between the channel and floodplain boundary unless the valley routing and water surface profiles are based on continuous dikes being installed.

iii. Not hinder the development of travelways for maintenance.

iv. Leave the right-of-way in the best condition feasible, consistent with the project purposes, for productive use by the owner.

v. Improve the aesthetic appearance of the site to the extent feasible.

vi. Be approved by the IDNR, IDEM or US Army Corps of Engineers (whichever is applicable).

g. Workmanship and Materials

i. Workmanship

Specifications shall be in keeping with the proceeding standards and shall describe the requirements for proper installation of the project to achieve its intended purpose.

ii. Materials

1. Grass
2. Riprap (naturally laid or grouted in place)
3. Concrete (precast or poured in place)
4. Gabions
5. Manufactured Synthetic or Natural Erosion Control Matting

Other lining materials shall receive specific approval by the City Engineer.

12. Stormwater Detention & Retention

The following shall govern the design of any improvement with respect to the detention and retention of stormwater runoff

a. Acceptable Detention Methods

The increased stormwater runoff resulting from a proposed development should be detained on-site by the provisions of appropriate wet bottom retention or dry bottom detention facilities, storage on flat roofs, parking lots, streets, lawns or other acceptable techniques. Measures which retard the rate of overland flow and the velocity in runoff channels shall also be used to partially control runoff rates. Detention/retention facilities shall be sized to store excess flows from storms with a 100-year return period. Control devices shall limit the discharge to a rate no greater than that prescribed by this manual.

b. Design Storm

Design of stormwater detention/retention facilities shall be based on a storm with a 1% chance of occurrence every year, also known as a 100-year storm. The storage volume and outflow rate shall be sufficient to handle stormwater runoff from a 24-hour duration storm.

c. Allowable Release Rate

Only methods approved by the City Engineer shall be used to determine the release rate for development sites controlled by this manual.

i. Small Site release rate calculation

For site developments on properties 10 acres and less the allowable release rate shall be no greater than 0.2 cfs per developed acre.

ii. Large Site release rate calculation

For site developments on properties greater than 10 acres the allowable release rate shall be determined by the 5-year return period pre-developed release rate.

In the event the natural downstream channel or storm sewer system is inadequate to accommodate the release rate provided above, then the allowable release rate shall be reduced to that rate permitted by the capacity of the receiving downstream channel or storm sewer system and additional detention as determined by the Board of Public Works and Safety and City Engineer.

If more than one detention/retention facility is involved in the development of the area upstream of the limiting restriction, the allowable release rate off of the site from any one detention basin shall be in direct proportion to the ratio of its drainage area to the drainage area of the entire watershed upstream of the restriction.

d. Drainage System Overflow Design

Drainage systems, including all ditches, channels, conduits, swales, etc., shall have adequate capacity to convey the stormwater runoff from all upstream tributary areas (off-site land areas), through the development under consideration for a 100-year return period design storm, calculated on the basis of the upstream land in its present state of development. Swales between privately owned residential lots shall not be used to convey the above referenced stormwater runoff unless the discharge paths are confined within the drainage easements and/or common areas. An allowance, equivalent to the reduction in flow rate provided, may be made for upstream detention, when such upstream detention and release rate have previously been approved by the City and design documents and evidence of its construction and maintenance can be shown.

e. Acceptable Outlet

Design and construction of the stormwater facility shall provide for the discharge of the stormwater runoff from off-site land areas as well as the stormwater from the area being developed (on-site land areas) to an acceptable outlet(s) having capacity to receive upstream (off-site) and on-site drainage.

The acceptable outlet for stormwater discharge shall be a municipal storm sewer, regulated open (ditch) drain or a "Blue Line" open drain as shown on the U.S.G.S. Quadrangle Maps. "Blue Line" open drains shall have adequate available capacity to handle design runoff. Roadside ditches may be acceptable provided permission is granted from Right-of-Way owner, roadside ditch is in a maintained condition, and the outlet for the roadside ditch is a regulated open drain or "Blue Line" open drain.

In case of extreme hardship, the City Engineer with the approval of the Board of Public and Safety has final authority over the acceptable outlet, where not governed by others.

Where the outfall from the stormwater drainage system of any developer flows through real estate owned by others prior to reaching a municipal sewer, regulated drain or natural waterway, no approval shall be granted for such stormwater drainage system until all impacted owners consent in writing to such use of their real estate or are notified of such use in writing of a hearing by the Board of Public Works and Safety to review such use. The notification shall include the time and place of a hearing and be delivered either personally or by certified mail, at least five (5) days prior to the hearing thereon and proof of such notice to each landowner shall be filed with the Board of Public Works and Safety prior to such hearing, which proof shall be by affidavit.

f. Determination of Storage Volume

The required volume of stormwater storage for development sites shall be submitted to and approved by the City Engineer in accordance with these standards.

i. Small Site Detention Volume Calculation (less than 2 acres)

For site improvements and redevelopments of less than 2 acres, the developer may opt to provide stormwater detention volumes at a rate of **0.25 cubic feet per square foot of new impervious surface.** This method is available to developers who wish to waive the requirements of design calculations of the storage volume. All other requirements are still in effect.

g. General Detention Basin Design Requirements

Basins shall be constructed to temporarily detain the stormwater runoff which exceeds the maximum peak release rate authorized by this manual. The volume of storage provided in these basins, together with such storage as may be authorized in other on-site facilities, shall be sufficient to control excess runoff from the 100-year storm.

The following design principles shall be observed:

i. The maximum volume of water stored and subsequently released at the design release rate shall not result in storage duration in excess of 48 hours from the start of the storm, unless additional storms occur within the period.

ii. All stormwater detention facilities shall be separated by not less than 25 feet from any building or structure to be occupied.

iii. All excavated excess spoil to be spread onsite shall be spread so as to provide for aesthetic and recreational features such as sledding hills, sports fields, decorative mounds, etc. Slopes no steeper

than 3 horizontal to 1 vertical (3:1) for safety, erosion control, stability and ease of maintenance shall be permitted.

iv. Safety screens having a maximum opening of four (4) inches shall be provided for any pipe or opening to prevent children or large animals from crawling into the structures.

v. Outlet control structures shall be designed to operate as simply as possible and shall require little or no maintenance and/or attention for proper operation. They shall limit discharges into existing or planned downstream channels or conduits so as not to exceed the predetermined maximum authorized peak flow rate.

vi. Emergency overflow facilities such as a weir or spillway shall be provided for the release of at least the 100-year storm runoff or, if applicable, the minimum required under the IDNR dam safety criteria. The overflow facility shall be of such design that its operation is automatic and does not require manual attention.

vii. Grass or other suitable vegetative cover shall be provided throughout the entire detention storage basin area. Grass should be cut regularly at approximately monthly intervals during the growing season or as required to maintain facility.

viii. Debris and trash removal and other necessary maintenance shall be performed on a regular basis to assure continued operation in conformance to design.

ix. Hydraulic calculations shall be submitted to substantiate all design features.

x. No detention facility or other water storage area, permanent or temporary, shall be constructed under or within then (10) feet of any pole or high voltage electric line. Likewise, poles or high voltage electric lines shall not be placed within ten (10) feet of any detention facility or other water storage area.

xi. No residential lots or any part thereof shall be used for any part of a detention basin or for the storage of water, either temporary or permanent.

h. Dry Bottom Facility Design Requirements

Detention facilities which will not contain a permanent pool of water shall comply with the following requirements:

i. Provisions shall be incorporated into facilities for complete interior drainage of dry bottom facilities, including the provisions of natural grades to outlet structures, longitudinal and transverse grades to perimeter drainage facility, paved gutters or the installation of subsurface drains.

ii. The detention facility may, whenever possible, be designed to serve as a secondary or multipurpose function. Recreational facilities, aesthetic qualities (open spaces) or other types of use shall be considered in planning the detention facility.

iii. In excavated detention facilities, a minimum side slope of 3:1 shall be provided for stability. In the case of valley storage, natural slopes may be considered to be stable.

i. Wet Bottom Facility Design Requirements

Where part of a detention facility will contain a permanent pool of water, all the items required for detention storage shall apply, except that the system of drains with a positive gravity outlet required to maintain a dry bottom facility will not be required. A controlled positive outlet will be required to

maintain the design water level in the wet bottom facility and provide required detention storage above the design water level. However, the following additional conditions shall apply:

i. Facilities designed with permanent pools or containing permanent lakes shall, if fish are to be used to keep the pond clean, be a minimum depth of approximately eight (8) feet over at least 25 percent of the pond area.

ii. In excavated ponds, the underwater side slopes in the lake shall be stable. In the case of valley storage, natural slopes may be considered to be stable.

iii. A safety ledge four (4) to six (6) feet in width at a slope of 10:1 is required and shall be installed in all ponds.

iv. Periodic maintenance is required in lakes to control weed and larval growth. The facility shall also be designed to provide for the easy removal of sediment which will accumulate during periods of reservoir operation.

v. For emergency use, facility cleaning or shoreline maintenance, additional facilities may have to be provided or plans prepared for auxiliary equipment to permit emptying and drainage.

j. Parking Lot Storage

Paved parking lots may, at the discretion of the Developer, be designed to provide temporary detention storage of stormwater on all or a portion of their surfaces. Outlets will be designed so as to empty the stored waters slowly. Depths of storage shall be limited to a maximum depth of six (6) inches so as to limit potential damage to parked vehicles and so that access to parked vehicles is not impaired. Ponding should, in general, be confined to those positions of the parking lots farthest from the area served and only on private property. Emergency service access routes shall not be impaired.

k. Facility Financial Responsibilities

The construction cost of stormwater control systems and required facilities, which are identified in the Stormwater Ordinance of the City of Decatur, shall be accepted as part of the cost of land development. Developer assumes responsibility for all associated costs.

l. Facility Maintenance Responsibilities

Maintenance of detention/retention facilities, during construction and thereafter, shall be the responsibility of the land developer/owner. Assignment of responsibility for maintaining facilities serving more than one lot or holding shall be documented by appropriate covenants to property deeds, unless responsibility is formally accepted by a public body, and shall be determined before the final drainage plans are approved

m. Inspections

All public and privately owned detention storage facilities may be inspected during construction and periodically thereafter by representatives of the City of Decatur.

n. Corrective Measures

If deficiencies are found by the inspector prior to final approval of the drainage facility, the owner of the detention/retention facility will be required to take the necessary measurements to correct such deficiencies. If the Owner fails to correct the deficiencies prior to completion, release of permits and certificate of occupancy will be withheld. In the event that corrective measures are needed for ponds as a result of periodic post construction inspection and the Owner fails to correct the violation, the Decatur

Board of Public Works and Safety reserves the right to undertake the work and collect the cost of maintenance or repair from the owner using lien rights, if necessary.

o. Joint Development of Control Structures

Stormwater control systems may be planned and constructed jointly by two or more developers as long as compliance with this manual and Zoning Ordinance is maintained and a clear system of ownership and maintenance is outlined.

p. Detention Facilities in Floodplains

If detention storage is provided within a 100-year floodplain, only the net increase in storage volume above that which naturally existed on the floodplain, shall be credited to the development. No credit will be granted for volumes below the elevation of the regulatory flood at the location unless compensatory storage is also provided.

13. Certifications Required

After completion of the project and before final approval and acceptance can be made a professionally prepared and certified "As-Built" set of plans shall be submitted to the City Engineer for review. These plans shall include all pertinent data relevant to the completed storm drainage system and shall include as a minimum:

- Pipe size & material
- Invert elevations*
- Rim and gutter elevations*
- Length of pipes
- Manhole, inlet or catch basin structure with their location, depth and size
- Overflow structures location and elevation
- Relevant swale or overland flow path flow line location and elevations
- Outfall structures and pipe end sections location and invert elevation
- As-built detention basin storage volume calculations and field data
- Certified statement on plans stating that construction substantially complies with construction plans submitted and approved by the City.
  *As-Built information must be submitted on the same coordinate system and elevation datum as the approved project submittal.

All such submitted plans shall be reviewed for compliance within 30 days after submission to the City Engineer. Plans must be accepted prior to the release of any leans, bonds, warranties, or occupancy permitting. Partial or phased development and As-built drawings are

14. Changes in Plan

Any significant change or deviation in the detailed plans and specifications after granting formal approval shall be filed in duplicate with and approved by the City Engineer prior to construction or installation of the proposed project deviation. Copies of the changes, if approved, shall be attached to the original plans and specifications.

15. Other Requirements

a. Easements

Easements intended for periodic or occasional use as conductors for the flow of surface water runoff shall be maintained in an unobstructed condition by the owners of the properties they cross. When specified, as by restrictive covenant, the Utility shall have the right to determine if any obstruction exists and to

repair and maintain or require such repair and maintenance by the property owner, as shall be reasonably necessary to keep the conductors unobstructed.

In the event that the developer wishes to dedicate stormwater conveyances to the Utility, easements shall be described, platted, and recorded in accordance with this manual and the City of Decatur Ordinance(s). Minimum easement width shall be 20 feet and accessible by public right of way or other easement.

b. Sump Pumps

Sump pumps installed to receive and discharge groundwaters or other storm waters shall be connected to the storm sewer where possible or discharged into a designated storm drainage channel. Sump pumps installed to receive and discharge floor drain flow or other sanitary sewage shall be connected to the sanitary sewers. A sump pump shall be used for one function only, either the discharge of storm waters or the discharge of sanitary sewage.

c. Downspouts

All down spouts or roof drains shall discharge onto the ground or be connected to the storm sewer. No down spouts or roof drains shall be connected to the sanitary sewers.

d. Footing Drains

Footing drains shall be connected to storm sewers where possible or designated storm drainage channels. No footing drains or drainage tile shall be connected to the sanitary sewer.

e. Basement Floor Drains

Basement floor drains shall be connected to the sanitary sewers.

16. Disclaimer of Liability

The degree of protection required by this manual is considered reasonable for regulatory purposes and is based on historical records, engineering and scientific methods of study. Larger storms may occur or stormwater runoff depths may be increased by man-made or natural causes. This manual does not imply that land uses permitted will be free from stormwater damage. This manual shall not create liability on the part of the City of Decatur or any officer or employee thereof for any damage which may result from reliance on this manual or on any administrative decision lawfully made thereunder.

17. Corrective Action

Nothing herein contained shall prevent the City of Decatur by and through the Stormwater Department, City Engineer, Mayor, City Council, Board of Public Works and Safety, Plan Commission, Plan Commission Director or other County official or officials from taking such other lawful action as may be necessary to prevent or remedy any violation. All costs connected therewith shall accrue to the person or persons responsible.

18. Repealer

All ordinances or parts, thereof, in conflict with the provisions of this ordinance are repealed.

19. When Effective

This manual shall become effective after its final passage, approval and publication as required by law.

20. Exempt Projects

All residential, commercial or industrial subdivision (major or minor) or construction project thereon, which has had its drainage plan approved by the Plan Commission and Stormwater Department prior to the effective date of this manual, shall be exempt from all of the requirements of this manual. All state or federal requirements supersede those included in this manual.

21. No Private Rights Conferred

    Notwithstanding any provision as contained herein, this manual shall not be construed to confer any private enforceable rights upon any private person, firm or corporation for enforcement of this manual, for damages, for injunctive relief or for any cause of action whatsoever resulting of non-compliance herewith. All rights to enforcement of this manual shall be exclusively delegated to the City of Decatur and the Decatur Board of Public Works and Safety acting in its public capacity.

22. Severability

    The invalidity of any section, sentence, clause, paragraph, port of provision of this manual shall not affect the validity of any other section, sentence, clause, paragraph, part of provision of this manual which can be given meaning without such invalid part or parts.

23. Amendments and Revisions

    The Board of Public Works and Safety of the City of Decatur, Indiana reserves the right, by appropriate action, to amend, modify, delete, change or otherwise revise this manual as it may deem, from time to time, to be desirable and/or necessary.