BASIC CRITERIA FOR DESIGN
ST. JOSEPH COUNTY, INDIANA

RECOMMENDED FOR APPROVAL:  Rollin E. Farrand, P.E.  Feb 27, 1995
ROLLIN E. FARRAND, P. E.  DATE
COUNTY ENGINEER

APPROVED:  BOARD OF COUNTY COMMISSIONERS

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3-6-95  DATE
# ST. JOSEPH COUNTY STORM DRAINAGE AND SEDIMENT CONTROL ORDINANCE

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**REVISIONS 10/31/95 & 12/15/97**
ST. JOSEPH COUNTY, INDIANA
ENGINEERING DEPARTMENT

BASIC DESIGN CRITERIA FOR ESTABLISHING STORM
DRAINAGE AND SEDIMENT CONTROL

A. PURPOSE:
St. Joseph County has experienced a rapid growth in subdivision construction over the last several years. The majority of these subdivisions have been built in the unincorporated areas beyond the standard utilities normally available in a city. Furthermore, much of this construction has taken place noncontiguous to built up areas.

The Area Plan Commission has the responsibility to determine the placement and geometrics of new subdivisions. This responsibility becomes quite difficult in insuring that the subdivisions will dovetail together. The authority for this phase of development is allotted to the Area Plan Commission by I.C. 36-7-4 and the County Subdivision Ordinance.

The County Engineer's Office (Department of Public Works) is charged with the supervision of design and construction of the work to be dedicated for public use within the subdivision. This authority is delegated by the Board of Commissioners to the County Engineer. The Board of Commissioners is empowered to act accordingly by State Law and the Subdivision Ordinance.

The task of administering design and construction supervision has become quite cumbersome due to the Engineer's lack of control over time schedules. The review of plans cannot be scheduled into the daily routine since each new subdivision always carries a "RUSH" priority in the view of the owner. Therefore, any delay on the County's part can cause monetary loss to the owner. Secondly, we are put into the very awkward position of reviewing the work of other professionals. This review can be time consuming since the many engineers and surveyors are using different basic data and methods in their procedures of design.

The County Engineer's Office has used construction standards, which included some basic design standards, for several years. Properly used, these have been of great use. We have seen that some procedures for standardization of criteria for drainage design and pavement design are greatly needed. This is not a small undertaking since any capable professional can make rational decisions, and consequently, a series of standards must be developed that are flexible, yet fair.

The Standards enclosed herein are not a finished item, and will be modified, expanded, and updated as necessary.

The submittal forms in the Standards are made for reproducing by the users. Please do so
at you pleasure. The Standards are not copyrighted but ethics dictate their use only in St.
Joseph County.

We have attempted to compile these Standards using the best methods and criteria available
to us. We have incorporated procedures, methods, criteria, and data available to us from,
but not limited to, the following agencies:

St. Joseph County Engineer
St. Joseph County Surveyor
St. Joseph County Area Plan Commission
Indiana Department of Transportation
The Asphalt Institute
Indiana Concrete Council
United States Soil Conservation Service
American Society of Civil Engineering
A Policy of Geometric Design of Highway and Streets
Institute of Traffic Engineers Handbook
Design Standards for Railroad Projects (by INDOT)
Basic Criteria for the Design of Storm Drainage System (by St. Joseph County)
Federal Emergency Management Agency
Flood Insurance Maps
Wetland Maps
County Storm Drainage Manual (HERPICC)
DESIGN STANDARDS
COUNTY SUBDIVISION PROJECTS
ST. JOSEPH COUNTY, INDIANA

B. ADMINISTRATION
1. Definitions applicable to these Standards:
   a. Area Plan Commission -- The professional staff and appointed Commission
      as defined in State Statutes and County Ordinances. Also referred to
      as the "Commission";
   
   b. Board of Commissioners -- The elected Board of County Commissioners.
     Also referred to as the "Board";
   
   c. Construction Drawings -- The engineering drawings prepared by the
      designer within the guidelines as detailed in these Standards;
   
   d. County -- The Board of Commissioners and their duly appointed agent, the
      County Engineer;
   
   e. County Drainage Board -- A board of citizens appointed by the Board of
      Commissioners. The Drainage Board is the governing agent for
      legal drains and the establishment of urban drains for construction
      and maintenance;
   
   f. County Highway Engineer -- A Registered Professional Engineer with a
      current license as issued by the State of Indiana. This position is
      appointed by the Board in accordance with State Statute;
   
   g. County Surveyor -- An elected position that is responsible for drainage
      review and approval within the Subdivision Ordinance of St. Joseph
      County. House numbering, boundary descriptions, and drainage
      assessments, in conjunction with the Drainage Board, are also the
      responsibility of this office;
   
   h. Designer -- The firm of individual hired by the owner to prepare the
      Construction Drawing, Master Drainage Plan, and miscellaneous
      submissions required by the Subdivision Ordinance. The designer
      must be a Registered Professional Engineer or Land Surveyor with a
      license as issued by the State of Indiana;
   
   i. Master Drainage Plans -- The plan designed for controlling runoff of
      storm water within a subdivision;
   
   j. Owner -- The individual on the Preliminary Drawings and
Construction Drawings. Any changes in the owner of record must be sent in writing to the proper County agencies;

k. Project — The entire subdivision as shown in the Primary Plat;

l. Specifications — The most current County Prevailing Specifications for Public Works Construction as adopted by the Board. The definitions as contained in the Prevailing Specifications are to be included in these Standards unless these Standards expressly offer a different definition;

2. Minor Subdivisions

Minor Subdivisions generally require no construction drawing submittals at this time.

3. Major Subdivisions

a. Major Subdivisions proceed through two (2) steps at the present time: Primary and Secondary. It is recommended that the designer be fully familiar with the Subdivision Ordinance of St. Joseph County. This section of the Standards will only make reference to those steps, and only as to the Public Works items.

b. Primary Subdivision Requirements:
   i. Classifications of streets into arterial, collector, minor loop, and cul-de-sacs.

   ii. Final geometrics of streets and right-of-way widths.

   iii. Locations of all easements.

   iv. Approved Master Drainage Plan with the approvals of the County Engineer and the County Surveyor.

c. Construction Drawing Requirements:
   i. This phase can be started prior to final approval of the Primary Subdivision upon approval of the County Engineer.

   ii. It is recommended that the Construction Drawings encompass the entire Primary Subdivision rather than one or more sections that are to be built.

   iii. Special attention shall be given to these Design Standards for ease of review. This will save time for the subdivider.
iv. Any special questions shall be resolved with the County Engineer. If any deviations less than these minimum Design Standards are requested, they shall be submitted in writing to the County Engineer giving full details and alternates proposed.

v. Any deviation from the Master Drainage Plan must be submitted in writing to the County Engineer. This request must be submitted with new drawings, calculations, and report covering the deviations. It shall be the determination of the County Engineer to interpret "deviation."

vi. Two (2) sets of prints of the Construction Drawings are to be submitted to the County Engineer for review. Each page of the drawings must be clearly stamped, in red ink, "PRELIMINARY - NOT FOR BIDDING OR CONSTRUCTION."

The County Engineer will make every attempt to review the Construction Drawings as rapidly as possible. Please allow a minimum of eight (8) and a maximum of 20 working days.

vii. One (1) set of marked up prints will be returned to the designer. The other set will be retained for comparison with the final drawings.

viii. The original Title Sheet can be submitted with the original two (2) sets. Usually, the County Engineer will sign the Title Sheet only upon submittal of the final drawings.

ix. The designer must submit two (2) sets of final approved drawings to the County Engineer for use.

x. The County Engineer will notify the owner (subdivision) of final approval. See this form attached, Page 8.

xi. The owner has the right to make changes during the construction of the project upon approval of the County. Any changes approved must be submitted on revised drawings prepared by either the original designer or the owner's current designer of record. Two (2) copies of the approved revised drawings are to be submitted to the County Engineer for use.

d. Completion Affidavit

i. When the developer is ready to request the County to accept all or
part of a subdivision and to return all or part of a surety, a final inspection must be requested.

ii. The County Engineer's Office will initiate the preparation of a "Completion Affidavit" and send it to the developer to be completed.

iii. (a) A letter from the designer stating that the construction has been completed in accordance with the approved construction drawings; or (b) A letter signed by a Professional Engineer stating that the construction has been completed in accordance with the approved construction drawings.

iv. The letter signed in accordance with the requirements of Paragraph iii above shall extend to the grading, storm drainage construction including sewers, and pavement construction.

f. Secondary Subdivision Requirements:

i. The owner has the option of completing fully or partially the improvements as shown in the approved Construction Drawings.

ii. If the improvements are not fully installed, the owner must post surety with the Board of Commissioners guaranteeing the improvements.

iii. Surety shall be defined as any of the following:

a. Performance Bond

b. Certified Check

c. Joint Certificate of Deposit

d. Irrevocable Letter of Credit

e. Escrow Account

Any other type of surety must be approved by the Board of Commissioners and the County Attorney, in writing.

iv. The surety must be based on either a signed construction contract or the designer's estimate of cost based on the quantities shown in the approved Construction Drawings that remain to be finished.
v. When the owner installs the improvements, a County Completion Affidavit must be filed and approved by the Board of Commissioners.

vi. Upon filing either a Completion Affidavit or approved surety, the Major Subdivision may be approved and recorded by the Area Plan Commission.

vii. No surety will be returned to the owner until and unless a Completion Affidavit is filed and approved by the Board of Commissioners.

viii. The surety must be such that County personnel are not required to leave St. Joseph County, Indiana to sign paper work necessary to collect on the surety.
SAMPLE

April 1, 1994

Heavenly Land Development, Inc.
77727 Eternal Blvd.
South Bend, IN 46696

Attn: Land Developers

We are aware that you are thinking about, or are in the process of, securing bids for improvements to your property during this coming construction season.

We are transmitting herewith three (3) forms to be completed by you. One is to be retained in your file, one sent to the County Engineering Department to help coordinate inspection, and one sent to your Consultant Engineer and/or Land Surveyor for his file.

If you have any questions, feel free to contact this office.

Very truly yours,

County Engineer
SAMPLE
April 1, 1994

Heavenly Land Development, Inc.
77727 Eternal Blvd.
South Bend, IN 46696

Re:  FINAL APPROVAL OF CONSTRUCTING PLANS
     HOLYOAK ACRES, SEC. 1-2 & 3

Gentlemen:

This is your notice of approval on subject Project. Your final plans have been approved and the necessary copies submitted to this office.

Please return the second copy of this form immediately with the requested data completed:

1. Sewer Contractor_________________________Start_________

2. Water Contractor_________________________Start_________

3. Grading Contractor________________________Start_________

4. Drainage Contractor_______________________Start_________

5. Paving Contractor________________________Start_________

6. Underground: Telephone: Yes  No  Electric: Yes  No
   Cable TV: Yes  No
   Overhead: Telephone: Yes  No  Electric: Yes  No
   Cable TV: Yes  No

7. Gas Service: Yes  No

8. STOP signs ordered from:_____________________Start_________

9. Street I.D. signs are required at this time.

Signed________________________________________
Owner

PAGE 1 OF 2
When we have received your notice we will allow you to proceed with construction. Any work done on this Project without notification of the County Department of Public Works will be done at the risk of forfeiture of this approval. Furthermore, this office must be notified at least 48 hours prior to any actual work; or again, you face forfeiture of approval.

RE: FINAL APPROVAL OF CONSTRUCTION PLANS (CON'T)

The County representative assigned to your Project is Bill E. Slabaugh.

Please coordinate all work with him.

Enc. 2nd copy

cc: Consulting Engineer

Very truly yours,

__________________________
County Engineer
SAMPLE

ST. JOSEPH COUNTY, INDIANA
HIGHWAY DEPARTMENT
ENGINEERING OFFICE

PROJECT COMPLETION AFFIDAVIT

DESCRIPTION_________________________________ APC FLAT APPROVAL ________________________

PROJECT NO. _______ CONTRACT SIGNED ____________________________

____________________________________ hereby certifies to St. Joseph County thru its Board of

OWNER (DEVELOPER)
Commissioners that all work on the above referenced Project as set forth in the approved plat, drainage plan, and construction drawings have been completed in accordance with said approved plat, drainage plan, and construction drawings.

____________________________________ states that Surety has been posted with St. Joseph County

OWNER (DEVELOPER)
Commissioners for the following work:

1. Curbs Amount__________________________

2. Streets including curbs, paving, and drainage Amount__________________________

3. Drainage Amount__________________________

NOTE: Indicate "N/A" for "Not Applicable" on a line that does not apply.

The streets for which construction has been completed are (1):

STREET DESCRIPTION LENGTH (FT.)
1. 
2. 
3. 
4. 
5. 
6. 

A Maintenance Agreement for a period of _____ years will be filed with the County as soon as the
date of acceptance is set.

PAGE 1 OF 2

11
hereby request that the County conduct a final inspection of

OWNER (DEVELOPER)
the project and accept the streets into the County Highway system and accepts these streets for
operation and maintenance. It is further requested that the Surety as listed herein above be
released.

(1) If drainage is the work area for which inspection is requested, list drainage under STREET and
the Subdivision and Section under DESCRIPTION.

WITNESSES

Subscribed and sworn to before me on this ____________
day of ________________.

CONTRACTOR

OWNER AND/OR AGENT

SIGNATURE NOTARY PUBLIC

SIGNATURE OF OWNER AND/OR AGENT

(If the Contractor is a corporation, the following certificate will be executed.)

I, __________________________, certify that I am Secretary of the Corporation executing this
release, that __________________________ who signed this release on behalf of the
contractor was then __________________________ of said Corporation that said release was
duly signed for and on behalf of said Corporation by Authority of its governing body, and is within
the scope of corporation powers.

CORPORATE SEAL

SIGNATURE OF SECRETARY

COUNTY HIGHWAY DEPARTMENT APPROVAL

(To be completed by County) DATE: __________________________

This project is acceptable for final approval and we recommend to the County Commissioners that
it be ordained so.

______________________________  ________________________________
COUNTY ENGINEER  COUNTY HIGHWAY ENGINEER
SAMPLE

(LETTERHEAD OF ISSUER)

DATE:

Beneficiary: Board of County Commissioners
St. Joseph County, Indiana

Gentlemen:

We hereby authorize you to draw on us at site and for the amount of
up to an aggregate amount of

Dollars ($ ) U. S.

Currency.

This Credit is irrevocable.

Drafts drawn under this Credit must specify the number of this Credit and be presented at our
office not later than for additional periods of one (1) year each unless you are notified by us to the
contrary at least thirty (30) days prior to either the above specified expiration date or the end of
any such additional one year period.

Drafts drawn under this Credit must be accompanied by your signed statement that the proceeds of
the draft will be used by you for the completion of {state the site improvements are to be
completed} at {describe the project site}.

We commit to you that drafts drawn under and in compliance with the terms of this Credit will be
duly and immediately honored.

Very truly yours,
C. **CRITERIA FOR A LOCAL COLLECTOR STREET**

County Code required that the entrance street in a residential development shall be a Local Collector.

Some interior streets shall be Local Collectors when there is increased traffic in volumes:

1. Over 300 v.p.d. (50 lots @ 3 trips per day = 300 v.p.d.);

2. Accommodate school bus under increased traffic conditions;

3. More room to keep two lanes open during snow conditions;

4. With traffic volume, could still tolerate parking on one side;

Consideration must be given to adjacent lands that may be developed.

D. **ROADWAY GEOMETRICS**

1. **Vertical Geometrics**
   a. Pavement and curb grades shown, divisible by four with a minimum of 0.40%;
   
   b. Vertical curve lengths shall be established using the AASHTO formula $L = KA$ for the speed as approved by the County Engineer. In no event shall the design speed be less than 30 MPH. Unless approved by the County Engineer, the design speed shall be 10 MPH faster than the operating speed;
   
   c. A minimum of two (2) permanent bench marks per project set to USGS elevation. The benchmarks (BM's) must be within the project area;
   
   d. Drainage structures and sewers plotted to grade;

2. **Cross Section (V : 1" = 5' & H : 1" = 10')**
   a. Entrances to existing roads - 150 feet each direction at 25 feet intervals showing new approaches and drainage ditches;
   
   b. A cross section on each street at intervals not to exceed 500 feet;
   
   c. Cross section of drainage swales, retention, and ditches;

3. **Horizontal Geometrics**
   a. The design speed must be approved by the County Engineer but may not be less than any posted limit;
b. The design speed shall be 10 MPH above the operating speed unless otherwise approved by the County Engineer;

c. The absolute minimum design speed shall be 40 MPH.

4. Minimum Right-Of-Way Width
   a. Indiana Code 8-20-1-15 states, "A County Highway right-of-way may not be laid out that is less than twenty (20) feet on each side of the centerline, exclusive of additional width required for cuts, fills, drainage, and public safety";
   
b. County Standard Sheets GS-1 and GS-3 have been revised to include this requirement as established by Indiana Code. New plats and plans submitted after September 7, 1995 must conform to this Indiana Code requirement;

E. DRAINAGE
   1. Basis of Design

The design of a drainage system has many solutions. Too often the designer must use inadequate, or even erroneous, data in that solution. Local governments have made many attempts to secure proper solutions, but in the final analysis the proof of the design is the question, "Does it work most of the time?" An over-designed system can be costly to the developer and home buyer, but an under-designed system becomes extra costly to the home owner and the County. Another factor is becoming more prevalent, and that is the lawsuit against the developer, the designer, the contractor, and the County. Far too often we cheapen a design to save pennies at the risk of paying dollars in a lawsuit.

No set of Standards can be so inclusive to relieve the designer of his professional responsibility. These Standards do not attempt to do this. These Standards only attempt to set basic criteria and requirements on which the design is to be based.

Special attention shall be given to the types of joints used on pipe. Special consideration will be given by the County to using storm sewers as sub-surface drains when properly designed and constructed.

The use of retention/detention basins is necessary to retain the additional runoff resulting from improvements to a property. The designer should fully recognize that poorly planned basins are an eyesore and a health and safety hazard. Proper use of drywells, in suitable soils, should insure complete emptying of detention areas. Proper design can afford a natural green area that can be used for neighborhood recreation.
Finally, the designer must bear in mind that the system must be maintainable and design accordingly.

2. Purpose

The purpose of this design criteria is to reduce the hazard to public health and safety caused by excessive storm water runoff. It will also protect, conserve, and promote the orderly development of land and water resources within the regulatory area. This design criteria controls:

a. Storm water drainage improvements related to development of lands located within the unincorporated parts of St. Joseph County and all areas under the jurisdiction of the St. Joseph County Board of Commissioners;

b. Drainage control systems installed during new land construction and grading of lots and other parcels of land;

c. Erosion and sediment control systems installed during new construction and grading of lots and other parcels of land;

d. The design, construction, and maintenance of storm water drainage facilities and systems.

3. Conflicting Design Criteria

The provisions of this design criteria shall be deemed as additional requirements to minimum standards required by other design criteria of the County. In case of conflicting requirements, the most restrictive shall apply.

In addition to the requirements of this design criteria, compliance with the requirements set forth in the Zoning Ordinance of St. Joseph County, Subdivision Ordinance of St. Joseph County, and other applicable ordinances with respect to submission and approval of subdivision plats improvements plans, performance bonds, payment bonds, surety bonds, building and zoning permits, construction, inspections, appeals, and similar matters and compliance with applicable state of Indiana Statutes and regulations shall be required.

4. Definitions

For the purpose of this design criteria, the following definitions shall apply:

a. 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;
b. Channel -- A natural or artificial watercourse of perceptible extent that periodically or continuously contains moving water, or which forms a link between two bodies of water. It has a defined bed and banks that serve to confine the water;

c. Clean-Out -- A structure of less size than a manhole used in conjunction with a sewer, for the purpose of maintenance;

d. Compensatory Storage -- An artificial volume of storage within a floodplain used to balance the loss of natural flood storage capacity when artificial fill or substructures are placed within the floodplain;

e. Computer Method -- A method through computer analysis and modeling of determining "Q." The method used must be one of the proven acceptable methods in present use by the State Highway, Soil Conservation Service, Corps of Engineers, or other recognized Public Agency;

f. Contiguous -- Adjoining or in actual contract with;

g. Culvert -- Conduit for conveyance of storm water, open at each end and generally of less than 100 feet in length;

h. Detention Basin -- The temporary detaining storage of storm water in storage basins, on rooftops, in streets, parking lots, school yards, parks, open spaces, or other areas under pre-determined and controlled conditions, with the rate of drainage therefore regulated by appropriately installed devices;

i. Ditch -- A depressed channel used for conveyance of storm water that is deeper than two (2) feet and whose side slopes are less than 6 : 1;

j. Drainage Area -- The area from which water is carried off by a drainage system, a watershed, or catchment area;

k. Drop Manhole -- Manhole having a vertical drop pipe connecting the inlet pipe to the outlet pipe. The vertical drop pipe shall be located immediately outside the manhole;

l. Dry Bottom Detention Basin -- A basin designed to be completely de-watered after having provided its planned detention of runoff during a storm event;

m. Duration -- The period of a rainfall event;
n. Drywell -- A structure used for collection and retention of storm water for percolation disposal. A drywell may also be used as a manhole or inlet. Its size shall be measured in gallons;

o. Erosion -- Wearing away of the land by running water and waves, abrasion, and transportation;

p. Flood -- 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;

q. Flood Elevation -- The elevation at all locations delineating the maximum level of high waters for a flood of given return period;

r. Floodway Fringe -- That portion of the floodplain lying outside the floodway, which is inundated by the regulatory flood;

s. Flood Hazard Area -- Those floodplains that have not been adequately protected from flooding caused by the regulatory flood, and are shown by the zoning map or on the Flood Hazard or Floodway-Flood Boundary Maps of the Federal Insurance Administration or maps provided to the County from the Indiana Natural Resources Commission;

t. Floodplain -- The channel proper and the areas adjoining any wetland, lakes, or watercourses that have been or hereafter may be covered by the regulatory flood. The floodplain includes both the floodway and the floodway fringe districts;

u. Flood Protection Grade -- The elevation of the regulatory flood plus two (2) feet at any given location in the Special Flood Hazard Area;

v. Floodway -- The channel of a river or stream and those portions of the floodplain adjoining the channel that are reasonably required to efficiently carry and discharge the peak flood flow of the Regulatory Flood of any river of stream;

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

x. Gradient -- The inclination of 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;
y. Impact Areas -- Areas defined and mapped by the County that 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 an adequate outlet, a floodway or floodplain, land within 75 feet of each bank of any legal drain or within 75 feet from the center line of any legal title ditch;

z. Impervious -- A term applied to material through which water cannot pass, or through which water passes with difficulty;

aa. Inlet -- An opening into a storm sewer system for the entrance of surface storm water runoff, more completely described as a storm sewer inlet;

ab. Junction Chamber -- A converging section of conduit, usually large enough for a man to enter, used to facilitate the flow from one or more conduits into a main conduit;

ac. Lateral Storm Sewer -- A sewer that has inlets connected to it but has no other storm sewer connected;

ad. Major Drainage Systems -- Drainage system carrying runoff from an area of one or more square miles in area classified as urban or rural. Design shall be in accordance with the Indiana Department of Natural Resources Standards;

ae. Minor Drainage Systems -- Drainage systems having an area of less than one square mile in areas classified as urban or rural;

af. Off-Site -- Everything not on site;

ag. On-Site -- Located within the controlled or urbanized area where runoff originates;

ah. 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;

ai. Peak Flow -- The maximum rate of flow of water at a given point in a channel or conduit resulting from a pre-determined storm or flood;

aj. Percolation Rate -- The rate at which surface water is absorbed into the ground. Percolation rates, where used, must be certified by a Professional Engineer or Soil Scientist;
ak. Radius of Curvature -- Length of radius of a circle used to define a curve;

al. Rainfall Intensity -- The cumulative depth of rainfall occurring over a given duration, normally expressed in inches per hour;

am. Rainfall Chart -- The isopluvial chart for duration and intensity of rainfall for St. Joseph County as shown of Standard Drawing DD-2;

an. Rational Formula -- The accepted method in St. Joseph County of determining the amount of discharge (CF/sec) in relation to the Coefficient of Runoff (c), Rainfall Intensity (i), and the Area of the Watershed for small watersheds (Q=CiA);

ao. Reach -- Any length of channel or storm sewer;

ap. Regulated Area -- All of St. Joseph County, except for land area lying within the jurisdiction or incorporated area of any incorporated City or Town, plus all area under the jurisdiction of the St. Joseph County Board of Commissioners;

aq. Regulatory Flood -- That flood having peak discharge which can be Equaled or exceeded on the average of once in a 100-years period, as calculated by a method and procedure accepted and approved by the Indiana Natural Resources Commission. This flood is equivalent to a flood having a probability of occurrence of 1% in any given year;

ar. Regulatory Floodway -- The channel of a river or stream and those portions of the floodplains adjoining the channel that are reasonably required to efficiently carry and discharge peak flow of the regulatory floor of any river or stream and is that area covered by floodwaters in significant downstream motion or covered by significant volumes of stored water during the occurrence of the regulatory flood;

as. Release Rate -- The amount of storm water released from a storm water control facility per unit of time;

at. Retention Basin -- A depressed area used for storage of storm water that has no positive outlet to a receiving channel or sewer and which will retain the runoff for an indefinite period. Water level changes only with percolation or evaporation;

au. Return Period -- The average interval of time within which a given rainfall event will be equaled to or exceeded once. A flood having a return period
of 100-years has a 1% probability of being equaled or exceeded in any one year;

av. Runoff Coefficient -- A decimal fraction relating the amount of rain that appears as runoff and reaches the storm sewer system to the total amount of rain falling. A coefficient of one half (0.5) implies that 50% of the rain falling on a given surface appears in storm water runoff;

aw. Sediment -- Material of soil and rock origin, transported, carried, or deposited by water;

ax. Siphon -- A close 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. Siphon utilizes atmospheric pressure to effect or increase the flow of water through a conduit. An inverted siphon is used to carry storm water flow under an obstruction such as a sanitary sewer;

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

az. Stilling Basin -- A basin used to slow water down or dissipate its energy;

ba. Storage Duration -- The length of time that water may be stored in any storm water control facility, computed from the time water first begins to be stored;

bb. Storm Water Drainage System -- All means, natural or man-made, used for conducting storm water to, through, or from a drainage area to any of the following: conduits and appurtenant features, canals, channels, ditches, streams, culverts, streets, and station;

bc. Storm Water Runoff -- The water derived from rains falling within a tributary basin, flowing over the surface of the ground or collected in channels or conduits;

bd. Swale -- A shallow, depressed channel used for conveyance and/or storage of storm water. It shall be less than two (2) feet deep, have a minimum of a two (2) feet wide flat bottom, and shall have 6 : 1 or greater side slopes;

be. Time of Concentration -- The time required for storm water to flow from most remote part of the drainage area to a specific point within the drainage area;
bf. Tributary -- Contributing storm water from upstream land areas;

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

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

bi. Watershed -- See Drainage Area;

bj. Wet Bottom Retention/Detention Basin -- A basin designed to retain a permanent pool of water after having provided its planned detention of runoff during a storm event (A retention basin has no direct outlet or overflow).

F. STORM WATER CONTROL POLICY

It is recognized that, with the possible exception of the major watercourses such as the St. Joseph River, the smaller streams and drainage channels serving St. Joseph County do not have sufficient capacity to receive and convey storm water runoff resulting from continued urbanization. Accordingly, the storage and controlled release rate of excess storm water runoff shall be required for all new business, commercial, and industrial developments, residential subdivisions, planned unit development and any redevelopment or other new construction located within St. Joseph County. Possible exceptions to the requirement are minor subdivisions and parceling described in the Subdivision Ordinance. The County Engineer, after thorough investigation and evaluation, may waive the requirements of controlled runoff for minor subdivision and parcelization. The release rate of storm water from developments and redevelopments may not exceed the storm water runoff from the land area in its undeveloped state.

If this water continues to flow off-site in the same manner as before development, then an amount equal to the undeveloped flow may continue to leave the site.

If the runoff is concentrated, then it must either be channeled into a ditch system designed to handle the flow or be retained.

Computations of runoff before and after development or redevelopment that demonstrates that runoff will not be increased must be provided with the drainage plans. Computations for areas up to and including 200 acres may use the Rational Method and the coefficients listed herein, with the 100-year return rainfall data of 24 hour durations. For areas larger than 200 acres, hydrograph techniques and/or computer drainage modeling methods shall be used. Hydrograph techniques and runoff shall be proven methods, subject to approval of the County Engineer. The developer must submit to
County Engineer, detailed computations showing the method of computation used. The computations shall be either the Soil Conservation Program T. R. - 20 (greater than 200 acres) or T. R. - 55 (less than 200 acres) unless the Rational Method is approved for use. If streams are involved, it may be necessary to use HEC-2. Other methods or computing the storage requirements for the 100-year return period 24 hour storm must be approved by the County Engineer.
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Sewers (Storm) -- 10 years, 2 hour storm</td>
</tr>
<tr>
<td>ii.</td>
<td>Culverts -- Head water not to exceed 0.9 or Allowable Head Water, based on design of inlet and outlet channels</td>
</tr>
<tr>
<td>iii.</td>
<td>Retention Basin -- 100-years, 24 hour storm, 5.6&quot;, 2' freeboard</td>
</tr>
<tr>
<td>iv.</td>
<td>Detention Basin -- 100-years, 24 hour storm, includes swales and ditches</td>
</tr>
</tbody>
</table>
G. INFORMATION REQUIREMENTS

The following information and data prepared by a licensed Professional Engineer or Land Surveyor engaged in storm drainage design shall accompany plans of (1) each proposed major subdivision lying within the regulated area at the time of Primary Plat Approval by the Area Plan Commission, (2) minor subdivisions when required, and (3) each building permit application for construction of a commercial or industrial facility that is to be constructed on real estate which lies within the regulated area.

1. Contour Map

A contour map is a topographic map of the land to be subdivided and such adjoining land whose topography may affect the layout or drainage of the development. The contour intervals shall be one (1) foot when slopes are less than 4% and shall be two (2) feet when slope exceeds 4%. On this map, the following shall be shown:

a. The location of streams and other flood water runoff channels, the extent of the floodplains at the established 100-year flood elevation where available, and the limits of the floodway, all properly identified;

b. The normal shoreline of lakes, ponds, swamps, and detention basins, their floodplains, and lines of inflow and outflow if any;

c. The location of legal drains, farm drains, inlets and outfalls, if any are of record;

d. Storm, sanitary and combined sewers, and outfalls, if any are of record;

e. Septic system and outlet, if any are of record;

f. Seeps, systems, flowing, and other wells, if any are of record;

g. Provide soils map of proposed development indicating soil name and their hydrologic classification when Soil Conservation Service (SCS) hydrologic methods are used.

2. Preliminary Drainage Plan

A comprehensive plan, in preliminary form (or in combined preliminary and final form), designed to handle safely the storm water runoff and detain the increased storm water runoff volume.

The plan shall provide or be accompanied by maps or other descriptive material indicating the feasibility of the drainage plan and showing the following:

a. The extent and area of each watershed affecting the design of detention facilities as shown of USGS Topographic Maps;
b. 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;

c. Receiving stream or channel and its 100-year return period water elevation;

d. The location and design of the proposed street system where pavements are planned to be depressed sufficiently to convey or temporarily store overflow from the heavier rainstorms and outlets for such overflow;

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

f. Proposed culverts and bridges to be built, their materials, elevations, waterway opening, and basis of their design;

g. Existing detention ponds and basins to be maintained, enlarged, or otherwise altered and new ponds or basins to be built and the basis of their design;

h. The estimated depth and amount of storage required by design of the new ponds or basins;

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

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

3. Valley Cross Section

One or more typical cross sections of all existing and proposed channels or other open drainage facilities carried to a point above the 100-year high water and showing the elevation of the existing land and the proposed changes thereto, together with the high water elevations expected from the 100-year storm under the controlled conditions called for by this design basis and the relations of structures, streets, and other facilities.

4. Site Plan

A plan drawn to scale showing dimensions of the sets with existing and proposed storm drainage facilities.
5. Final Drainage Plans

Upon approval of the preliminary drainage plans by the County Engineer, under this Design Criteria and under the Subdivision Ordinance, final drainage plans shall be submitted to the County Engineer and the County Surveyor. The final plans shall include calculations, maps, and/or other descriptive material showing the following:

a. The extent and area of each watershed tributary to the drainage channels in the development;

b. The street storm sewers and other storm drains to be built, the basis of their design, outfall and outlet locations and elevations, receiving stream or channel and its high water conditions;

c. 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;

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

e. Proposed culverts and bridges to be built, their materials, elevations, waterway openings, and basis of their design;

f. Existing detention basin and ponds to be maintained, enlarged, or otherwise altered and new basins or ponds to be built and the basis of their design;

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

h. The slope type and size of all sewers and other waterways;

i. For all detention basins, a plot or tabulation of storage volumes with corresponding water surface elevations and a plot or tabulation of the basin outflow rates for those water surface elevations.

6. Submittal and Consideration of Plans

Preliminary drainage plans shall be submitted to the County Engineer five (5) working days prior to Area Plan Commission Plan Submittals. All preliminary plans prepared in compliance with the standards of this design basis shall be reviewed by the County Engineer. The County Engineer shall orally report revisions to be made by the designer. The construction plans designed under this design basis shall be
approved or disapproved by the County Engineer.

The St. Joseph County Engineer is authorized to review engineering summaries of projects and, based upon the same, grant approval for concept only and with no responsibility for the design of the Drainage Plan.

H. **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 that is generated as the result of a given rainfall intensity shall be calculated as follows:

1. For areas up to and including 200 acres the Rational Method shall be used. In the Rational Method, the peak rate of runoff, "Q," in cubic feet per second is computed as:

   \[ Q = CIA \]

   \[ C = \text{runoff coefficient, representing the characteristics of the drainage area and defined as the ratio of runoff to rainfall;} \]

   \[ I = \text{average intensity of rainfall in inches per hour for a duration equal to the time of concentration (tc) for a selected rainfall;} \]

   \[ A = \text{tributary drainage area in acres.} \]

Guidance to selection of the runoff coefficient "C" is provided by Table 2 and Table 3 which shows values for a given drainage area with various surface types shall be the weighted average value for the totals are calculated from a breakdown on individual area having different surface types.

Table 4 provides runoff coefficients and inlet times for different land use classifications. In the instance of undeveloped land situated in an upstream area, a coefficient or coefficients shall be used for this area in its present state of development.

Rainfall intensity shall be determined from the rainfall frequency curves shown in Figure 1, Page 32. The time of concentration (tc) to be used shall be the sum of the inlet time and flow time in the drainage facility from the most remote part of the drainage area to the point under consideration. The flow time in the storm sewers may be estimated by the distance in feet divided by the velocity of flow in feet per second. The velocity shall be determined by the Manning Formula. Inlet time is the combined time required for the runoff to reach the inlet of the storm sewer. It includes overland flow time and flow time through established surface drainage channels such as swales, ditches, and sheet flow across such areas as lawns, fields, and other graded surfaces. It may be computed by using Figure 2.

a. The runoff rate for areas in excess of 200 acres shall be determined by methods described in Section F, page 22.
## TABLE 2

**URBAN RUNOFF COEFFICIENTS**

*Note*

<table>
<thead>
<tr>
<th>Type of Surface</th>
<th>Runoff Coefficient &quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt</td>
<td>0.90</td>
</tr>
<tr>
<td>Concrete</td>
<td>0.92</td>
</tr>
<tr>
<td>Roof</td>
<td>0.96</td>
</tr>
<tr>
<td>Lawns (Sandy)</td>
<td></td>
</tr>
<tr>
<td>Flat (0-2% Slope)</td>
<td>0.07</td>
</tr>
<tr>
<td>Rolling (2-7% Slope)</td>
<td>0.12</td>
</tr>
<tr>
<td>Steep (greater than 7%)</td>
<td>0.20</td>
</tr>
<tr>
<td>Lawns (Clay)</td>
<td></td>
</tr>
<tr>
<td>Flat</td>
<td>0.16</td>
</tr>
<tr>
<td>Rolling</td>
<td>0.21</td>
</tr>
<tr>
<td>Steep</td>
<td>0.30</td>
</tr>
</tbody>
</table>

1. The coefficients of this tabulation are applicable to storms of 5 to 10 years frequencies. Coefficients for less frequent higher intensity storms shall be modified as follows, except that no coefficient shall exceed 1.00:

<table>
<thead>
<tr>
<th>Return Period (years)</th>
<th>Multiply &quot;C&quot; by</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>1.05</td>
</tr>
<tr>
<td>50</td>
<td>1.10</td>
</tr>
<tr>
<td>100</td>
<td>1.10</td>
</tr>
</tbody>
</table>

*Weighted coefficient, minimum 0.60 for developed runoff.*
### TABLE 3

**RURAL RUNOFF COEFFICIENTS**

<table>
<thead>
<tr>
<th>Type of Surface</th>
<th>Runoff Coefficient &quot;C&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodland [Sandy]</td>
<td></td>
</tr>
<tr>
<td>Flat [0-5% Slope]</td>
<td>0.10</td>
</tr>
<tr>
<td>Rolling [5-10% Slope]</td>
<td>0.25</td>
</tr>
<tr>
<td>Steep [greater than 10%]</td>
<td>0.30</td>
</tr>
<tr>
<td>Woodland [Clay]</td>
<td></td>
</tr>
<tr>
<td>Flat</td>
<td>0.30</td>
</tr>
<tr>
<td>Rolling</td>
<td>0.35</td>
</tr>
<tr>
<td>Steep</td>
<td>0.50</td>
</tr>
<tr>
<td>Pasture [Sandy]</td>
<td></td>
</tr>
<tr>
<td>Flat</td>
<td>0.10</td>
</tr>
<tr>
<td>Rolling</td>
<td>0.36</td>
</tr>
<tr>
<td>Steep</td>
<td>0.42</td>
</tr>
<tr>
<td>Cultivated [Sandy]</td>
<td></td>
</tr>
<tr>
<td>Flat</td>
<td>0.30</td>
</tr>
<tr>
<td>Rolling</td>
<td>0.40</td>
</tr>
<tr>
<td>Steep</td>
<td>0.52</td>
</tr>
<tr>
<td>Cultivated [Clay]</td>
<td></td>
</tr>
<tr>
<td>Flat</td>
<td>0.50</td>
</tr>
<tr>
<td>Rolling</td>
<td>0.60</td>
</tr>
<tr>
<td>Steep</td>
<td>0.72</td>
</tr>
</tbody>
</table>

1. The coefficients of this tabulation are applicable to storms of 5 to 10 year frequencies. Coefficients for less frequent higher intensity storms shall be modified as follows, except that no coefficient shall exceed 1.00:

<table>
<thead>
<tr>
<th>Return Period [Years]</th>
<th>Multiply &quot;C&quot; By</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>1.1</td>
</tr>
<tr>
<td>50</td>
<td>1.2</td>
</tr>
<tr>
<td>100</td>
<td>1.2</td>
</tr>
</tbody>
</table>

2. “C” Values From Page 3-4, Table 3.2.1, HERPICC Storm Drainage Manual, 1994

* Weighted Coefficient Guidelines:

1. For Undeveloped Runoff: The maximum allowable runoff coefficient is 0.20.

2. For Developed Runoff:
   a. If the Weighted Coefficient for the entire site is equal to or less than 0.3, then the designer may use a minimum Runoff Coefficient "C" of 0.45 for drainage calculations.
   b. If the Weighted Coefficient for the entire site is greater than 0.3, then the designer shall use a minimum Runoff Coefficient "C" of 0.60 for drainage calculations.
### TABLE 4

**RUNOFF COEFFICIENT "C" BY LAND USE AND TYPICAL INLET TIMES**

<table>
<thead>
<tr>
<th>Land Use (Minutes)</th>
<th>Runoff Coefficients</th>
<th>Inlet Times</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FLAT</td>
<td>ROLLING</td>
</tr>
<tr>
<td>Commercial (Cob)</td>
<td>0.75</td>
<td>0.83</td>
</tr>
<tr>
<td>Commercial (Neighborhood)</td>
<td>0.54</td>
<td>0.60</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.63</td>
<td>0.70</td>
</tr>
<tr>
<td>Garden Apartments</td>
<td>0.54</td>
<td>0.60</td>
</tr>
<tr>
<td>Churches</td>
<td>0.54</td>
<td>0.60</td>
</tr>
<tr>
<td>Schools</td>
<td>0.31</td>
<td>0.35</td>
</tr>
<tr>
<td>Semi-Detached Residential</td>
<td>0.45</td>
<td>0.50</td>
</tr>
<tr>
<td>Detached Residential</td>
<td>0.40</td>
<td>0.45</td>
</tr>
<tr>
<td>Quarter Acre Lots</td>
<td>0.36</td>
<td>0.40</td>
</tr>
<tr>
<td>Half Acre Lots</td>
<td>0.31</td>
<td>0.35</td>
</tr>
<tr>
<td>Parkland</td>
<td>0.18</td>
<td>0.20</td>
</tr>
</tbody>
</table>

1. Flat terrain 0-2% slopes.
2. Rolling terrain 2-7% slopes.
3. Steep terrain greater than 7%.
4. Interpolation, extrapolation, and adjustment for local conditions shall be based on engineering experience and judgment.
5. The coefficients of this tabulation are applicable to storms of 5 to 10 year frequencies. Coefficients for less frequent higher intensity storms shall be modified as follows, except that no coefficient shall exceed 1.00:

<table>
<thead>
<tr>
<th>Return Period (years)</th>
<th>Multiply &quot;C&quot; by</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>1.10</td>
</tr>
<tr>
<td>50</td>
<td>1.20</td>
</tr>
<tr>
<td>100</td>
<td>1.25</td>
</tr>
</tbody>
</table>
# FIGURE I
Worksheet 3: Time of concentration ($T_C$) or travel time ($T_t$)

<table>
<thead>
<tr>
<th>Project</th>
<th>By</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Check</td>
<td>Date</td>
</tr>
</tbody>
</table>

Circle one: Present  Developed

Circle one: $T_C$  $T_t$ through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

## Sheet flow (Applicable to $T_C$ only)

<table>
<thead>
<tr>
<th>Segment ID</th>
</tr>
</thead>
</table>

1. Surface description (table 3-1) ..............
2. Manning's roughness coeff., $n$ (table 3-1) ..
3. Flow length, $L$ (total $L \leq 300$ ft) ......... ft
4. Two-yr 24-hr rainfall, $P_2$ ................. in
5. Land slope, $s$ .................................... ft/ft
6. $T_C = \frac{0.007 \ (\text{nl})^{0.8}}{P_2^{0.5} \ s^{0.4}}$ Compute $T_C$ ...... hr

## Shallow concentrated flow

<table>
<thead>
<tr>
<th>Segment ID</th>
</tr>
</thead>
</table>

7. Surface description (paved or unpaved) ......
8. Flow length, $L$ .................................. ft
9. Watercourse slope, $s$ ............................ ft/ft
10. Average velocity, $V$ (figure 3-1) ............ ft/s
11. $T_C = \frac{L}{3600 \ V}$ Compute $T_C$ ...... hr

## Channel flow

<table>
<thead>
<tr>
<th>Segment ID</th>
</tr>
</thead>
</table>

12. Cross sectional flow area, $a$ .................. $\text{ft}^2$
13. Wetted perimeter, $P_w$ ......................... ft
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute $r$ ...... ft
15. Channel slope, $s$ .................................. ft/ft
16. Manning's roughness coeff., $n$ ...............
17. $V = \frac{1.49 \ r^{2/3} \ s^{1/2}}{n}$ Compute $V$ ....... ft/s
18. Flow length, $L$ .................................. ft
19. $T_C = \frac{L}{3600 \ V}$ Compute $T_C$ ...... hr
20. Watershed or subarea $T_C$ or $T_t$ (add $T_C$ in steps 6, 11, and 19) .......... hr
NORTHERN INDIANA RAINFALL CURVES
INTENSITY - DURATION - RECURRENCE INTERVAL

60 MINUTE 100' YEAR = 2.8 INCHES
24 HOURS 100' YEAR = 5.6 INCHES
NOMOGRAPH OF KIRPICH FORMULA
FOR ESTIMATING TIME OF CONCENTRATION

NOTE: MULTIPLY tc by 1.5 IF LESS THAN ONE-HALF THE WATERSHED AREA IS SEWERED.
MULTIPLY tc by 0.75 IF MORE THAN ONE-HALF THE WATERSHED AREA IS SEWERED.

FIGURE 2
2. Amount of runoff to be accommodated by various parts of drainage facility
Various parts of a drainage facility must accommodate runoff water as follows
(Note -- Ground water shall not be allowed to cross lot lines when drained or
pumped from sub-surface appurtenances, including perimeter, foundation, and
geo-thermal drain outlets; Ground water and surface water from lanes may not be
pumped or allowed to flow by gravity over a lot line into a curb and gutter stub
section. When approved by the County Engineer and the County Surveyor, such
flows may be collected and connected directly into a storm drainage structure.):

a. The minor drainage system such as inlets, manholes, street gutters, swales,
sewers, and small channels (less than 30 cfs) which collects storm water
must accommodate peak runoff from 10 year return frequency storms.
Duration shall be equal to or greater than the time of concentration;
provided however:

b. The allowable spread of water on arterial and collector streets is limited to
maintaining two (2) clear ten (10) feet moving lanes of traffic. One (1) ten
(10) feet land is to be maintained on local streets;

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

d. Culvert shall be capable of accommodating peak runoff from a 50-year
return frequency storm when crossing under a road that is part of the rural
functional classification system and are classified as principal or minor
arterial, major or minor collector roads.

Major Drainage Systems are defined in Paragraph 4 and shall be designed in
accordance with Indiana Department of Natural Resources Standards.

3. Level of protection for urban areas
a. First floor elevations of all living units, commercially or industrially used
building, shall be such that all floors including basements shall have tow (2)
feet or freeboard above the 100-year flood elevation or the flood protection
grade.

b. The land grade at houses shall be based upon the maximum flood of record
or upon a flood that may occur once in 100-years, whichever is greater,
together with a freeboard of two (2) feet. The maximum flood elevations
shall be determined from the best records available, and may be taken from
the Flood Hazard or Floodway - Flood Boundary Maps of the Federal
Insurance Administration or Indiana Department of Natural Resources
maps.

34
c. Developer should check the Federal Flood Insurance requirements for the latest rules and regulations.

I. **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:

1. **Manning Equation:**

   The hydraulic capacity of storm sewers shall be determined using Manning's Equation:

   \[ V = \frac{1.486}{n} \left( \frac{R}{3} \right)^{2/3} S^{1/2} \]

   \( V = \text{Mean velocity of flow in feet per second;} \)

   \( R = \text{The hydraulic radius in feet;} \)

   \( S = \text{The slope of the energy gradient line in feet per foot;} \)

   \( n = \text{roughness coefficient;} \)

   The hydraulic radius, "R," is defined as the cross sectional area of flow divided by the wetted flow surface or wetted perimeter. Typical "n" values and maximum permissible velocities for storm sewer materials are listed in Table 5, Page 36.
<table>
<thead>
<tr>
<th>Material</th>
<th>Manning's n</th>
<th>Desirable Maximum Velocities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed Conduits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td>0.013</td>
<td>7 f.p.s.</td>
</tr>
<tr>
<td>Extra Strength Clay</td>
<td>0.013</td>
<td>7 f.p.s.</td>
</tr>
<tr>
<td>Brick</td>
<td>0.015</td>
<td>7 f.p.s.</td>
</tr>
<tr>
<td>Ductile Iron</td>
<td>0.013</td>
<td>7 f.p.s.</td>
</tr>
<tr>
<td>Plastic, Smooth</td>
<td>0.013</td>
<td>7 f.p.s.</td>
</tr>
<tr>
<td>Open Channels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete, Trowel Finish</td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td>Concrete, Broom or Float Finish</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>Pre-Cast Concrete Block</td>
<td>0.020</td>
<td></td>
</tr>
<tr>
<td>Gunite</td>
<td>0.018</td>
<td></td>
</tr>
<tr>
<td>Riprap Placed</td>
<td>0.030</td>
<td></td>
</tr>
<tr>
<td>Riprap Dumped</td>
<td>0.035</td>
<td></td>
</tr>
<tr>
<td>Gabions</td>
<td>0.028</td>
<td></td>
</tr>
<tr>
<td>New Earth (Uniform, Sodded, Clay)</td>
<td>0.025</td>
<td></td>
</tr>
<tr>
<td>Existing Earth (Fairly Uniform, With Some Weeds)</td>
<td>0.030</td>
<td></td>
</tr>
<tr>
<td>Dense Growth of Weeds</td>
<td>0.040</td>
<td></td>
</tr>
<tr>
<td>Dense Weeds and Brush</td>
<td>0.040</td>
<td></td>
</tr>
<tr>
<td>Swale with Grass</td>
<td>0.035</td>
<td></td>
</tr>
</tbody>
</table>
2. **Minimum size**

The minimum size of all storm sewers shall be twelve (12) inches. Rate of release for detention storage shall be controlled by an orifice plate or other devices, subject to approval of the County Engineer, where the twelve (12) inches pipe will not limit the rate of release as required.

3. **Grade - Velocity**

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. Pipe cover less than the minimum may be used only upon 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 two and one half (2.5) and eight (8) feet per second, respectively, when the sewer is flowing full. Velocities outside these limits must be approved by the County Engineer.

4. **Alignment**

Storm sewers shall be straight between manholes insofar as possible. Where long radius curves are necessary to conform to street layout, the minimum radius of curvature shall be no less than 100 feet for sewers 42 inches and larger in diameter. Deflection of pipe sections shall not exceed the maximum deflection recommended by the pipe manufacturer. The deflection shall be uniform and finished installation shall follow a smooth curve.

5. **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:

a. Where two or more storm sewers converge;

b. At the point of beginning or at the end of a curve, and at the point of reverse curvature (PC, PT, PRC);

c. Where pipe size changes;

d. Where an abrupt change in alignment occurs;

e. Where a change in grade occurs;
f. At suitable intervals in straight sections of sewer.

The maximum distance between storm sewer manholes shall be as follows:

<table>
<thead>
<tr>
<th>Size of Pipe (inches)</th>
<th>Maximum Distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 thru 42</td>
<td>400</td>
</tr>
<tr>
<td>48 and larger</td>
<td>600</td>
</tr>
</tbody>
</table>

6. Inlets

Inlets or drainage structures shall be utilized to collect surface water through grated openings and convey it to storm sewers, channels, or culverts. Inlet design and spacing shall be in accordance with the Indiana State Highway Commission, Road Design Manual, Volume I or other approved design. Inlets shall pass the design ten (10) year flow with 50% of the sag inlet areas clogged. An overland 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 temporarily ponded is the street sag shall not exceed seven (7) inches.

7. Special hydraulic Structures

Special hydraulic structures required to control the flow of water in storm runoff drainage system include junction chambers, drop manholes, inverted siphons, stilling basins, and other special structures. The use of these structures shall be limited to those locations justified by prudent planning and by careful and thorough hydraulic engineering analysis.

J. WORKMANSHIP AND MATERIALS

1. Workmanship

The specifications for the construction of storm sewers shall not be less stringent than those set forth in the latest edition of the Indiana Department of Transportation "Standard Specifications." Additionally, ductile iron pipe shall be laid in accordance with American Water Works Association (AWWA) C-600 and clay pipe shall be laid in accordance with American Society of Testing Materials (ASTM) C-12.

2. Materials

Storm sewer, pipe, manholes, and inlets shall conform to Indiana Department of Transportation "Standard Specifications," sheet MPA dated February 2, 1995 and be of the material listed by Table 5. The pipe groups that are not acceptable are Bituminous Coated Corrugated Steel, Acrylonitrile-Butadiene-Styrene (ABS) sewer pipe, or Composite and Polyethylene sewer pipe. The plastic pipe material of Polyvinyl Chloride (PVC) may be acceptable if approved by the County Engineer.
Other pipe and fittings not specified herein may be used only when specifically authorized by the County Engineer. IN ALL CASES, the appropriate minimum coefficient of friction, as shown in Table 5, shall be used for design.

Pipe joints shall be watertight and shall conform to the requirements of materials of the latest edition of the Indiana Department of Transportation "Standard Specifications."

If the County Engineer approves the use of plastic pipe, a ring deflection test will be required.

Upon completion of installation, bedding, backfill, and compaction, the contractor shall pull a mandrel device through the pipe line. The maximum ring deflection shall be limited to 5% of the internal pipe diameter. All pipe exceeding this deflection shall be re-laid or replaced by the Owner/Contractor. This test shall not be performed sooner than 30 days after installation and shall be witnessed by the County Engineer or representative.

K. OPEN CHANNEL DESIGN STANDARDS

All open channels, whether private or public, and whether constructed on private or public land shall be lined with a material listed in Table 5 and shall conform to the design standards and other design requirements contained herein. Vegetal lined channels shall be allowed. Back yard swales shall not be utilized to convey drainage other than from the single lot itself unless approved by the County Surveyor and the County Engineer. Swales used for this purpose shall have a structure number and shall be constructed with fabric reinforced seeding, sodding, or concrete lining.

1. Manning Equation

The waterway for channel shall be determined using Manning's equation:

\[ Q = AV = A \frac{1.486}{n} R^{2/3} S^{1/2} \]

- \( A \) = Waterway area of channel in square feet;
- \( Q \) = Discharge in cubic feet per second (dfs);
- \( V \) = Mean velocity of flow in feet per second;
- \( R \) = The hydraulic radius in feet;
- \( S \) = The slope of the energy gradient line in feet per foot;
- \( n \) = roughness coefficient.

2. 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 one and one half (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 channel are shown on Table 6, page 41. Developments through which the channel is to be constructed must be considered in the design of the channel section.
### TABLE 6

**MAXIMUM PERMISSIBLE VELOCITIES IN VEGETAL-LINED CHANNELS**

<table>
<thead>
<tr>
<th>Cover</th>
<th>Slope Range (2)</th>
<th>Permissible Velocity (1)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent</td>
<td>Erosion Resistant Soil</td>
<td>Easily Eroded Soils</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(feet per second)</td>
<td>(feet per second)</td>
<td></td>
</tr>
<tr>
<td>Bermudagrass</td>
<td>0-5</td>
<td>8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5-10</td>
<td>7</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>over 10</td>
<td>6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Bahia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffalograss</td>
<td>0-5</td>
<td>7</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Kentucky Bluegrass</td>
<td>5-10</td>
<td>6</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Smooth Brome</td>
<td>over 10</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Blue Grama</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grass Mixtures</td>
<td>0-5 (2)</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Reed Canarygrass</td>
<td>5-10</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Lespedeza Sericea</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weeping Lovegrass</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow Bluestem</td>
<td>0-5 (3)</td>
<td>3.4</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Redtop</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alfalfa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Fescue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Lespedeza</td>
<td>0-5 (5)</td>
<td>3.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Sudangrass (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Use velocities exceeding 5 feet per second only where good covers and proper maintenance can be obtained.
2. Do not use on slopes steeper than 10% except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
3. Do not use on slopes steeper than 5% except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
4. Annuals -- use on mild slopes or as a temporary protection until permanent covers are established.
5. Use on slopes steeper than 5% is not recommended.

*From Soil Conservation Service, SCS-TP-61, *Handbook of channel design for Soil & Water Conservation*
3. Side Slopes

Earthen channel side slopes shall be no steeper than 3 : 1. Flatter slopes may be required to prevent erosion and for the ease of maintenance. Where channels will be lined, side slopes no steeper than 1 1/2 : 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.

4. 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 end of the waterway or through a standard tile outlet.

5. Appurtenant Structures

The design of channels will provide for all structures required for the proper functioning of the channel and the laterals thereto and travelways for operation and maintenance. 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 is also to provide for necessary flood gates, water level control devices, and any other appurtenances affecting the functioning of the channels and the attainment of the purpose for which they are built. The effect 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 bridges that are modified or added as part of channel need for modification or replacement. Culverts and 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.

6. Disposition of Spoil

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

a. Minimize overbank wash;

b. Provide for the free flow of water between the channel and floodplain unless the valley routing and water surface profile are based on continuous dikes being installed;

c. Not hinder the development of travelways for maintenance;
d. Leave the right-of-way in the best condition feasible, consistent with the project purposes, for productive use by the owner;

e. Improve the aesthetic appearance of the site to the extent feasible;

f. Be approved by the IDNR or US Army Corps of Engineers (whichever is applicable) if deposited in the floodway.

7. Channel Lining
   a. Construction

   Specifications shall be in keeping with the preceding standard and shall describe the requirements for proper installation of the facility to achieve its intended purpose.

   b. Materials

   Materials acceptable for use as channel lining are:
   i. Revetment Rip-rap;
   ii. Concrete;
   iii. Hand-Laid Rip-rap;
   iv. Precast Cement Concrete Rip-rap;
   v. Grouted Rip-rap;
   vi. Grass;

   Other lining materials shall receive specific approval of the County Engineer. Materials shall comply with the latest edition of the Indiana Department of Transportation "Standard Specifications."

L. **STORM WATER DETENTION**
The following shall govern the design of any improvement with respect to the detention of storm water runoff:

1. Acceptable Detention Methods

   The increased storm water runoff resulting from a proposed development should be detained on-site by the provision of appropriate wet or dry bottom reservoirs, by storage on flat roofs, parking lots, streets, lawns, or other acceptable techniques.
2. Design Consideration (General)
   a. Control of Overland Flow

   Measures that retard the rate of overland flow and the velocity in runoff channels shall also be used to partially control runoff rate.

   b. Design Storm

   Design of storm water detention and retention facilities shall be based on not less than 24 hours, 100-year storm plus 6% for siltation. The storage volume, outflow rate, and percolation rate shall be sufficient to handle storm water runoff from a 100-year return period (1% probability) storm rainfall depth-duration-frequency shall be those given in Figures 1 and 2.

   c. Ground Water Elevation

   The elevation at which ground water is encountered affects the design and operation of both detention and retention basins.

   A soil boring shall be made at the location of any retention or detention basin to a depth of two (2) feet below the proposed elevation of the bottom of any such basin. This boring log shall show the ground water elevation at the time the boring was completed and 24 hours later.

   This data shall be submitted with the drainage calculations.

3. Allowable Release Rate
   a. Detention Basins

   When there is a stream channel into which water may be released, the release rate shall not exceed the runoff rate for the design storm from the undeveloped drainage area tributary to the detention basin. When there is no defined stream channel into which water may be released, the basin must store the design storm runoff. In the event the natural downstream channel or storm sewer system is inadequate, 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 County Engineer shall be required to store that portion of the runoff exceeding the capacity of the receiving sewers or water ways.

   b. Retention Basins

   For retention basins, anticipated percolation rates as determined by field tests at the basin site may be utilized in computing the retention basin
storage if percolation is considered. If more than one (1) retention basin is involved in the development of the area upstream of the limiting restriction, the allowable release rate from any one retention basin shall be in direct proportion to the ration of its drainage area to the drainage area of the entire watershed upstream of the restriction.

4. Drainage System Overflow Design

The drainage system shall have adequate capacity to convey the storm water runoff from all upstream tributary areas through the development under consideration for a storm of design return period calculated on the basis of the upstream land in its present state of development. An allowance, equivalent to the reduction in flow rate provided, shall be made of upstream detention when upstream detention and release rate has previously been approved by the County Engineer and evidence if its construction can be shown.

5. Determination of Storage Volume

The required volume of storm water storage shall be calculated using the Rational Method for drainage areas of 200 acres or less and based on the runoff from a 100-year return period storm of 24 hour duration. The following thirteen (13) step procedure may be used to determine the required volume of storage. Other design methods may also be used, subject to approval of the County Engineer.

a. Determine total drainage area in acres "A";

b. Determine composite runoff coefficient "Cu" based on existing land use;

c. Determine time of concentration "tc" in minutes based on existing conditions;

d. Determine rainfall intensity "Iu," in inches per hour, based on time of concentration and using Figure 1 or from data given in Figure 1, Page 32;

e. Compute runoff based on existing land use "Qu = Cu Iu Au," or the allowable release rate "O";

f. Determine composite runoff coefficient "Cd" based on developed conditions;

g. Determine 100-year return rainfall intensities "Id" for various storm duration using Figure 1, page 32;
h. Determine developed inflow rate "Qd" for various storm duration times, "td"
\[ Q_d = C_d \ I_d \ A_d \ (Cfs) \]

i. Compute storage rate for various storm durations times, "td"
\[ S_{sd} = A_{sd} \ O \]

j. Compute required storage "S" for each storm duration times "td"
\[ S_r = (S_{sd}) \ \frac{td}{12} \]

k. Select largest storage for detention basin design;

l. Increase by 6% for silt (see Section F, Page 22);

m. For storm water areas in excess of 200 acres follow Section F, page 32.

6. General Detention Basin Design Requirements

Basin shall be constructed to detain temporarily the storm water runoff that exceeds the maximum peak flow rate authorized by this design criteria. 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, 24 hour storm.

The following design principles shall be observed:

a. The maximum volume of water stored and subsequently released at the design rate shall not result in a storage duration period in excess of 48 hours unless additional storms occur within this period.

b. The maximum planned depth of storm water stored (without a permanent pool) shall not exceed four (4) feet.

c. Freeboard will not be required for level or depressed basins. A minimum of two (2) feet of freeboard must be provided at embankment sections as protection from overtopping and potential erosion failure of the embankment.

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

e. All excavated excess spoil shall be spread so as to provide for aesthetic and recreational features such as sliding hills, sports fields, etc. Slopes for detention basins no steeper than six (6) horizontal to one (1) vertical along
roadways and four (4) to one (1) on other sides for safety, erosion control, stability, and ease of maintenance shall be provided.

f. Safety screens will normally be required by the County Engineer to prevent children or large animals from crawling into large structures.

g. Danger signs should be mounted at appropriate locations to warn of deep water, possible flooding conditions during storm periods, and other dangers that exist. Fencing and/or signs shall be provided by the developer, if deemed necessary by the County Engineer.

h. Outlet control structures shall be designed to limit any discharge to that discussed in Section F, Page 22.

i. Emergency overflow facilities such as the weir or spillway shall be provided for the release of exceptional storm discharge devices. The overflow facility shall be of such design that its operation is automatic and does not require manual attention.

j. Grass or other suitable vegetative cover shall be provide throughout the entire basin area. Grass should be cut regularly at approximately monthly intervals during growing season, or as required.

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

l. Hydraulic calculations shall be submitted to substantiate all design features, including percolation rates for retention basins.

7. Dry Bottom Basin Design Requirements

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

a. Provisions shall be incorporated to facilities complete interior drainage of dry bottom basins, to include the provisions of natural grades to outlet structures, longitudinal and transverse grades to perimeter drainage facilities, paved gutters, or the installation of subsurface drains and/or drywells;

b. The detention basin shall, 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. Dry detention and retention ponds shall have
all slopes, bottom of the basin and areas above the high water line 
hydroseeded and hydromulched, and provided further that the high water 
line is not closer than 25 feet to any development boundary.

8. Wet Bottom Basin Design Requirements

Where part of a detention basin 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 basin will not be 
required. A controlled, positive outlet will be required to maintain the design water 
level in the wet bottom basin and provide required detention storage above the 
permanent water level. However, the following additional conditions shall apply:

a. Basins designed with permanent pools or containing permanent ponds shall 
have a water area of at least one half (0.5) acre. If fish are to be stocked, a 
minimum depth of approximately ten (10) feet shall be maintained over at 
least 25% of the pond area. The remaining pond area shall have no 
extensive shallow areas, except as required by sub-section c below. Except 
for those areas of the pond over the side slopes, no area of the permanent 
pond shall be less than six (6) feet in depth;

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

c. A safety ledge four (4) to six (6) feet in width is required and must be 
installed in all ponds approximately 30 to 36 inches below the permanent 
water lever. In addition, a similar maintenance ledge twelve (12) to eighteen 
(18) inches above the permanent water line shall be provided. the slope 
between the two (2) ledges shall be stable and of a material such as stone or 
rip-rap that will prevent erosion due to wave action;

d. A safety ramp exit from the ponds is required in all cases and shall have a 
minimum width of 20 feet and exit slope of six (6) horizontal to one (1) 
vertical. The ramp shall be of a material that will prevent its deterioration 
due to vehicle use and/or wave action;

e. Periodic maintenance is required to ponds to control weed and larval 
growth. The reservoir shall also be designed to provide for the easy removal 
of sediment that will accumulate during periods of reservoir operation. A 
means of maintaining the design water level of the pond during prolonged 
periods of dry weather is also required;

f. For emergency use a basin cleaning and shoreline maintenance plan shall be 
provided to permit emptying and drainage down to or below the natural 
water table elevation;
g. Facilities to enhance and maintain pond water quality shall be provided, if required to meet applicable Water Quality Standards. Design calculations to substantiate the effectiveness of these facilities shall be submitted with the engineering plans. Agreements for the perpetual operation and maintenance of these facilities shall be provided to the satisfaction of the County Engineer and the County Surveyor.

9. Roof Storage

Detention storage requirements may be met in total or in part by detention on flat roofs. Details of such designs to be included in the building permit application shall include the depth and volume of storage, details of outlet devices and downsprays, and elevations of emergency overflow provisions.

10. Parking Lot Storage

Paved parking lots may be designed to provide temporary detention storage of storm waters on all or a portion of their surfaces. Outlets will be designed so as to empty the stored waters slowly. Depths of storage must be limited to a maximum depth of seven (7) inches so as to prevent 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 farther from the area served.

11. Facility Financial Responsibilities

The construction cost of storm water control systems and required facilities that are identified in the Subdivision Ordinance of St. Joseph County shall be accepted as part of the cost of land development.

12. Facility Maintenance Responsibility

Maintenance of detention/retention facilities during construction, and thereafter, shall be the responsibility of the land developer/owner. Assignment of responsibility of maintaining facilities serving more than one (1) 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. Storm water detention and retention basins must be maintained by a Property Owners Association established covenants of the subdivision unless the basin(s) is accepted as an urban drain by the County Drainage Board. However, the detention or retention pond must be platted as a part of two (2) or more adjoining lots in the subdivision. Separate out lots or the basin(s) will not be approved.
13. Inspections

All public and privately owned detention storage facilities may be inspected by representatives of the County. After any such inspection a certified inspection report covering physical conditions, available storage capacity, and operational condition of key facilities elements will be provided to the owner.

14. Corrective Measures

If deficiencies are found by the inspector, the owner of the detention/retention facility will be required to take the necessary measures to correct such deficiencies. If the owner fails to do so, the County will undertake the work and collect from the owner using lien rights if necessary.

15. Joint Development of Control System

Storm water control systems may be planned and constructed jointly by two (2) or more developers as long as compliance with this Ordinance is maintained.

16. Installation of Control Systems

Runoff and erosion control systems shall be installed as soon as possible during the course of site development. The County Engineer will require an erosion control plan to be submitted as part of the construction plans and specifications. Detention/retention basins shall be designed with an additional 6% of available capacity to allow for sediment accumulation resulting from development and to permit the pond to function for reasonable periods between cleanings. Basins shall be designed to collect sediment and debris in specific locations so that removal costs are kept to a minimum.

17. Detention Facilities in Floodplains

If detention storage is provided within a floodplain, only the increase in storage volume above that 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 provided.

18. Off-Site Drainage Provision

When the allowable runoff is released in an area that is susceptible to flooding, the developer may be required to construct appropriate storm drains through such an area to avert an increased flood hazard caused by the concentration of allowable runoff at one (1) point instead of the natural overland distribution. The requirement of off-site drains shall be at the discretion of the County Engineer.

50
a. **Sheet Flow**

The allowable release rate as defined herein may be allowed to flow off site of the property if the owner, developer, designer, or builder can demonstrate that the off-site flow has not been concentrated.

b. **Concentrated Flow**

When potential off-site flow is concentrated such as a storm sewer outlet, a swale, or a detention/retention pond overflow, the total flow from the design storm must be retained on-site.

19. **Temporary Detention Basin**

If the overall design of a project requires detention or retention basins and the development time-table is such that the basins are in the future planning, as opposed to being in the present development state, then provisions must be made for temporary basins to receive the storm drainage until the permanent basins are constructed and connected to the development.

20. **Erosion Control**

Erosion control plans shall be submitted as part of the construction plans and specifications and shall include the following:

a. **Temporary erosion control measures necessary during the initial construction establishment phases up to final site grading and seeding;**

b. **A permanent erosion control plan of all the graded and non-hard surface areas within the proposed development, as planned for completion, up to and including seeding of the final lot on which business or residential dwellings are to be placed;**

c. **Details concerning removal of temporary erosion control devices after the initial establishment of adequate vegetative cover;**

d. **Maintenance procedures, as part of the continuing plan, to deep all of the land under adequate cover and erosion at an acceptable minimum.**
<table>
<thead>
<tr>
<th>TABLE 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>EROSION CONTROL</td>
</tr>
</tbody>
</table>

| Basins: | Full rural type (R) seeding on complete basin including topsoil and fertilizer. Side slopes shall be no steeper than a 4 : 1 ratio. |
| Swales: | Same as Basin. |
| Ditches: | 0 - 2.0% Grade -- Same as Basins. |
| | 2.1% - 4.0% Grade -- Sodded invert and seeding as in Basins. |
| | 4.0% and greater -- Concrete, stone, block, or brick lined per type required, sod along edge of lining and Basin-type seeding. |
| Culverts: | Sodded inlets and outlets and special riprap when entering or exiting ditch exceeds 4% grade. |
21. **Certifications Required**

After completion of the project and before final approval, plat recording, release of bonds, and acceptance can be made, professionally prepared, and certified "As Built" set of plans shall be submitted to the County Engineer for review. These plans shall include all pertinent data relevant to the completed storm drainage system and shall include:

a. Pipe size and pipe materials;

b. Invert elevations;

c. Top rim elevations;

d. Lengths of all pipe structures;

e. Submit data and calculations showing detention basin storage volume;

f. Certified statement on plans saying the completed storm drainage system substantially complies with construction plans as approved by the County Engineer.

22. **Review**

All such submitted plans shall be reviewed for compliance within 30 days after submission to the County Engineer. If notice of non-compliance is not given within 30 days of submission of the plans, the plans shall be construed as approved and accepted.

23. **Change in Plans**

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 County Engineer prior to the land development involving the change. Copies of the changes, if approved, shall be attached to the original plans and specifications.

**M. DETERMINATION OF IMPACT DRAINAGE AREAS**

The County Engineer is authorized, in cooperation with the County Surveyor, but is not required to classify certain geographical areas as impact drainage areas and to enact and promulgate regulations that are generally applied. In determining impact drainage areas, the County Engineer shall consider such factors as topograph, soil type, capacity of existing legal drains, and distance from an adequate drainage facility. The following areas shall be designed as impact drainage areas, unless good reason for not including them is presented to and accepted by the County Engineer.
1. Designated Areas
   a. A floodway or floodplain as designated by the IDNR;
   b. Land within 75 feet of each bank of any regulated drain;
   c. Land within 75 feet of the centerline of any regulated drain title. Land where there is not an adequate outlet, taking into consideration the capacity and depth of the outlet, may be designated as an impact drainage area by the County Engineer. Special requirements for development within any impact drainage area shall be included in any decision of the County Engineer.

2. Other Requirements
   a. 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.
   b. Down Spouts and Roof Drains
      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.
      Down spouts/roof drains shall not drain either overland or through a buried conduit, directly into a paved street. This storm water may drain into a roadside ditch when approved by the County Engineer. Flow over or through a curb will not be permitted.
   c. 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 sewers.
   d. Basement Floor Drains
      Basement floor drains shall be connected to the sanitary sewers.
e. Drainage Systems

The drainage system including both conduit and swales, etc., shall be maintained by the developer until formally accepted by the County. A conduit or swale between two (2) lots for example, will not be accepted by the County or into an urban drain until construction, grading, and landscaping of both lots is complete.

N. MISCELLANEOUS REQUIREMENTS

1. Disclaimer of Liability

The degree of protection required by this design criteria is considered reasonable for regulatory purposes and is based on historical records, engineering, and scientific methods of study. Larger storms may occur or storm water runoff depths may be increased by manmade or natural causes. This design criteria does not imply that land uses permitted will be free from storm water damage. This design criteria shall not create liability on the part of St. Joseph County or any officer, employee, or agent thereof for any damage that may result from reliance on this design criteria or on any administrative decision lawfully made thereunder.

2. Corrective Action

Nothing herein contained shall prevent St. Joseph County from taking such other lawful action as may be necessary to prevent or remedy any violation. All costs connected herewith shall accrue to the person or persons responsible.

3. Responsibility of Design Engineer

All work to meet the requirements herein and to review the work to determine if the requirements are met shall be accomplished according to the laws of the State of Indiana with regard to Registered Professional Engineers and Registered Land Surveyors.

4. Repealer

All design criteria or parts thereof in conflict with the provisions of this work are repealed, except where established by formal legislative action.
<table>
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<th>2</th>
<th>5</th>
<th>10</th>
<th>25</th>
<th>50</th>
<th>100</th>
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</table>

**Table 8**
RAINFALL DEPTHS FOR VARIOUS RETURN PERIODS AND STORM DURATIONS
DEPTH (INCHES)
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<th>Duration</th>
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<th>25</th>
<th>50</th>
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<tr>
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<tr>
<td>10 min.</td>
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<td>6.00</td>
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<td>30 min.</td>
<td>2.20</td>
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<tr>
<td>3 hrs.</td>
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<td>0.87</td>
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<tr>
<td>6 hrs.</td>
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<td>0.45</td>
<td>0.50</td>
<td>0.58</td>
<td>0.63</td>
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<tr>
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### TABLE 10

**DETENTION STORAGE VOLUME EXAMPLE WORKSHEET**

Example using procedure outlined on Pages 45 and 46 to determine detention storage volume.

Area = 40 Acres  
Allowable Release Rate "O" = 18.30 cfs (for 10-Year Storm)  
Composition Developed Runoff Coefficient "Cd" - 0.45  
Detention Storage Volume Required = 2.66 Acres/Feet

<table>
<thead>
<tr>
<th>Storm Duration &quot;td&quot; (hours)</th>
<th>100-Year Intensity &quot;Id&quot; (in./hr.)</th>
<th>Inflow Rate &quot;Qd&quot; (cfs)</th>
<th>Allowable Release Rate &quot;O&quot; (cfs)</th>
<th>Storage Rate &quot;Std&quot; (cfs)</th>
<th>Require Storage &quot;Sr&quot; (acres/feet)</th>
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<td>18.30</td>
<td>---</td>
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<tr>
<td>5.00</td>
<td>0.84</td>
<td>---</td>
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</tbody>
</table>
O. DRAFTING REQUIREMENTS

1. Drafting Plates:
   a. All 24" X 36" size;
   b. Standard title sheet;
   c. Federal Aid Type Plan and Profile Sheets, preferably with no title blocks;
   d. Federal Aid Type Drafting Plates, preferably with no title blocks;
   e. Federal Aid Cross Section Sheets on a 10 X 10 scale, either single or double row.

2. Title Sheet (County Standard Drawing DT-4):
   a. Complete data entered;
   b. Lettering to be LeRoy or equal
      i. Street Name: 350 minimum
      ii. Limits: 290 minimum
      iii. Reminder: 140 minimum
   c. APC Primary Plat approval must be dated;
   d. Title Sheet to be numbered "Sheet 1" at all times.

3. Detail Sheets:
   a. Approved primary plat for complete subdivision delineating previous
      sections approved for final recording and/or construction, the section(s)
      covered by these drawings, and future sections;
   b. Approved master drainage plan;
   c. Typical pavement sections keyed to streets, including thickness and type of
      pavement (1" = 4' H & 1" = 2' V);
   d. Drainage structures (scale as needed);
   e. Drainage swales and basins shall be detailed either in this section or shown
      in the cross-sections;
   f. Intersection design, grading, and jointing (1" = 20');
g. Any other construction details needed for correct interpretation of the designer's ideas;

h. Detailed estimate of quantities for each section encompassed in the drawings. The estimate shall be done in strict accordance with the County Specifications for nomenclature and method of measurement;

i. The sequence of Detail Sheet shall be:
   i. Approved Primary Plat (Sheet 2);
   ii. Approved Master Drainage Plan (Sheet 3);
   iii. Typical pavement sections, quantity estimates, and details (Sheet 4);
   iv. Drainage design details and other details to follow sequentially as needed;
   v. Soil logs if used (See Section R – Pavement Design).

4. Plan and Profile Sheets
   a. Plan and Topography
      i. North Arrow;
      ii. All improvements showing curbs, pavement, structures, walks, utility locations, and other pertinent design data (1" = 50' maximum);
      iii. All horizontal alignment shown as:
         a. PI Station
         6. PC Station
         γ. PT Station
         δ. Δ -- Degrees, Minutes, & Seconds or Decimals
         ε. D -- Degree of Curve
         ζ. R -- Radius of Curve
         η. T -- Tangent of Length
         θ. L -- Length of Curve
i. E -- Mid Ordinate Offset

iv. Lot line, lot numbers, and easements;

v. Station equations at intersections and street names;

vi. Structures fully nomenclated and referenced.

b. Profile

i. Existing center line profile and elevations at maximum of 50 feet intervals;

ii. Proposed C.L. profile and finished elevations at maximum of 50 feet intervals. If the street varies from the typical section then the profile of the top of curbs shall be shown, along with the transition from the typical section to the special section. Elevations shall be marked at 25 feet intervals or closer if necessary;

iii. Profiles shall be plotted with stations on solid vertical lines, matched with plan;

iv. All vertical curve data shown as:
   α. PVI Station
   β. PVI Elevation
   γ. VC Length
   δ. e Mid Ordinate Correction

5. Drawings Required

a. Retention/Detention Basins

i. Full plan showing all structures, flow lines, erosion control, and landscaping (1" = 50');

ii. Plan shall show existing proposed contour at two (2) feet intervals or full cross-sections at 25 feet intervals in Cross Section sheets.

b. Sewers and Channels

i. Profiles and plans of all sewers on Plan and Profile sheets with all structures plotted to grade;

ii. Each structure shall be plotted to scale on Plan and Profile and noted as:
α. Sewers -- Storm and Sanitary
STRUCTURE NO.
L.F. of _________ (Type *) Pipe
Connect to Structure No.
Upper I.E.
Lower I.E.
*Refer to Pipe Table for Types of Pipe allowed.

δ. Structures -- Manholes, Inlets, Paved Ditch, etc.
STRUCTURE NO.
Type (Type *) Connect to Str. No.
Top of Casting Elev. _______ Ty. **
I.E.
*Refer to County Standard Drawings or Details
**Refer to County Standard Drawings

γ. Drywells
STRUCTURE NO.
(Capy.) Gals. Bottom Elev.
Top of Casting Elev. _______ Ty. *
Inlet I.E. **
Outlet I.E. **
*Refer to County Standard Drawings
**For Battery Construction Only

δ. Culvert
STRUCTURE NO.
L.F. of _________ (Type *) Pipe
and _________ end sections. _______ S.Y. Sod
each end or _________ S.Y. Rip-rap each end.
Upper I.E.
Lower I.E.
*Refer to Pipe Tables for Types of Pipe allowed

ε. Channel -- Ditches and Swales
STRUCTURE NO.
L.F. of Ty. ** Swales.
S.Y. of Seeding.
S.Y. of Sodding.
S.Y. of Rip-Rap
at connections with (Name) Stream.
*Refer to County Standard Drawings or Details
iii. It will be necessary to combine some of the above notes at times. Please keep in mind that the note is meant as an instruction to the contractor and should be clear, concise, and complete;

iv. All structures shall be numbered consecutively as near as possible, beginning at the low end of the run. Do not use letter suffixes;

v. The types of pipes and structures shall be as shown in the County Standards;

vi. Profiles and alignments of ditches and swales shall be on Plan and Profile Sheets.

6. Public Road Approaches
   a. Profile of county road ditch to point of discharge if the ditch is to be utilized in any manner for use;
   
   b. Profile shall be plotted on Plan and Profile sheets and shall show any and all county road culverts or sewers utilized;
   
   c. Also see cross section requirements at public road approaches.

7. Stage or Section Development
   a. A receiving structure (basin, channel, ditch, sewer, etc.) must be designed and included in the section submitted if it is, or will be, needed for the receiving or conveyance of storm water.
      i. This shall be interpreted to mean that if any drainage work that is placed within a subsequent section that is needed to make a previous section drainage system operable, it must be designed and built within the previous section;

      ii. The final receiving structure must be covered by adequate surety if a temporary or intermediate structure is approved for use.

P. **HYDRAULIC DATA**
   All work shall show the pertinent data used in the design of each structure.

Q. **CONSTRUCTION OF CASTINGS**
   Whenever an asphalt base course has been placed and the asphalt surface course will not be placed until the following paving season, all castings in that street must be placed at the elevation of the bituminous base course and then adjusted using approved adjusting rings as the surface course is placed.
PAVEMENT DESIGN

1. Basis of Design

Comparison of traffic on an existing public highway with a proposed subdivision street is quite difficult, and many publications attempt to do this. In reality, it is not difficult to measure existing traffic on a highway and project these volumes to a future year. The highway is an established route, fits a geographical area, and is performing a definite service. The only variable is the growth factor.

In determining the future traffic in a subdivision, the same parametrics have been used. Proof that this method has many deficiencies is visible in our several hundred miles of subdivision streets constructed since the late 1950's. Even since the arrival, in the late 1960's, of certain design equations for bituminous pavements, the results of the analysis have revealed certain variable results when applied to subdivision streets. Based on this premise, an in-depth analysis procedure was performed. The following data is basic to this procedure:

a. The Asphalt Institute's method of deriving the design traffic number was selected for both flexible and rigid pavements;

b. The American Association of State (and Transportation) Officials and the Indiana State Highway Commission for material coefficients of strength are acceptable;

c. A Serviceability Index of two and one half (2.5) at 20 years;

d. The California Bearing Ration (CBR) for subgrade strength for flexible pavement design with a corresponding modules of subgrade reaction (k) for rigid pavement design was accepted;

e. Since a subdivision street has 0 length, the County's traffic analysis was based on a 100 foot centerline length of pavement. This length allows for the construction of a structure on each side, or two (2) structures per 100 feet;

f. The heaviest traffic using the street is during the actual construction of the street, utilities, and structures;

g. The function of the street, collector, minor, or cul-de-sac has a definite bearing on the traffic using the street;

h. The function of a street becomes critical in the volume of construction traffic using the street for delivery of materials, equipment, and personnel to feeder streets. A basic analogy would be the different sites needed for local,
collector, and trunk sewers. The use of a street varies directly with its location and relation to other streets;

i. Street widths are based on those widths shown in the County Standards. Edge curbing is to be provided. For information the widths are as follows, back-to-back, of curb:
   i. Arterial = by County design;
   ii. Collector = 38 feet;
   iii. Minor = 28 feet;
   iv. Cul-de-sac = 50 feet radius.

j. Right-of-way widths are based on those shown in the County Standards. The widths are as follows:
   i. Arterial = minimum of 80 feet;
   ii. Collector = 40 feet with ten (10) feet Public Easement on each side with a total easement width of 50 feet;
   iii. Cul-de-sac street = shall be the same as a minor street;
   iv. Cul-de-sac turn-around = 50 feet with a ten (10) feet easement (total of 60 feet radius, 120 foot diameter) for utilities, drainage, operation, and maintenance of the street.

NOTE: The ten (10) feet easement as listed above shall be labeled "10' easement for utilities, drainage, operation, and maintenance of public streets." Utilities shall include but not limited to electricity, telephone, cable TV, gas, sanitary sewer, storm sewer, and potable water.

2. Subgrade Evaluation
   a. The consultant has the option of retaining a Soils Consultant for actual evaluation or accepting the minimum requirements as set forth by the County;
   b. California Bearing Ratio (CBR) shall be the basis of pavement thickness design;
   i. The CBR is not the basis of determination whether the subgrade qualifies as subbase in the County Specifications. Only mechanical analysis will be accepted for this test.
c. Compacted densities prior to paving of the subgrade shall be:
   i. Embankment: 95% of maximum density;
   ii. Excavated Area: 100% of maximum density in top six (6) inches.

d. Densities to be measured based upon Standard Proctor.

3. CBR Determination
   a. Two (2) CBR's shall be taken in each soil series as delineated on the Soils Survey map and at least one (1) for every 1,000 feet of pavement within a series;
      i. Proof will be required that this CBR is representative of the soil at the final elevation of the subgrade at the location of the test.

   b. The CBR results within each soil series shall be weighted in relation to the number taken;

   c. The percentages derived shall be plotted against the CBR results for determination of the 95% value, which shall be used for design;

   d. See Example on form attached, Page **;

   e. If only two (2) CBR's are taken for a certain soil series, 90% of the average of the two (2) shall be used for design;

   f. A sample form is attached which can be copied for submission to the County.

4. Traffic Determination
   a. The following traffic numbers have been analyzed and computed by the County and are the basis of traffic determination, and are based on a distance of 100 linear feet of pavement:
      i. Arterial Street = by County analysis;
      ii. Collector Street = eleven (11);
      iii. Minor Street = eight (8);
      iv. Cul-de-sac (28 feet BB) = seven (7).

5. Method of Design
   a. Each street is measured in stations on the Preliminary Plat;
b. The length of the street times the traffic number equals the equivalent axes for that street;

c. The design traffic number for each street is derived by accumulating the traffic numbers from feeder streets;

d. The design traffic number is used in the Pavement Design Charts for the total thickness of the pavement;

e. See the attached SAMPLE DESIGN on page *** for an example. A sample form is also attached which can be copied for submission to the County;

f. Coefficients of materials used for other types of flexible bases:
   i. HAC Base = 0.34 (1.00"");
   ii. Bit. Stab. Base = 0.24 (1.12"");
   iii. Recycled Asphalt Pavement (RAP) = 0.21;
   iv. Stone or Slag Base = 0.17 (2.00"");
   v. Gravel Base = 0.14 (2.43"").

g. If any of the above materials are substituted for the total depth of HAC Base as determined in the Design Chart then the thickness shall be increased by the factor following the coefficient:

   EXAMPLE: 6" HAC Base = 6 X 2.43 = 14.58" Gravel
             6 X 2.99 = 12.00" Stone

h. Working stress in concrete = 550 psi;
i. Modules of subgrade reaction shall be correlated to the CBR as follows:

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<th>CBR</th>
<th>K</th>
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</tr>
<tr>
<td>12 - maximum</td>
<td>216</td>
</tr>
</tbody>
</table>

j. Serviceability Index will be two and one half (2.5) for a design period of 20 years on all pavements.

6. Minimum Designs
   a. Rigid Pavement
      i. Thickness = six (6) inches;
      ii. Reinforcement = none;
      iii. Joint Steel = see standard drawings PJ-1;
      iv. Joint Arrangement = see standard drawing PJ-1;
      v. Subbase = maximum of 8% passing No. 200 sieve, minimum depth of four (4) inches.

      NOTE: Base can be used if surface course is increased to 125#/S.Y. or Equivalent Aggregate Base.

S. **EROSION CONTROL**

1. Rule Five (5)

   No subdivision will be approved for construction until the design requirements of Rule Five (5) are met. The County Soil and Water Conservation Office shall indicate compliance before final approval will be given.

2. Drainage

   Erosion into drainage features including swales, detention basins, and retention basins must be removed and permanent erosion control measures such as sod and rip-rap must be in place before the storm drainage system will be accepted.
3. Streets

Erosion onto streets must be prevented. If erosion does occur onto a paved surface it must be removed and the street cleaned. The County Engineer may require water to be used at the engineer's discretion.

4. Lot Improvements
   a. The requirement to control erosion shall extend to the development of individual lots;
   b. Erosion control fencing, straw bales, sod, or other means of erosion control shall be used to prevent erosion onto other lots or public streets;
   c. Any erosion that escapes from a lot must be removed or cleaned daily. If it becomes necessary for the County to remove eroded dirt from a public street, the County will seek recovery of all associated costs, first from the contractor's bond and secondly from the property owner and liens will be filed where necessary;
   d. If the owner/developer wishes to transfer responsibility for erosion control to an individual lot or property owner, the form included on Page 71 must be completed and forwarded to the County Engineer with a copy to the Soil and Water Conservation Office.
ST. JOSEPH COUNTY
EROSION CONTROL PLAN SUBMITTAL FORM

PROJECT NAME:______________________________________________________________

LOCATION:  COUNTY______________________CIVIL TOWNSHIP____________________

LEGAL DESCRIPTION
_______________________________________________________________________

TOWNSHIP______________RANGE__________

TYPE OF PROJECT:___________________________________________________________

DATE OF SUBMITTAL:__________________________________________________________

DEVELOPER:______________________________________________________________

ADDRESS:_________________________________________________________________

PHONE:__________________________FAX:__________________________

AREA CODE                     AREA CODE

EROSION CONTROL PLANNER:____________________________________________________

ADDRESS:_________________________________________________________________

PHONE:__________________________FAX:__________________________

AREA CODE                     AREA CODE

PRINCIPAL RESPONSIBLE PARTY (is the person/corporation designated to see that the
erosion and sediment control is implemented):

ADDRESS:_________________________________________________________________

PHONE:___________________________________________________________________

AREA CODE

DISTRICT CONTACT PERSON:

ST. JOSEPH COUNTY SWCD, 60455  U.S. 31 SOUTH, SOUTH BEND, IN 46614

(219/291-2300 OR FAX 219/291-5472)

COUNTY NOTIFICATION DATE:_________________________________________________
EROSION CONTROL TRANSFER OF RESPONSIBILITY NOTIFICATION

Mail this form to:
IDEM, Office of Water Management
Permits Section, Stormwater Desk
100 North Senate Avenue
Indianapolis, IN 46206-6015

Subdivision Name:__________________________________________________________

Name and Address of
Developer:______________________________________________________________

Erosion & Sediment Control Plan Preparer:__________________________

______________________________________________________________

Party initially responsible for implementation and maintenance of the erosion and sediment control plan at the above subdivision site:

______________________________________________________________

______________________________________________________________

The following Contractor/Landowner accepts, as of the date below, responsibility for implementation and maintenance of erosion and sediment control measures for the following described land:

in accordance with 327 IAC 15-5, "Rule 5" as described in the "Indiana Handbook for Erosion Control in Developing Areas" and as outlined on the Soil Erosion Control Plan submitted to the St. Joseph County Soil and Water Conservation District on the following date: ____________________, for the above referenced subdivision. Once construction is completed for the above described land, the responsible party, noted below, must notify the Indiana Department of Environmental Management of this fact in writing to the above referenced address.

Signature:______________________________________________________________

Printed Name:____________________________________________________________

Company Name (if applicable):_____________________________________________

Address:________________________________________________________________

City:_________________________________________ State:__________ Zip:________

Date Responsibility Accepted:______________________________________________
SAMPLE

Re: SURETY EXPIRATION SUBDIVISION

Dear Mr.

Surety for the improvements in the above referenced subdivision are scheduled to expire in sixty (60) days (date here).

This subdivision is not 80% complete, the stage at which final improvements can be made and the County can accept the improvements. Please arrange to extend the Surety for an additional period of one (1) year. This revised Surety should be submitted at least thirty (30) days prior to the expiration date of the existing Surety.

If no action is taken by (date here), the County will foreclose on the existing Surety and hold the funds, until the subdivision is ready for final paving. Any expenses in excess of the Surety will be invoiced to you.

Your cooperation in this matter will be appreciated.

Very truly yours,

County Engineer
SAMPLE

Re: SURETY EXPIRATION

SUBDIVISION

Dear

The Surety on the above referenced subdivision is due to expire in sixty (60) days (date here).

This subdivision has been developed to the point that all improvements are to be completed.

Please advise this office before (date here) of your schedule to complete these improvements. After (date here) it will be necessary for the County to use the Surety to complete the improvements.

Your cooperation in completing these improvements will be appreciated.

Very truly yours,

Rollin E. Farrand, P.E.
County Engineer

REF:bvb

cc: Files
PAVEMENT DESIGN CONT. (FROM PAGE 68)
7. The minimum flexible (asphalt) pavement thickness shall be seven inches and adhere to the following typical section:

One Inch of HMA Surface, 9.5 mm, Mainline, PG 70-22, Type "B"
Two Inches of HMA Intermediate, 12.5 mm, Mainline, PG 64-22
Four Inches of HMA Base, 25 mm, Mainline, PG 64-22

The asphalt and aggregates shall meet 1999 INDOT Specifications (402 as currently revised). Local aggregates may be used in the HMA Base only. The Developer shall direct the Contractor to submit mix designs and job mix formulas for approval one week prior to paving. Any pavement placed without notification or prior to an approved mix design shall be rejected by St. Joseph County.

Material testing shall be the responsibility of the Developer/Contractor and the results forwarded to St. Joseph County. St. Joseph County shall have the opportunity to utilize the Contractor's facilities and testing equipment as necessary to test the respective mixes.

Frequency for testing shall be one asphalt sample for every 500 TN of mix placed, or if less than 500 TN is placed, a minimum of one sample per day per mix. County shall also require one core per road in the subdivision at a location directed by the County. Coring shall occur prior to placing the surface course.

APPROVED THIS 2 DAY OF SEPT., 2003
BOARD OF COMMISSIONERS OF
COUNTY OF ST. JOSEPH, INDIANA

[Signature]
Cynthia A. Bodle, President

[Signature]
Mark A. Dobson, Vice President

[Signature]
David L. Niesgods, Member
Section DRAINAGE (Continued from page 16)
2. Purpose
d. The design, construction, and maintenance of stormwater drainage facilities and systems and stormwater quality measures.

Section STORM WATER DETENTION (Continued from page 44 – added as second sub-point)
3. Allowable Release Rates
   a. Detention Basins
      2. Approved releases are subject to further consideration of stormwater quality measures and best management practices to minimize potential pollutants entering receiving waters. Landowner/developer must submit proposed measures and practices for any approved release on the required stormwater pollution prevention plan for consideration, review and approval.

12. Facility Maintenance Responsibility (Continued from page 49 – remove existing text and replace with statements below)

Maintenance of detention/retention facilities during construction, and thereafter, as well as stormwater quality measures and practices, where applicable (private development), shall be the responsibility of land developer/owner. Assignment of responsibility of maintaining facilities serving more than one (1) 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. Stormwater detention and retention basins must be maintained by a Property Owners Association established covenants of the subdivision unless the basin(s) is accepted as an urban drain by the County Drainage Board. However, the detention or retention pond must be platted as a part of two (2) or more adjoining lots in the subdivision. Separate out lots or the basin(s) will not be approved.

On private sites, landowner/developer is required to follow the post-construction requirements identified in the site’s stormwater pollution prevention plan.

20. Stormwater Pollution Prevention Plan (SWPPP)/Erosion Control (Continued from page 51 - remove existing text and replace with statements below)

The SWPPP shall be submitted as part of the construction plans and specifications, shall meet St. Joseph County Ordinance 33-06, and include the following, but not limited to:

a. Temporary erosion control measures necessary during the initial construction establishment phases up to final site grading and seeding;

Revisions shown in Italics.
Each revision to be incorporated in the body of the text of each Section and Page No. identified
b. A permanent erosion control plan of all the graded and non-hard surface areas within the proposed development, as planned for completion, up to and including seeding of the final lot on which business or residential dwellings are to be placed;

c. Details concerning removal of temporary erosion control devices after the initial establishment of adequate vegetative cover;

d. Maintenance procedures, as part of the continuing plan, to keep all of the land under adequate cover and erosion at an acceptable minimum.

e. Post-construction stormwater control Design Standards shall include requirements for a post-construction stormwater pollution prevention plan for new development and redevelopment areas that disturb one or more acres of land. This plan must meet the requirements of 327 IAC 15-5-6.5 (a) (8), including:

i. A description of potential pollutant sources from the proposed land use that may reasonably be expected to add a significant amount of pollutants to stormwater discharges.

ii. Location, dimensions, detailed specifications, and construction details of all post-construction stormwater quality measures.

iii. A description of measures that will be installed to control pollutants in stormwater discharges that will occur after construction activities have been completed. Such practices include infiltration of run-off, flow reduction by use of open vegetated swales and natural depressions, buffer strip and riparian zone preservation, filter strip creation, minimization of land disturbance and surface imperviousness, maximization of open space, and stormwater retention and detention ponds.

iv. A sequence describing when each post-construction stormwater quality measure will be installed.

v. Stormwater quality measures that will remove or minimize pollutants from stormwater runoff.

vi. Stormwater quality measures that will be implemented to prevent or minimize adverse impacts to stream and riparian habitat.

vii. A narrative description of the maintenance guidelines for all post-construction stormwater quality measures to facilitate their proper long term function. This narrative description shall be made available to future parties who will assume responsibility for the operation and maintenance of the post-construction stormwater quality measures.

The post-construction stormwater control design standards shall also contain the following provisions:

- Infiltration practices will not be allowed in wellhead protection areas.

Revisions shown in Italics.
Each revision to be incorporated in the body of the text of each Section and Page No. identified
• As site conditions allow, plan requires an appropriately sized vegetated filter strip with along unvegetated swales/ditches.
• Discharges from the MS4 area will not be allowed directly into sinkholes or fractured bedrock, without treatment that results in the discharge meeting Indiana ground water quality standards as referenced in 327 IAC 2-11.
• As site conditions allow, the rate at which water flows through the MS4 conveyances shall be regulated to reduce outfall scouring and stream bank erosion.
• Post-construction stormwater pollution prevention practices shall meet the St. Joseph County Ground Water Protection Ordinance.

APPROVED THIS 21 DAY OF Jan, 2014
BOARD OF COMMISSIONERS OF
ST. JOSEPH COUNTY, INDIANA

Andrew T. Kostielney, President
M. G. McClure, Vice President
Dave Thomas, Member

Revisions shown in Italic.
Each revision to be incorporated in the body of the text of each Section and Page No. identified