



**LIBERTY COUNTY**

**SUBDIVISION AND DEVELOPMENT**

**REGULATIONS**

Revised January 2019

## ***TABLE OF CONTENTS***

<b>SECTION 10 - DEVELOPMENT REGULATIONS IN GENERAL .....</b>	<b>3</b>
Sub-Section 1 - Purpose .....	3
Sub-Section 2 - Applicability .....	3
Sub-Section 3 - Definitions .....	5
Sub-Section 4 - Delegation of Authority, Appeals and Public Records .....	12
Sub-Section 5 - Outstanding Tax Liabilities .....	12
Sub-Section 6 - Fees .....	12
Sub-Section 7 - General Application and Approval Procedures .....	14
Sub-Section 8 - Administrative Authorization and Variances .....	17
Sub-Section 9 - General Notice Requirements .....	18
Sub-Section 10 - Sub-Section Not Used .....	19
Sub-Section 11 - Development Approvals .....	19
Sub-Section 12 - Filing Record Documents with the County Clerk .....	21
Sub-Section 13 - Enforcement and Penalties .....	22
Sub-Section 14 - Conflicts of Interest .....	24
Sub-Section 15 – Termination and Modification of Development Approvals .....	24
Sub-Section 16 – Assignment of Road Numbers and Addresses .....	25
 <b>SECTION 20 - SUBDIVISION AND PLATTING OF PROPERTY .....</b>	 <b>26</b>
Sub-Section 1 - Applicability .....	26
Sub-Section 2 - General Subdivision Requirements .....	26
Sub-Section 3 - Exemptions .....	28
Sub-Section 4 - Revision and Cancellation .....	30
Sub-Section 5 - Master Plan Information .....	32
Sub-Section 6 - Application Procedures .....	34
Sub-Section 7 - Minimum Lot Setbacks .....	37
Sub-Section 8 - Easements .....	38
Sub-Section 9 - General Requirements for Preliminary Plats .....	38
Sub-Section 10 - Preliminary Plat Submittal .....	42
Sub-Section 11 - Approval of Preliminary Plat .....	43
Sub-Section 12 - Final Plat .....	43
Sub-Section 13 - Approval of a Final Plat .....	47
Sub-Section 14 - Record Plat .....	48
Sub-Section 15 - Construction Plans .....	49
Sub-Section 16 - Plat Revisions .....	49
 <b>SECTION 30 - WATER AND WASTEWATER AVAILABILITY .....</b>	 <b>53</b>
Sub-Section 1 - Applicability .....	53
Sub-Section 2 - Water and Wastewater Service Engineering Report Contents .....	54
Sub-Section 3 - Additional Information Required for Water Systems .....	58

<b>SECTION 40 - ROADWAY STANDARDS .....</b>	<b>61</b>
Sub-Section 1 - Applicability.....	61
Sub-Section 2 - General Engineering Standards.....	61
Sub-Section 3 - Roadway Design Report.....	62
Sub-Section 4 - Roadway Classifications .....	63
Sub-Section 5 - Public Roadways .....	64
Sub-Section 6 - Private Roadways .....	65
Sub-Section 7 - Standards for Regulated Roadways.....	67
Sub-Section 8 - Construction Plans and Requirements.....	73
Sub-Section 9 - Construction Requirements for Paving and Drainage Improvements.....	78
 <b>SECTION 50 - DRAINAGE STANDARDS .....</b>	 <b>92</b>
Sub-Section 1 - Applicability.....	92
Sub-Section 2 - Public Facilities .....	100
Sub-Section 3 - Design Criteria .....	101
Sub-Section 4 - Areas Subject to Local Water Quality Requirements.....	154
Sub-Section 5 - Incentives for Lots Larger Than Five Acres .....	155
 <b>SECTION 60 - CONSTRUCTION, ACCEPTANCE OF MAINTENANCE, AND SECURITY .....</b>	 <b>156</b>
Sub-Section 1 - Applicability.....	156
Sub-Section 2 - Construction .....	157
Sub-Section 3 - Construction Security .....	161
Sub-Section 4 - Acceptance of Public Infrastructure for Maintenance.....	161
Sub-Section 5 - Financial Assurance .....	163
 <b><u>APPENDIX</u></b>	
Appendix A	Application Forms and Checklists
Appendix B	Subdivision Process Flow Charts
Appendix C	Standard Plat Notes and Certifications
Appendix D	Sample Form for Water and Wastewater Service Agreement
Appendix E	Appendix E Not Used
Appendix F	Concrete Pavement Details Contraction Design
Appendix G	TXDOT Special Specification 3016 for Roller Compacted Concrete
Appendix H	Standard Forms for Construction and Maintenance Security
Appendix I	On Site Sewage Facilities Order
Appendix J	Liberty County Flood Damage Prevention Ordinance (Under Separate Cover)

## **SECTION 10 - DEVELOPMENT REGULATIONS IN GENERAL**

### ***Sub-Section 1 – Purpose***

#### **10.1.01. Purpose**

These Subdivision and Development Regulations have been adopted by Order of the Liberty County Commissioners Court to provide for orderly and efficient development of areas of Liberty County. The various departments, agencies, entities, employees, and agents of Liberty County are directed to implement these regulations and are authorized to do so as outlined herein.

The purpose of these Regulations is to implement the powers and duties of the County authorized under the Texas Water Code, the Texas Health and Safety Code, the Texas Local Government Code and other laws, to establish the policies of the Commissioners Court and to set forth procedures to be followed in County proceedings in regulating certain activities associated with development in Liberty County.

#### **10.1.02. Severability**

It is hereby declared to be the express intention of the Commissioners Court of Liberty County, Texas, that the sections, appendices, clauses, paragraphs, phrases, sentences, and subsections of these Regulations are severable. In the event any section, appendix, clause, paragraph, phrase, sentence, or subsection of these regulations shall be declared unconstitutional or invalid by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality or invalidity shall not affect any remaining sections, appendices, clauses, paragraphs, phrases, or subsections of these Regulations.

### ***Sub-Section 2 – Applicability***

#### **10.2.03. General Requirements**

This Section shall govern the general administrative procedures and review and evaluation processes to be used by the County to process and approve applications for approval for subdivision developments. Any Applicant who subdivides a tract of land shall comply in all respects with these Regulations and prepare and submit to the Commissioners Court an application for approval of the proposed subdivision in accordance with the terms and procedures set forth in these regulations.

#### **10.2.04. Legal Authority**

Legal Authority for adopting and enforcing the regulations in this Chapter is granted to the County under certain provisions of the Texas Local Government Code (TLGC) in Chapter 232; under the Texas Water Code (TWC) in Chapters 26 and 35; as authorized by provisions of Title 13, Local

Government Code; by Title 6 of the Transportation Code; by Title 7, Subtitle B, et. Seq. Local Government Code; and Title 12, Subtitle C, Chapter 395, Local Government Code.

#### **10.2.05. Approval Required**

Except as otherwise provided herein, approval of the County is required prior to conducting any of the development activities outlined in these regulations.

#### **10.2.06. Development Approvals within other Jurisdictions**

Whenever any portion of an original tract lies within the defined extraterritorial jurisdiction (ETJ) of a municipality or has any impact upon jurisdiction of another agency or entity and is subject to both the development regulations of such municipality, agency, or entity and Liberty County, the following procedures will govern:

- (A) Whenever an original tract lies totally or partially within the extraterritorial jurisdiction of an incorporated city, the incorporated city shall be the governing entity and the County will not have review or approval authority.
- (B) For Applications for which the County is the Reviewing Authority, Applicants shall follow the procedures outlined in these Regulations.
- (C) The applicant shall submit a copy of the Preliminary and/or Final Plat with appropriate supporting information to all jurisdictions and/or utility providers in addition to Liberty County that have jurisdiction over or that will provide water, sewer, gas, or electric service to the subdivision. A letter indicating approval of the subdivision components of direct concern to these entities will be required prior to approval of the Final Plat by Liberty County.

#### **10.2.07. Effect of Regulations on Prior Development Approvals**

These Regulations shall not alter the rights granted by any prior development approvals issued by the County, provided that:

- (A) Such development approval has not expired based on the provisions of the regulations or ordinances under which such development approval was issued; and,
- (B) The activities authorized under such development approval are conducted in accordance with the provisions of the development approval and the regulations and the ordinances under which such development approval was issued.

#### **10.2.08. Effect of Regulations on Pending or Previously Filed Applications**

- (A) These Regulations shall not alter the rights granted by TLGC Chapter 245 to applications filed or pending before the effective date of these Regulations. Applications filed or pending before the effective date of these Regulations, and subsequent County-issued development approvals related to such pending applications, have the right to be reviewed under the regulations in effect at the time the original application was filed, provided that:

- (1) The Application has not expired in accordance with the regulations in effect at the time of filing;
  - (2) The Applicant timely files supplemental information requested by the Department for consideration; and,
  - (3) The Application is not denied by the Commissioners Court.
- (B) Applications pending before the effective date of these Regulations that expire at any time after the effective date of these Regulations shall be null and void and shall disqualify the Applicant, Permittee and owner of the Subject Property from the ability to submit any subsequent applications for consideration under prior regulations based on the original application date of the expired application. Expired applications shall require a complete new Application be submitted under these Regulations.

### ***Sub-Section 3 – Definitions***

#### **10.3.01. Language Construction and Meaning**

Unless otherwise indicated by individual Chapters of these Regulations, the language and meaning shall be that assigned in common usage at the time of their adoption. All capitalized terms used in these Regulations shall have the meaning ascribed to them in this Section, unless no definition is found in this Section, in which case the meaning should be drawn by the context and common English usage.

#### **10.3.02. Defined Terms Used in the Regulations**

- (A) Acre - A unit of area equal to 43,560 square feet. When calculating the acreage of any lot, the gross square footage within the lot shall be used, provided any area within a private roadway easement or an easement for a Shared Access Driveway shall be excluded.
- (B) Agent - A County employee, County department, or outside consultant designated to perform certain duties laid out in these Regulations on behalf of the County.
- (C) Applicant - An Owner or authorized representative seeking approval of a proposed Subdivision pursuant to these Regulations.
- (D) Application - A document or series of documents describing the applicant, the property, the activity for which approval is sought, how the activity satisfies the requirements of these regulations, and which is filed with the intent of obtaining approval of the application.
- (E) B.F.E - Base Flood Elevation
- (F) Calendar Day - any and all days shown on the County's official calendar, inclusive of holidays and weekends.

- (G) Commissioners Court - The Commissioners Court of Liberty County.
- (H) Conservation Easement – an easement on real property for the purpose of limiting or restricting development activities on the property subject to said easement. To qualify as a Conservation Easement under this Chapter, the easement shall be granted to the public and shall be held by the County or other non-profit legal entity recognized by the County as custodian for the County. A Conservation Easement shall be in such form and under such conditions as are acceptable to the County.
- (I) Contiguous Property(ies) - land parcels, tracts or lots of real property that are immediately adjacent, connected to one another or share a common boundary, but may also include land separated only by a roadway, utility corridor or aquatic feature. Properties that are separated by a roadway, utility corridor or aquatic feature and within 100 feet of each other are considered Contiguous Properties.
- (J) County - Liberty County, Texas. Where referenced herein, the County may include either the Commissioners Court or personnel, departments, agencies, or consultants of the County acting under authority delegated to such personnel.
- (K) County Clerk - The County Clerk of Liberty County.
- (L) Department - The Liberty County Engineering Department.
- (M) Development - All land modification activity, including the construction of buildings, roadways, paved storage areas, parking lots, drainage facilities, and other impervious structures or surfaces.
- (N) Development Approval – The approval by the Liberty County Commissioners Court or by departments, agents, or personnel delegated such approval authority by the Commissioners Court of Application(s) for development activities governed by these Regulations for a specific project or tract of land, as identified in such Application(s). Development Approvals shall occur in stages for approved preliminary plat/preliminary drainage plans, final plat/final drainage plans, and construction plans, in this order.
- (O) Master Plan - All land modification activity, including the construction of roadways, drainage facilities, and other proposed and future development of single or contiguous properties, normally all under the control or ownership of the Owner. Such a phased development will likely occur over an extended period of time and, possibly, in multiple Applications. The Master Plan may or may not result in a Phased Development Approval.
- (P) Drinking Water - All water distributed by any agency or individual, public or private, for the purpose of human consumption, use in the preparation of foods or beverages, cleaning any utensil or article used in the course of preparation or consumption of food or beverages for human beings, human bathing, or clothes washing. This term shall be interchangeable with Potable Water.
- (Q) Dwelling Unit - A single family residence (home), a manufactured home, an apartment, or a

condominium unit.

- (R) Endangered Species Act - the federal Endangered Species Act of 1973, including any and all subsequent amendments.
- (S) Engineer - A person licensed and authorized to practice engineering in the State of Texas under the Texas Engineering Practice Act.
- (T) Final Plat - A map of a proposed Subdivision of land prepared in a form suitable for filing of record with all necessary survey drawings, notes, information, affidavits, dedications and acceptances as required by these Regulations.
- (U) Final Plat Checklist - An itemization of requirements that must be met for the Final Plat review.
- (V) Flag Lot - A Flag Lot is a lot designed to provide a minimum avenue of road access while allowing other lots to be stacked around it, so that the result is a lot which is often shaped something like a flag, with a “flag pole” of access stretching out to the nearest road - and other “flag poles” adjacent, leading to more “flag lots”. As provided for in Chapter 251 of the Texas Transportation Code and in other state laws the County has the general authority and responsibility for road and drainage maintenance and safety. Minimum driveway spacing is one critical component of both public safety and effective road and drainage maintenance where County equipment must operate in barrow ditches or along rural road shoulders. Flag Lots shall generally not be permitted, except if approved by the Commissioners Court as consistent with the intent and spirit of these Regulations. The Department, Precinct Commissioner, Agent shall advise the Commissioners Court if a proposed lot constitutes a “Flag Lot” and the Commissioners Court shall, in reviewing all the circumstances, make the final determination as part of the Subdivision process.
- (W) Finished Floor Elevation - The finished floor elevation of all Dwelling Units shall be two feet (2’) above the Base Flood Elevation, which is the elevation shown on the Flood Insurance Rate Map that indicates the water surface elevation resulting from a flood that has a one percent chance of equaling or exceeding that level in any given year.
- (X) Groundwater – Water obtained by pumping or extracting water from below the surface of the ground from an Aquifer native to Liberty County.
- (Y) Liberty County Central Appraisal District (LCCAD) – The agency responsible for determining taxable values of private property within the County and for assigning street addresses to new developments.
- (Z) Liberty County Plat Records - the official County map records, deed records, and such other official County records as the County Clerk may be required or in fact does maintain.
- (AA) Lot - Any tract to be created by the division of the Original Tract pursuant to the proposed subdivision application, including the remainder of the Original Tract.
- (BB) NAVD 88 Datum – North American Vertical Datum dated 1988.



- (CC) Non-public water (supply) system - Any water system supplying water for domestic purposes which is not a public water system. These systems are often described as Non Community systems by the TCEQ.
- (DD) On-Site Sewage Facility Rules – The Order Adopting Rules of Liberty County, Texas, for On-Site Sewage Facilities, as shown in Appendix A and as may be amended from time to time.
- (EE) Original Tract - The original tract of land owned by an Owner prior to the proposed Subdivision.
- (FF) OSSF - On-site sewage facilities as that term is defined in rules and/or regulations adopted by the TCEQ, including, but not limited to, 30 TAC Chapter 285.
- (GG) Owner(s) - The holder(s) of a legal or equitable interest in real property as shown by the deed records of the county in which the property is located, and which has been included in an Application or Development Approval under these Regulations.
- (HH) Permittee – A person, including legal successors or assigns, to whom the County actually issues a Development Approval and who is responsible for complying with the terms of said Development Approval, including any representations, covenants and agreements included in the Application and any special provisions incorporated by the County into the Development Approval. A person indicated on an Application as a Permittee shall be considered a prospective Permittee until such time as a Development Approval is issued to such Permittee. The term Permittee may be interchangeable with the term Applicant.
- (II) Permitted Sewer System - Any public or private sewerage system for the collection of sewage that flows into a treatment and disposal system that is regulated pursuant to the rules of the Texas Commission on Environmental Quality (TCEQ) and Chapter 26 of the Texas Water Code for which the TCEQ is the permitting authority.
- (JJ) Permitted Street - A Street that meets the requirements of Liberty County under these Regulations.
- (KK) Phased Development Approval – A Development Approval that allows for the timely and orderly development process of a large-scale development in phases as a result of a submitted Development Master Plan.
- (LL) Plat Letter - A letter prepared by a title company or attorney. It shall list all encumbrances, taxes, and ownership of the tract of land.
- (MM) Platted - Recorded with the county in an official plat record.
- (NN) Political Subdivision - A county, municipality, school district, housing authority, authority established by the Texas Legislature, municipal utility district, water control and improvement district, groundwater conservation district, emergency services district, other special district, or other political subdivision of the State of Texas.

- (OO) Potable Water – Potable Water shall have the same definition as and be inter-changeable with Drinking Water, as defined herein.
- (PP) Preliminary Plat - A map of the proposed Subdivision of land showing the general dimensions and boundaries of each lot, topography, flood plain, the layout of proposed streets, conceptual drainage improvements, any easements, and other information required by these Regulations.
- (QQ) Preliminary Plat Checklist - An itemization of requirements that must be met for Preliminary Plat review.
- (RR) Private (Water Supply) Well - Shall have the meaning ascribed in the On-Site Sewage Facilities Rules of Liberty County, as amended.
- (SS) Public Water (Supply) System – As defined by the TCEQ, a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, which includes all uses described under the definition for drinking water. Such a system must have at least 15 service connections or serve at least 25 individuals at least 60 days out of the year. This term includes any collection, treatment, storage, and distribution facilities under the control of the operator of such system and used primarily in connection with such system; and any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Two or more systems with each having a potential to serve less than 15 connections or less than 25 individuals but owned by the same person, firm, or corporation and located on adjacent land will be considered a public water system when the total potential service connections in the combined systems are 15 or greater or if the total number of individuals served by the combined systems total 25 or more at least 60 days out of the year. Without excluding other meanings of the terms “individual” or “served,” an individual shall be deemed to be served by a water system if he lives in, uses as his place of employment, or works in a place to which drinking water is supplied from the system.
- (TT) Public Water Supply Well - Shall have the meaning ascribed to “Public Well” in the On-Site Sewage Facilities Rules of Liberty County, as amended.
- (UU) Purchaser - Shall include purchasers under executory contracts for conveyance of real property
- (VV) Record Documents – Documents included and associated with an Application or Development Approval, including but not limited to:
- (1) Information included with the Application;
  - (2) Deeds, including restrictive covenants;
  - (3) Plats;
  - (4) Easements;

- (5) Any other document required under these Regulations.
- (WW) Record Plat - A Final Plat that has been approved by the Commissioners Court and is prepared by the Applicant for recordation in the Plat Records of Liberty County.
- (XX) Regulated Roadways – Those roadways, including the associated right-of-way and features constructed in the right-of-way, located within the County but outside of the incorporated limits of any municipality in the County, associated with an Application for a Development Approval under these Regulations, including the following:
- (1) Existing dedicated public roadways that are improved or on which construction or tie-ins are made in association with the proposed development for which an Application is submitted under these Regulations;
  - (2) New roadways dedicated to the public through any action of the County;
  - (3) New roadways dedicated to the public to be maintained by the County including roadways constructed as a part of a subdivision, or other type of Development Approval approved under these Regulations; and, Private roadways, shared access easements, and shared access driveways not dedicated to the public and not maintained by the County, but used for emergency services access as a part of any Development Approval issued under these Regulations.
- (YY) Regulations - The Liberty County Subdivision and Development Regulations.
- (ZZ) Retail Public Utility - Any entity meeting the definition of a retail public utility as defined in Water Code Section, 13.002.
- (AAA) Reviewing Authority – An authorized municipality, Liberty County or its agents, or a joint office established by one or more authorized municipalities and Liberty County for the purpose of conducting reviews and issuing approvals for development activities.
- (BBB) Sewerage Facilities - The devices and systems which transport domestic wastewater from residential property, treat the wastewater, and dispose of the treated water in accordance with the minimum state standards contained or referenced in these rules.
- (CCC) Single Family Residence - Any habitable structure constructed on, or brought to, its site and occupied by members of a family, including but not limited to manufactured homes situated on leased space.
- (DDD) Subdivider - Any owner of land or authorized agent thereof proposing to divide or dividing land so as to constitute a subdivision.
- (EEE) (Subdivision - The division of land located within Liberty County and outside the corporate limits of a municipality into two or more parcels to lay out: (1) a subdivision of the tract, including an addition; (2) lots; or (3) streets, alleys, parks, or other parts of the tract

intended to be dedicated to public use or for the use of purchasers or owners of lots fronting on or adjacent to the streets, alleys, parks, or other parts. Subdivision of a tract includes a division regardless of whether it is made by using a metes and bounds description in a deed of conveyance or in a contract for deed, by using a contract for sale or other executory contract to convey, in a lease (other than agricultural and hunting leases), or by using any other method.

Because County review of subdivision and development activity can be important to many aspects of public health and safety, such as drainage and flood control, 9- 1-1 addressing, OSSF system sizing and road planning, among others, it is the intent of the Commissioners Court of Liberty County that the term “subdivision” be interpreted to include all divisions of land to the fullest extent permitted under the laws of the State of Texas, except where specific exceptions may be noted in these rules.

A division of land shall be considered as relating to the laying out of streets, whether public or private, if:

The division of land creates one or more lots without practical, physical vehicular access onto a Regulated Roadway or with less than fifty feet (50') of direct frontage onto a Regulated Roadway or calls for driveways onto Regulated Roadways that are spaced fewer than fifty feet (50') apart;

The division of land will affect drainage on, in or adjacent to a public roadway or any county drainage ditch, swale, culvert or other drainage facility; or

Other circumstances exist which, in the determination of the Department, cause such division of land to be related to the laying out of roadways or related to drainage for any roadway to which any lot has access.

(FFF) Subject Property – the property or tract for which an Application has been submitted under these Regulations.

(GGG) Surface Water - Water from streams, rivers or lakes or other bodies of water above the surface of the ground.

(HHH) TAC - Texas Administrative Code, as compiled by the Texas Secretary of State.

(III) TCEQ - Texas Commission on Environmental Quality.

(JJJ) TLGC – Texas Local Government Code

(KKK) Water Facilities - Any devices and systems which are used in the supply, collection, development, protection, storage, transmission, treatment, and/or retail distribution of water for safe human use and consumption.

(LLL) Wetland(s) - an area (including a swamp, marsh, bog, prairie pothole, or similar area) having a predominance of hydric soils that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support it and that under normal circumstances supports the growth and regeneration of hydrophytic vegetation. The intent of this definition is to conform to the corresponding definition included in the Texas Water Code, Chapter 11, Subchapter J, as

subsequently amended.

- (MMM) Working Day – Any recognized working day that the County offices are routinely open for business, specifically excluding weekends and holidays recognized by the County.

### ***Sub-Section 4 - Delegation of Authority and Appeals***

#### **10.4.01. Responsible Departments**

The Commissioners Court designates the Liberty County Engineering Department (Department) as agent for receiving and reviewing Applications submitted under these regulations and as custodian of records for all information received, acquired or developed during the exercise of these duties. The Department may coordinate with any other County departments, agencies, or personnel in the performance of the duties required and allowed under these regulations.

#### **10.4.02. Delegation of Authority**

The Department is delegated the authority by the Commissioners Court to conduct the activities required on behalf of the County under these regulations. All officials, employees, agents, and consultants of Liberty County, Texas, having duties under these Regulations are authorized to perform such duties as are required of them under said Regulations. The Commissioners Court reserves the final authority for approval or denial of any Application submitted under these regulations.

#### **10.4.03. Appeals**

Persons aggrieved by an action or decision of a designated representative of the Commissioners Court may appeal any such action or decision to the Commissioners Court of Liberty County, Texas. Any such appeal shall be filed with the County Clerk and with the office of the County Judge within thirty (30) days from the date the aggrieved person receives notice of such action or decision.

### ***Sub-Section 5 - Outstanding Tax Liabilities***

Payment of any delinquent taxes (including penalties, interest, late fees, etc.) on behalf of the Subject Property shall be required when the final plat is submitted for recording.

### ***Sub-Section 6 – Fees***

#### **10.6.01. Establishment and Assessment of Fees**

The Commissioners Court shall establish fees for Applications, permits, inspections, reviews or other activities as required or allowed under these regulations. The applicable application fee shall be as allowed by Local Government Code 232.0021 Chapter “A”. These fees may be amended from time to time by the Commissioners Court without amending or affecting the remainder of these Regulations.

The Department shall maintain and make available to the public a list of all fees established under these Regulations. Any dispute between the Applicant and the Department regarding the basis or amount of applicable fees may be appealed by either party to the Commissioners Court.

#### **10.6.02. Payment of Fees**

The Applicant shall understand that fees will be assessed for the various stages of the platting process. Department Fees could include the Master Plan Review Fee, Preliminary Plat Fees, Final Plat/Construction Plan Fees, and Construction Inspection Fees. County Consulting Engineer Review Fees will be in addition to the Department Fees. A Schedule of Department Fees are maintained separately from these Regulations by the Department. That Schedule may be obtained from the Department.

- (A) Master Plan Review Fees – If required by these Regulations, upon submitting a Master Plan for review, the Applicant shall pay, at that time, a fee for review by the Department plus the County Consulting Engineer Review Fees.
- (B) Preliminary Plat Fees - Upon filing the Preliminary Plat Application, the Applicant shall pay, at that time, a Preliminary Plat application fee. The Applicant shall also pay the County Consulting Engineer Review Fees.
- (C) Final Plat Fees/Construction Plan Review - Upon filing the Final Plat Application, the Applicant shall pay a Final Plat application fee. The Applicant shall also pay the County Consulting Engineer Review Fees.
- (D) Re-Plat Fees – Upon filing for Re-Plat Application, the Applicant shall pay a Re-Plat Application fee. The Applicant shall also pay the County Consulting Engineer Review Fees.
- (E) Revised Plat Fees – Upon filing for Revised Plat Application, the Applicant shall pay a Final Plat Application fee. The Applicant shall also pay the County Consulting Engineer Review Fees.
- (F) Construction Inspection Fee – The Applicant shall pay fees to Liberty County to cover the costs for the County to perform, or have performed, inspection services adequate to confirm the subdivision improvements are constructed to Liberty County Regulations and the approved construction plans and specifications for the development.
- (G) County Consulting Engineer Review Fees – The Applicant shall pay all fees associated with the review of all phases of the Application by the County’s Consulting Engineer. This shall include the Master Plan, Preliminary Plat Application, the Final Plat Application, the Construction Plans, engineering reports, and the associated drainage plans. These fees are charged to the County as hourly fees by the Consulting Engineer.
- (H) Liberty County reserves the right to enlist the services of additional professionals, as necessary, to adequately determine if the submittals, constructed improvements, materials, and workmanship meet the requirements of the regulations. All such costs shall be assessed to the Applicant as a fee or additional expense.

- (I) If the Department determines that the tests provided by the Applicant are insufficient to meet the requirements of the regulations, then the Department reserves the right to enlist require additional testing at the expense of the Applicant. An itemized list of tests and approved testing laboratories that is acceptable to the Department will be provided to the Applicant. The Applicant is then responsible for complying with the additional testing required by the Department.
- (J) All fees for Applications, permits, inspections or other fees required or allowed under these Regulations shall be made payable to the Liberty County Treasurer. The fees shall be determined in U.S. dollars in accordance with the most recent fee schedule approved by the Commissioners Court. Payment may be made using any payment method established by the Commissioners Court for transacting County business.

#### **10.6.03. Waiver or Deferral of Fees**

The Commissioners Court may agree to waive or defer any or all fees assessed in conjunction with these Regulations to the extent that the Commissioners Court determines that such waiver or deferral is in the public interest. The Department is authorized to waive fees assessed to Political Subdivisions (as defined in this Chapter) under these Regulations to the extent that those Political Subdivisions have or will waive similar or corresponding fees assessed to the County for similar types of approvals.

#### **10.6.04. Additional Fees for Items Returned Unpaid**

The Commissioners Court may establish additional fees to be assessed in the event that any form of payment made to the County under these Regulations is returned unpaid.

#### **10.6.05. Refunds of Fees**

Unless specifically noted herein, all fees paid to the County are non-refundable. The County may refund fees under the following circumstances:

- (A) Fees collected for reviews and/or inspections that are not actually conducted;
- (B) Permit fees for any portion of a permit term where the Permittee voluntarily surrenders or revokes the permit.
- (C) Deposits collected for review fees or inspection fees that are in excess of the actual costs.

### ***Sub-Section 7 - General Application and Approval Procedures***

#### **10.7.01. Application Forms**

The Department shall develop and make available to the public forms for submitting Applications for the various types and stages of approvals required under these regulations. These forms can be found in Appendix A. These application stages include the Preliminary Plat/Preliminary Drainage Plan and

the Final Plat along with the Construction Plans/Final Drainage Plan. Forms must be submitted for each individual application stage. See Section 20.2.02 for a description of the subdivision approval process and descriptions of each application stage. See the applicable sections of Preliminary Plats and Final Plats in Section 20 for additional required application information. Applicants shall submit an electronic copy (along with the paper documents) of all application material on USB drive or other approved electronic media.

#### **10.7.02. Representations and Certifications**

By submitting an Application under these regulations, the Applicant, Permittee and/or the owner(s) of the Subject Property shall represent and certify:

- (A) there is no delinquent tax liability, at the time of submittal, to the County on the Subject Property;
- (B) the owner(s) of the Subject Property has authorized the submittal of the Application;
- (C) the County is authorized to review and act upon the application;
- (D) and the Applicant, Permittee, and/or the Owner shall be liable for all County assessed fees including the County Consulting Engineer Review Fees.

#### **10.7.03. Application Fees**

Each Application submitted under these regulations shall be accompanied by the payment of all applicable fees identified under these regulations. The Application fees shall be non-refundable and in the amounts set forth in these Regulations.

#### **10.7.04. Administrative Review**

Before each individual Application for a Master Plan, Preliminary Plat or a Final Plat/Construction Plans filed under these regulations will be reviewed by the Department, it must be administratively complete. An administratively complete Application will contain responses to all items on the Application form and the appropriate checklists contained in the Appendix A, will be accompanied by the payment of all applicable fees, and all documents and submittals in electronic formats. The application shall include all required reports, information, plans, etc, as required in applicable parts of Section 20.6.03 and subsequent sub-sections. The Department shall conduct an initial review of the Application to determine whether it is administratively complete. All administratively complete applications shall be subjected to a technical review by the Department.

If the Application is not administratively complete, the Department shall notify the Applicant of the deficiencies with the Application not later than 10 business days after the date the Application is received by the County. Further processing of the Application shall be suspended until these administrative deficiencies have been remedied. The Applicant shall provide a written response to each noted deficiency issued by the County, accompanied by any additional information required to respond to such deficiency. Once a Subdivision Application has been determined by the Department to be administratively complete, the application shall immediately be subject to technical review.



#### **10.7.05. Technical Review & Approval**

Once an application is determined to be Administratively Complete, the application shall be reviewed by the Department within 30 calendar days. That time will be extended based on accuracy and completeness of the technical information and responses from the Applicant to requests for additional information or modifications to meet these Regulations. Before an Application filed under these regulations will be submitted to the Commissioners Court for final action, the Application must be determined to be in compliance with these Regulations. Once that determination has been made, the Department shall make a recommendation to Commissioner's Court regarding Approval of the Application. See applicable Technical Review Procedure in Section 20.6.07.

An Applicant that disagrees with the Department's determination of technical deficiencies in the Application may petition the Department to forward the Application to the Commissioners Court without resolving the alleged deficiencies. Such requests shall be made in writing to the Department with a copy to the office of the County Judge.

#### **10.7.06. Expiration of Application and Suspension by Agreement**

Unless an extension request is submitted to the Department in writing and such extension is subsequently granted in writing by the County, Applications for which the deficiencies are not remedied within sixty (60) calendar days following issuance of the notice of deficiencies are deemed expired and shall be returned to the Applicant. Extension requests may be granted administratively by the Department for a period of up to and inclusive of sixty (60) calendar days. Extension requests exceeding this requirement must be submitted to the Department in writing and must be subsequently approved by the Commissioners Court.

#### **10.7.07. Applications Forwarded to Commissioners Court**

All Applications for various stages of the approval process will be submitted by the Department to the Commissioners Court with a request that the item be placed on the agenda for consideration. Along with the Application, the Department shall make a written recommendation to the Commissioners Court that the application be approved, approved with changes, or denied. The Department shall provide a copy of the Application and the Department's recommendation to the Commissioner(s) in whose precinct(s) the Subject Property is located.

#### **10.7.08. Notice of Action on Application**

The Department shall notify all Applicants of the final action taken on the various stages of their Application. Development Approvals by the Commissioners Court shall comply with the notice requirements in Sub-Section 11 of this Section. For Applications that are denied by the Commissioners Court, the Department shall send written notice to the Applicant, the Permittee, and the owner of the Subject Property providing a detailed list of reasons the application is denied. Unless otherwise required, notice of action on an Application shall be sent within ten (10) working days of said action.

#### **10.7.09. Withdrawal of Application**

An Applicant may withdraw an Application by submitting a written request to the Department. Upon receipt of a written request for withdrawal of an Application, the Department shall cease processing the Application and shall confirm the withdrawal of the Application in writing, with copies forwarded to the Applicant, Permittee, Owner of the Subject Property, and the Commissioner(s) in whose precinct(s) the Subject Property is located. The written confirmation shall address the disposition of fees (both refundable and non-refundable) and shall indicate that a new application, including fees, shall be required prior to conducting any of the regulated activities included in the original Application. The Applicant shall be liable for all fees, if any, incurred to date, including those not yet invoiced, by the County Consulting Engineer.

### ***Sub-Section 8 – Administrative Authorization and Variances***

#### **10.8.01. Criteria for Variance**

The Commissioners Court shall have the authority to grant variances from these Regulations when the public interest or the requirements of justice warrants relaxation of the strict requirements of the Regulations. Factors to be considered in evaluating a request for variance shall include:

- (A) The actual situation of the property in question in relation to neighboring or similar properties, such that no special privilege not enjoyed by other similarly situated properties may be granted;
- (B) Whether strict enforcement of the Regulations would deny the Applicant the privileges or safety of similarly situated property with similarly timed development;
- (C) That the granting of the variance will not be detrimental to the public health, safety and welfare, or injurious to other property or will not prevent the orderly development of the land in the area in accordance with these Regulations;
- (D) Whether there are special circumstances or conditions affecting the land or proposed development involved such that strict application of the provisions of these Regulations would deprive the applicant the reasonable use of his land and that failure to approve the variance would result in undue hardship to the applicant and/or a regulatory taking; and,
- (E) Financial hardship standing alone shall not be deemed to constitute undue hardship.

#### **10.8.02. Application Materials**

Any person who wishes to receive a variance should apply, in writing, to the Department with a list of, and a detailed justification, for each variance requested. Justifications shall include all necessary information, test results, manufacturer's information, certifications, etc. as deemed necessary by the Department in order to determine if a variance is warranted, justified, and in the best interest of the County and the public.

#### **10.8.03. Discretion to Grant Variances**

The decision of the Court whether to grant or deny a variance is at its complete discretion and will be final.

## ***Sub-Section 9 - General Notice Requirements***

### **10.9.01. Sub-Section Not Used**

### **10.9.02. Identification of Affected Political Subdivisions**

The Applicant shall identify all such entities on the Application for the Preliminary Plat. The identified political subdivisions shall be, at a minimum, those which appear on the tax certificate for the Subject Property.

### **10.9.03. Identification of Contiguous Property Owners**

The applicant shall identify all owners of Contiguous Property that are not parties to the Application on the Application for the Preliminary Plat. The identified owners for the Contiguous Properties shall be those owners on file with the Liberty County Appraisal District (LCAD) within thirty (30) days prior to the date the Application is filed. The address of the identified owners for notice purposes shall be the address on file with the LCAD.

### **10.9.04. Written Notice for Revised Plats**

Except for plat revisions only combining existing tracts, an Application for revision of an existing Subdivision plat shall be required to notify all owners of affected properties within the original Subdivision by certified mail. The County shall provide notice to each affected property owner at the affected property owner's address in the subdivided tract. This is only required for plat revisions and not new plat applications. In addition to the items required herein for Written Notice for revised plats, the written notice will include, at a minimum, the following information:

- (A) For Replat Applications a detailed description of the proposed revision to the plat.
- (B) For Applications involving cancellation or vacation of an existing Subdivision plat, a statement that an Application has been filed requesting that the County cancel and vacate the plat and any associated Development Approvals.

### **10.9.05. Published Notice for Revised Plats**

After the date the Department posts the Revision, Replat, Cancellation, or Vacation of an existing Subdivision Replat for consideration by the Commissioners Court, but before the application is considered by the Court, the County shall have published all notices required by Texas Local Government Code Sections §232.008, 212.013, 212.014 and 212.015. The publication shall include a statement of the time and place at which the Commissioners Court will meet to consider the application and hear protests, if any. The Published Notice shall be published at least three (3) times during the period that begins on the 30<sup>th</sup> day and end on the 7<sup>th</sup> day before the date of the Commissioners Court meeting, in accordance with the requirements for Published Notice in this Section.

**10.9.06 Sub-Section Not Used**

**10.9.07. Sub-Section Not Used**

**10.9.08. Additional Public Notice by the County**

Where these regulations require notice, the County may accomplish additional public notice of any Application or pending action on such Application using whatever means it may deem appropriate and as required by federal, state or local law. Any such costs for this additional public notice shall be the responsibility of the County. Additional public notice by the County may include, but is not limited to, posting notice on the Commissioners Court agenda, posting notice in conjunction with other posted notices at County facilities, posting on any electronic medium maintained or used by the County, or inclusion of such notice in any announcement or communication performed by the County. Except where required by law, such additional public notice by the County will be at the discretion of the Commissioners Court.

***Sub-Section 10 – Sub-Section Not Used***

***Sub-Section 11 - Development Approvals***

**10.11.01. Basis for Issuance of Development Approvals**

Development Approval is a broad term used to describe each stage of approval required for the entire approval process. Staged Development Approvals will be issued by the County for the various stages of the Application. These include, but may not be limited to, the Preliminary Plat, the Final Plat, the Construction Plans and Drainage Plan, and the completed Construction of the Improvements. A Final Development Approval will be issued in the form of an approval of the Final Plat. Specific Approvals identified herein must be obtained prior to the start of any construction. All Development Approvals issued by the County shall be based on the Application materials, any representations made in the Application, any supplemental information submitted by the Applicant, and any information presented to the Commissioners Court by the Department. The Commissioners Court may incorporate into a Development Approval by reference any information submitted in conjunction with an Application or place any stipulations on the Approval deemed necessary to protect the public.

**10.11.02. Issued to Permittee**

All Development Approvals issued by the County shall be issued to one or more Permittees. Unless a different Permittee is specifically indicated on the Application, the Development Approval shall be issued to the Applicant as the Permittee.

**10.11.03. Contiguous Property Development**

The County may issue Development Approvals for Contiguous Property Development under single ownership, separate ownership, or under multiple ownership. If the Development Approval is issued

for Contiguous Property under multiple ownership, all development activities taking place shall be subject to a common plan of development with common authority and common responsibility.

**10.11.04. Sub-Section Not Used**

**10.11.05. Form of Development Approval**

All Development Approvals issued by the County shall include:

- (A) The legal name of the Permittee and the Applicant;
- (B) Location and description information for the Subject Property;
- (C) The specific phase of development being approved (Preliminary Plat and Preliminary Drainage Plan, Final Plat, Approval of Construction Plans, and Final Drainage Plan), including activities, features, and components authorized under the Development Approval, including any representations, covenants, restrictions or agreements included in the Application, and any Special Provisions incorporated by the County;
- (D) Special provisions incorporated by the County, including any notification and enforcement provisions;
- (E) General Provisions incorporated into all Development Approvals;
- (F) Expiration provisions, if any; and,
- (G) Notices of other regulatory programs that may affect the Development Approval.

**10.11.06. Effective Dates and Expiration**

Development Approvals shall identify the date on which they are effective. In the absence of an identified effective date, the effective date shall be the date on which the Development Approvals is issued by the County. Development Approvals issued by the County may be subject to expiration as outlined in the individual Sections(s) under which said Development Approvals are issued. Expired Development Approvals are null and void and require a new Application, including application fees.

**10.11.07. Dedication to the Public**

Where dedication to the public is required under these regulations, such dedication shall be made through appropriate legal instruments. Such dedication shall be made to the public with the County as custodian of all titles, privileges and other legal rights conveyed through such dedication. In the case of easements dedicated to the public, the Commissioners Court may, at its option, designate another Political Subdivision as custodian of the County's rights under said easement. No dedication shall be effective unless accepted and approved by the Commissioners Court and until the record document is filed with the County Clerk in the Official County Records. Dedications to the public may be accomplished through any legal means recognized by the County, including:

- (A) Filing a written deed in the Official County Records that conveys the fee simple interest to the County in the item being dedicated;
- (B) An easement document filed in the Official County Records that conveys a perpetual right-of-way easement to the County in the item being dedicated;
- (C) Designation of rights-of-way, easements, open space, parkland, and other public dedications on a final plat, whether through indication on the plat or reference in a plat note;
- (D) Designation of rights-of-way, easements, open space, parkland, and other public dedications on a recorded conveyance instrument for the registration of an exempt subdivision in accordance with Section 20 of these Regulations; and,
- (E) An order issued by a court of competent jurisdiction subsequently filed in the Official County Records.

**10.11.08. Sub-Section Not Used**

**10.11.09. Notice of Other Regulatory Programs**

To the extent that the County is aware of other applicable regulatory programs, the County may incorporate into a published Application Form or Development Approval notices of the Permittee's responsibility to comply with such other regulatory programs. The County may require additional information to be submitted either in conjunction with the Application or following the issuance of a Development Approval to document compliance with these other regulatory programs. Any obligation to submit additional information following the issuance of a Development Approval must be included as a special provision in such Development Approval. Ultimately, it is the Applicant's responsibility to comply with all local, state, and federal laws and failure by the County, its agents, or employees to notify the Applicant of these requirements shall not relieve the Applicant of those responsibilities and shall not create liability on the part of the County, its agents, or its employees. It shall also be the sole responsibility of the Applicant to supply all reports, documents, drawings, maps, or other instruments to other Agencies. The County will not be responsible for supplying documentation to any other agency on behalf of the Applicant.

**10.11.10. Notice of Issuance of Development Approvals**

When issuing a Development Approval for which the Applicant and/or the owner of the Subject Property is not the Permittee, the Department shall forward copies of the Development Approval to the Permittee. The Department shall also forward copies of the Development Approval to any public entity with overlapping jurisdiction on the Subject Property that has requested notice and to any person requesting to be on the Department's public notice distribution list.

***Sub-Section 12 - Filing Record Documents with the County Clerk***

**10.12.01. Requirement to File**

Where required by one or more individual Sections of these Regulations, the Applicant shall file copies of the required record documents with the County Clerk for inclusion in the Liberty County Plat Records.

#### **10.12.02. Submission of Record Documents to the Department**

Following issuance of a Development Approval which requires filing of the record documents, the Applicant shall present such record documents to the Department for final review and delivery to the County Judge, or the County Judge's designated representative, for execution. Once these documents have been executed, the Department shall notify the Applicant that those documents are ready for filing with the County Clerk.

#### **10.12.03. Filing with the County Clerk**

Final record documents that are required to be filed in the Official County Records and that have been executed by the County Judge or the County Judge's designated representative may be presented to the County Clerk for filing in the County plat records, in accordance with the Texas Property Code, Chapter 12. The Applicant is solely responsible for the filing of record documents with the County Clerk, including any applicable fees. As required by the Texas Property Code, the County Clerk will not accept documents for recordation unless they have been approved by the Commissioners Court.

### ***Sub-Section 13 - Enforcement and Penalties***

#### **10.13.01. Inspection**

The Department may routinely inspect facilities that have been approved for development under these Regulations to assure continued compliance with these rules.

#### **10.13.02. Offenses**

A person commits an offense if the person intentionally or knowingly makes or causes to be made a false material statement, representation, or certification in, or omits or causes to be omitted material information from an application, notice, record, report, plan, or other document filed or required to be maintained under these Regulations. A person commits an offense if the person knowingly or intentionally violates a requirement of these Regulations or the requirements or provisions of any appendices attached to these Regulations, or any provision of a Development Approval issued by the County. A separate offense occurs under this Section on each day on which all of the elements of the offense exist. A separate offense occurs for each separate provision of the Regulations violated.

#### **10.13.03. Category of Offense**

Failure to comply with these regulations shall constitute a Class C Misdemeanor offense. An individual adjudged guilty of a Class C Misdemeanor offense shall be punished by a fine not to exceed \$500.00. Each and every day of the offense shall constitute a new and separate offense and shall be punishable by a fine not to exceed \$500.00.

#### **10.13.04. Fines and Penalties**

These Regulations hereby incorporate by reference all authority granted to the County or the County Commissioners Court by applicable penalty provisions of any and all relevant statutes and regulations, including, but not limited to, those found in the Texas Health and Safety Code, the Texas Local Government Code, the Texas Water Code, and the regulations of any state or federal agency for whom the County is the implementing entity.

#### **10.13.05. Enforcement of Covenants and Representations**

Development Approvals may be issued by the County based on covenants and representations made by the Applicant. Any special provisions or restrictions incorporated into the Development Approval are considered an integral part of such Development Approval and are subject to all of the enforcement procedures available under these Regulations. Compliance with provisions or restrictions incorporated into Development Application based on covenants and representations in the Application is generally the responsibility of the Applicant, the Permittee and other persons holding an interest in the Subject Property. All such covenants and representations (e.g. Plat notes, deed restrictions, etc.) shall reflect that the County may enforce any such special provisions or restrictions incorporated in order to qualify for a Development Approval issued under these Regulations. The County's enforcement of these special provisions or restrictions is limited to those that are used as the basis for issuing a Development Approval, and shall be limited within those items to only those measures required to achieve compliance with these Regulations.

Plat notes and deed restrictions may be enforced by any person who is considered to be benefited by the deed restriction, as authorized under state law. Plat notes shall also reflect that the County may enforce any plat notes imposed pursuant to the Rules of Liberty County for On-Site Sewage Facilities or these Regulations, any plat note affecting County rights of way or drainage or the public health, safety and welfare. Moreover, the Commissioners Court shall have the right and authority through appropriate legal procedures to prohibit the construction or connection of utilities or issuing of permits if the covenants and representations have been violated. All requests to the County to remove or alter a special provision or restriction previously incorporated into a Development Approval will be considered a modification variance subject to Sections 10.8, 10.15, and 20.16, as appropriate, and will require consideration by the Commissioners Court in accordance with those sections.

#### **10.13.06. Stop-Work Orders by the Department**

As a part of its routine duties, the Department may issue stop-work orders for activities being conducted pursuant to a Development Approval issued by the County, if a representative of the Department has confirmed that the activities violate or are in danger of violating a Development Approval, a Development Agreement, these Regulations, or the requirements of other applicable entities with jurisdiction over the project that have been incorporated by reference. Orders issued by the Department under this authority may be provided verbally, but must be confirmed by Written Notice, provided to the Permittee and the Owner of the Subject Property. Notification of stop-work orders shall be provided to the County Judge and the Commissioner(s) in whose precinct the Subject Property is located. Stop-work orders may be appealed to the Commissioners Court based on a written request of the Permittee or the Owner of the Subject Property. Failure to comply with these regulations



shall constitute a Class C Misdemeanor offense. An individual adjudged guilty of a Class C Misdemeanor offense shall be punished by a fine not to exceed \$ 500.00. Each and every day of the offense shall constitute a new and separate offense and shall be punishable by a fine not to exceed \$ 500.00

#### **10.13.07. Enforcement Actions**

- (A) At the request of the Commissioners Court, the Liberty County District Attorney's office, or other such authorized legal representative as designated by the Commissioners Court may file an action in a court of competent jurisdiction to:
  - (1) Enjoin the violation or threatened violation of a requirement established by or adopted by the Commissioners Court under these Regulations;
  - (2) Seek civil or criminal penalties or fines as provided by law;
  - (3) Take all actions or seek any penalty authorized under law, including the penalties and enforcement provisions incorporated by reference from the Texas Health and Safety Code, the Texas Local Government Code, the Texas Water Code and the regulations of any state or federal agency for whom the County is the implementing entity; and,
- (B) Whenever it appears that a violation of any of these rules has occurred or is occurring, any person is entitled to bring a suit for injunctive relief against the person who committed, is committing, or is threatening to commit the violation. Such civil suits, excluding criminal prosecutions, may not be instituted by the County unless the Commissioners Court has authorized the institution of the suit.
- (C) Prosecution of a suit under these Regulations may be exercised by any court of competent jurisdiction. Venue for prosecution of a suit under these Regulations is proper in Liberty County, Texas.

### ***Sub-Section 14 - Conflicts of Interest***

#### **10.14.01. Requirement to File**

If a member of the Commissioners Court is the Applicant, the Permittee or has a "substantial interest" (as that term is defined in TLGC Chapter 232) in any property associated with an Application for Development Approval, that member shall file, before a vote or decision regarding the approval of the Application, an affidavit stating the nature and extent of the interest and shall abstain from further participation in the matter on behalf of the County. The affidavit must be filed with the County Clerk in the Official County Records.

### ***Sub-Section 15 - Termination and Modification of Development Approvals***

#### **10.15.01. Transfer of Development Authorization**

The County may transfer a Development Approval from one or more existing Permittees to one or

more new Permittees. Transfers of Development Approvals shall be processed as Modifications in accordance with Section 10.15.03.

#### **10.15.02. Suspension, Termination or Revocation by County**

The County may suspend, terminate or revoke Development Approvals under the following conditions:

- (A) The Commissioners Court may suspend, terminate or revoke any Development Approvals which the County determines was obtained under false pretenses, including intentionally or knowingly making or causing to be made a false material statement, representation, or certification in, or omitting or causing to be omitted material information from an Application, notice, record, report, plan, or other document, filed or required under these Regulations.
- (B) Prior to suspending, terminating, or revoking a Development Approval, the County shall provide the Permittee with written notice, delivered by US Mail or an approved Agent of the Court, that the Commissioners Court will consider the suspension, termination, or revocation of the Development Approval. Such written notice shall be transmitted to the Permittee at least ten (10) calendar days prior to Commissioners Court consideration.
- (C) In instances where the Commissioners Court determines that any such Development Approval obtained under false pretenses poses a significant or imminent threat to public safety, human health, or the environment, the County may suspend, terminate or revoke such Development Approval without prior notice. In such instance, the County Judge, the County Clerk, or the County Judge's authorized representative shall furnish written notice to the Permittee within three (3) working days of the suspension, termination or revocation.

#### **10.15.03. Modification of Development Approval**

A Permittee that holds a valid Development Approval issued by the County may petition the County to modify the terms of such Development Approval. This petition must be submitted in writing to the Department and shall outline the specific modifications requested and shall include any supplemental information necessary for the Department to determine that the requested modification is in compliance with these Regulations. Request for modifications shall be reviewed by the Department in accordance with the procedures outlined for the application process and shall be submitted to the Commissioners Court for consideration.

#### **10.15.04. Sub-Section Not Used**

### ***Sub-Section 16 – Assignment of Road Numbers and Addresses***

Road numbers shall be issued by the Department after the Final Plat is submitted for approval. Addresses will be issued to individual property owners by the LCCAD during the building permit process.

## **SECTION 20 - SUBDIVISION AND PLATTING OF PROPERTY**

### ***Sub-Section 1 – Applicability***

#### **20.1.01. General Requirements**

This Section shall govern activities associated with the subdivision of property within the County, including construction of infrastructure and utilities, the construction and dedication of features to the County for maintenance and operation, and documenting and recording the requirements for these activities based on the approval of the County.

#### **20.1.02. Legal Authority**

Legal Authority for adopting and enforcing the regulations in this Section is granted to the County under Texas Local Government Code (TLGC) in Chapter 232 under the Texas Water Code in Chapters 26 and 35.

#### **20.1.03. Approval Required Prior to Construction**

Approval of the Commissioners Court is required prior to the construction and development of a subdivision, unless excluded or exempted under State law or as exempted below in Section 20.3.01.

### ***Sub-Section 2 - General Subdivision Requirements***

#### **20.2.01. General Requirements**

Any person who subdivides a tract of land in unincorporated areas located outside of the extraterritorial jurisdiction of a municipality shall:

- (A) Comply in all respects with these Regulations; and,
- (B) Prepare and submit to the Commissioners Court an Application for approval or registration of the proposed Subdivision in accordance with the terms and procedures set forth in this Section.
- (C) Receive a Development Approval from the Liberty County Commissioners Court.

#### **20.2.02. Subdivision Approval Process**

A Final Development Approval shall be issued for a Subdivision when the Applicant has satisfied each of the following steps in the following order:

- (A) Schedule and hold a pre-develop meeting with the Development Review Board, Commissioners Court, the Department, appropriate County committees, and other affected entities.
- (B) Submitted the Preliminary Plat Submittal Application, a Preliminary Plat Checklist, all items required on the checklist, the Preliminary Plat, the Master Plan (if required), the Preliminary Drainage Plan, the Application Report required in Section 20.6.03, and required information listed in subsequent sub-sections of Section 20 for review by the Department and approval by the Commissioners Court;
- (C) Submitted a Final Plat Submittal Application, a Final Plat Checklist, all items required on the checklist, the Final Plat, the Construction Plans, the Final Drainage Plan, Roadway Design Report, the Water and Wastewater Service Engineering Report, and information required by Section 20.6.03 and subsequent sub-sections for review by the Department and Approval by the Commissioners Court;
- (D) Once the Final Plat is approved, the Filing of the Record Plat with the County Clerk, to be recorded with the County Clerk in the Liberty County Plat Records;
- (E) Construction of the improvements in the Approved Construction Plans are completed and approved by the Department;
- (F) Submitted the Maintenance Security for two (2) years for review by the Department and Approval by the Commissioners Court.

Illustrated flow charts for this process and other approval processes can be found in **Appendix B**.

References in these Regulations to Final Plat shall be construed to include the Construction Plans and the Final Drainage Plan. The Final Plat, the Construction Plans, and the Final Drainage Plan should be submitted at the same time for review and approval. Construction shall not begin until both the Final Plat and the Construction Plans have been reviewed and approved. Clearing, grubbing, and temporary drainage shall not be considered construction activities and is, therefore, not prohibited at this stage.

Lots cannot be sold until such time as a Record Plat has been filed with the County Clerk.

Construction in County rights of ways for individual lots is prohibited until such time that construction of the public infrastructure has been completed, the County has inspected the improvements, the County has issued a Certificate of Construction Completion, the maintenance period has begun, the Record Plat has been filed with the County Clerk, and the two (2) year maintenance security submitted to and approved by the Commissioners Court.

### ***Sub-Section 3 – Exemptions***

#### **20.3.01. Exempted Subdivisions**

The following Subdivisions shall be exempt from Section 20.2.02 and shall not be required to obtain plat approval under these Regulations:

- (A) Exemptions allowed as defined in TLGC 232.0015. Exempted subdivisions must provide direct access to a regulated roadway. This requirement to provide direct access shall not be construed to require formal subdivision where TLGC §232.0015 does not require formal subdivision. Further subdivisions of platted lots do not qualify for exemptions under this sub-section.
- (B) The land is used primarily for agricultural use, as defined by Section 1-d, Article VII, Texas Constitution, or for farm, ranch, wildlife management, or timber production use within the meaning of Section 1-d-1, Article VIII, Texas Constitution and not laying out a street.
- (C) The land is being divided among close family members and no more than four lots are being created for these family members. To qualify for the exemption, all of these lots must have adequate existing road frontage, with no new streets, parks, alleys or any other parts of the tract intended to be dedicated to public use. None of the lots shall meet the definition of a Flag Lot. Generally, to be considered having adequate road frontage to guarantee safe driveway spacing, sight distance, and reasonable maintenance of road and drainage areas, each lot must have a least 50 feet (50') of frontage. The County relies on the state's definition of what is close family under the exemption clause provided in the state law that governs county subdivision authority. Thus, close family is defined as a family member related within the third degree of consanguinity or affinity, in accordance with the Government Code, Chapter 573.023 (c); an individual's relatives within the third degree by consanguinity are the individual's:
  - (1) Parent or child (relatives in the first degree);
  - (2) Brother, sister, grandparent, or grandchild (relatives in the second degree); and
  - (3) Great-grandparent, great-grandchild, aunt who is a sister of a parent of the individual, uncle who is a brother of a parent of the individual, nephew who is a child of a brother or sister of the individual, or niece who is a child of a brother or sister of the individual (relatives in the third degree). In accordance with the Government Code, Chapter 573.025 (b), an individual's relative within the third degree by affinity are the individual's:

- (4) Anyone related by consanguinity to the individual's spouse in one of the ways named in Chapter 573.023 (c); and
  - (5) The spouse of anyone related to the individual by consanguinity in one of the ways named on Chapter 573.023 (c).
- (D) Any division of land in which all of the lots in the Subdivisions are greater than ten acres in area, and the Applicant does not lay out streets, alleys, parks, or other parts of the tract for public or private use. To qualify for the exemption, each lot must have direct physical access onto an existing public street or road, with adequate minimum lot frontage to guarantee safe driveway spacing, sight distance, and reasonable maintenance of road and drainage areas. This minimum lot frontage is generally considered to be at least 100 linear feet. None of the lots shall meet the definition of a Flag Lot.
- Any division of land in which all the lots of the Subdivision are sold to Veterans through the Veteran's Land Board Association; and no streets, alleys, parks, or other parts of the tract are intended for public or private use. To qualify, each lot must have direct physical access onto an existing public street or road, with adequate minimum lot frontage to guarantee safe driveway spacing, sight distance, and reasonable maintenance of road and drainage areas. None of the lots shall meet the definition of a Flag Lot.
- (E) The State of Texas or any state agency, board, or commission of Land owned by the permanent school fund or any other dedicated funds of the state shall be exempt unless laying out streets, alleys, parks, or other parts of the tract intended to be dedicated to public use or for the use of purchasers or owners of lots fronting on or adjacent to the streets, alleys, parks, or other parts.
- (F) The owner of the tract of land is a political subdivision of the state, the land is situated in a flood plain, and the lots are sold to adjoining landowners.
- (G) The Applicant is creating two tracts, one to be retained by the owner and the other to be transferred to another person who will further subdivide that tract subject to the plat approval requirements of these Regulations. To qualify for this exemption, the Applicant may not lay out streets, alleys, squares, parks or other parts of the tract intended to be for the use of the public or the common use of lot or tract owners. None of the lots shall meet the definition of a Flag Lot.
- (H) The Applicant does not lay out streets, alleys, parks, or other parts of the tract intended to be dedicated to public use or for the use of purchasers or owners of lots fronting on

or adjacent to the streets, alleys, parks, or other parts, and all parts are transferred to persons who owned an undivided interest in the original tract and a plat is filed before any further development of any part of the tract. None of the lots shall meet the definition of a Flag Lot.

- (I) Subdivisions made for the purpose of financial severance to establish a security interest in any portion less than the entirety of the property, which, if the security interest were exercised would sever the property into separate ownership.
- (J) Flag Lots shall generally not be permitted, except if approved by the Commissioners Court as consistent with the intent and spirit of these Regulations. The Department shall advise the Commissioners Court if a proposed lot constitutes a "Flag Lot" and the Commissioners Court shall, in reviewing all the circumstances, make the final determination.

#### **20.3.02. Registration**

Exempted subdivisions must file a final survey of the divided property showing the divided lots, adjacent roads, and adjacent properties with the County Clerk.

#### **20.3.03. Acknowledgement of Registration**

Upon the receipt of a Registration for an Exempt Subdivision, the Department shall issue a written acknowledgement to the person filing the Registration. This written acknowledgment shall reference the acknowledgements made on the Registration form and the affidavits referenced in this sub-section and shall indicate that any changes in the exemption status will require review by the County and may require that the property to be formally subdivided under this Section.

### ***Sub-Section 4 – Revision and Cancellation***

#### **20.4.01. Revision**

An Owner, Developer, or Applicant of an existing lot or lots in a platted Subdivision may submit an application to revise the recorded subdivision by submitting the following to the Department:

- (A) Revision Submittal Requirements:
  - (1) Subdivision Application;
  - (2) One (1) mylar and four (4) black and white copies of the proposed revised plat, conforming in all respects to the requirements of these Regulations; or, if

submitted by a private landowner who is not a developer in the Subdivision, can be on legal size paper as long as it clearly sets forth the desired amendment;

- (3) A statement giving the reason for the proposed revision;
- (4) The applicable filing fee.

(B) Review Period

The County will meet the review standards established by Chapter 232.009 of the Texas Local Government Code.

(C) Public Notice

- (1) After the application is filed with the Commissioners Court, but before the application is considered by the Court, the Court or the Department shall determine if the revision affects the public interest and warrant public notice. If it does not, the Court may waive the notice and public hearing requirement in accordance with Texas Local Government Code Section 232.011(c). The Court or the Department shall publish all notices as required by Texas Local Government Code Section 232.009, including a notarized publisher's affidavit demonstrating publication of the application in a newspaper of general circulation in the County. The notice must include a statement of the time and place at which the court will meet to consider the application and hear protests to the revision of the plat. The notice must be published at least three times during the period that begins on the 30<sup>th</sup> day and ends on the 7<sup>th</sup> day before the date of the meeting.

(D) Criteria for Approval. The Commissioners Court may approve an application to revise a Subdivision upon a finding that the plat as revised conforms to the requirements of the Regulations, and one of the following has been satisfied:

- (1) The revision will not interfere with the established rights of any owner of a part of the subdivided land, or
- (2) Each owner whose rights may be interfered with has agreed to the revision and signed a letter to the fact of their agreement.

(E) Record Plat. Upon approval of the Revised Plat by Commissioners Court, the Applicant shall prepare a Record Plat for recordation in the Liberty County Plat Records in accordance with these Regulations. The Record Plat must be recorded within three (3) months of the approval of the Revised Plat or it will become void.



#### **20.4.02. Cancellation**

Any application to cancel an existing plat shall be submitted and considered in accordance with Chapter 232.008 of the Texas Local Government Code and as further described in Section 20.16.

#### **20.4.03. Combination**

Where the Owner of two or more platted lots wishes to combine lots and/or existing tracts, without creating new lots, the Commissioners Court may allow conveyance of portions of one or more previously platted lots by metes and bounds description without revising the plat in order to accomplish the combination. In this case, an Applicant should present the Department with a letter of request describing the proposed combination of lots, including the name and location of the subdivision and an approximate sketch or map of the intended combination. The Commissioner's Court may grant the request by vote at a subsequent meeting of the Court, without publishing special notice.

The division and combination of lots shall in no way decrease the minimum lot size required by the platted subdivision or as determined by the Liberty County minimum land area requirements for use of an onsite sewage filtration system.

### ***Sub-Section 5 – Master Plan Information***

When a subdivision is large enough or complicated by special topographic, geologic, hydrologic conditions, or other conditions the County deems important, or the Applicant expects to convey or improve lots in two (2) or more phases, the County may require the preparation and submittal of a Master Plan along with the Preliminary Plat. Such a Plan allows the County and utility providers to learn of the needs and schedules of the Applicant so that proper public facilities may be scheduled. At the Master Plan stage overall public service needs can be determined, rights of ways located, and all required permits can be identified. If required by the County, the Master Plan shall be submitted to the Commissioner's Court for approval. A Master Plan shall remain in effect for a period of two years. If a Preliminary Plat, Final Plat, or Record Plat of any phase of the development is filed within two years of the date of approval of the Master Plan, the Master Plan shall automatically be extended for another two (2) years. The Applicant can request an extension of the Master Plan at any time from the Commissioners Court.

The purpose of the Master Plan is to allow the Department and Commissioner's Court to review proposed major thoroughfare and collector street patterns, land use, and the property's relationship to adjoining subdivisions or properties.

Where a phased or partial development is proposed, the Master Plan area shall include the entire property from which the phase is being subdivided. Where the applicant can demonstrate that natural or man-made features, such as thoroughfares and creeks make

unnecessary the inclusion of the entire property in the Master Plan to adequately review the items listed in the preceding paragraph, the Applicant may request approval from the Department for a submittal of a smaller Master Plan area. Boundaries such as thoroughfares (existing or proposed), creeks, political subdivisions, or other such natural or man-made features may be used to delineate the smaller area.

- (A) The submittal of the Master Plan shall be accompanied by the completed application for the Preliminary Plat as specified by the County.
- (B) The approval in concept of the Master Plan by the County does not constitute approval of the subsequent plats within the plan boundaries.
- (C) Graphic requirements for the Master Plan shall conform to the requirements of these regulations.
- (D) The following items shall be included in a Master Plan
  - (1) The full boundary of all land to be included in the proposed development for which later Preliminary and Final Plats will be submitted for approval showing the ownership and property lines (generally) of all adjacent properties;
  - (2) All existing roads, right of ways, and easements;
  - (3) All existing drainage ways, water bodies, canals, rivers, streams, and impoundments;
  - (4) Location and elevation of the 100 year and 500 year flood plains and all floodways;
  - (5) Approximate location of major utility lines. A listing of the owners and providers of utility services that will serve the development and a general statement of how services will be provided;
  - (6) General layout of proposed major street patterns, connections to existing streets, and general layout for proposed land uses in a bubble type format at a minimum;
  - (7) A preliminary schedule for phasing and construction;
  - (8) If not held in fee by the Applicant, the Master Plan must be accompanied by a Notarized Affidavit from the record owner consenting to the submission and development of the land and it shall indicate which tracts are owned by the Applicant and which are not, and;

- (9) A general statement as to how the property will be developed to adhere to the County thoroughfare plan.

### ***Sub-Section 6 - Application Procedures***

#### **20.6.01. General Requirements and Application Procedures**

Applications to the Commissioners Court for platting and subdividing property pursuant to these Regulations are subject to the general requirements and Application procedures set forth in Section 10.7 of these Regulations.

#### **20.6.02. Fees**

Fees for Applications for Subdivisions shall be based on the number of lots shown on the Preliminary Plat and the Final Plat and shall be as established by the Commissioners Court and detailed in Section 10.6.02.

#### **20.6.03. Application Report**

All Applications to the County for platting and subdividing property pursuant to these Regulations, including amendments or supplemental materials, shall be delivered to the Department and shall initially include the application form from Section 10.7.01 and the following information in a report format. Additional information shall be required with each of the Preliminary Plat and the Final Plat submittals (See Appendix A). Normally, the Preliminary Plat and its required information will be submitted with this Application material.

- (A) The name of the proposed Subdivision;
- (B) The legal name of the Applicant;
- (C) The name, address and contact information for the Applicant's designated contact person and any person submitting Application materials on behalf of the Applicant;
- (D) The legal name, address and contact information for the Owner(s) of the Subject Property, if different from the Applicant;
- (E) The legal name of the Permittee, if the Development Approval is to be issued to a person that is not the Applicant;
- (F) The size and location of the Original Tract or, if a reference identifier has previously been assigned, the reference identifier of the Subdivision application;
- (G) The applicable Preliminary Plat application fee;

- (H) The Preliminary Plat Checklist, Preliminary Plat, and preliminary drainage plan;
- (I) A detailed description of the specific activities proposed for the Subject Property;
- (J) Provide a general discussion of the means and methods of providing Water and sewer services;
- (K) The LCCAD Property Identification number(s) for the Subject Property;
- (L) The identification of any supplemental information submitted and any other information requested by the Department to fully evaluate the proposed development project;
- (M) The County Precinct(s) in which the Subject Property is located;
- (N) Information on the precise location of the Subject Property to include:
  - (1) The current legal description;
  - (2) The Primary and any secondary existing public roadways which abut the Subject Property or will be used for access to the proposed development; and,
  - (3) A set of Geographic Coordinates for the main entrance to the subdivision from an existing public roadway.
- (O) Identify any technical representatives or consultants responsible for preparation of the Application or Supplemental Information (e.g. professional engineers, professional geoscientists, professional land surveyors, registered sanitarians, professional land planners, attorneys, etc.).
- (P) The signature of the Applicant.

The Applicant is responsible for ensuring that all applicable information regarding the Application is provided in the Application Report. Supplemental information may be attached to the Application Report.

#### **20.6.04 Item Not Used**

#### **20.6.05 Supplemental Information**

In addition to the items required to be submitted in the Application Report in accordance with Section 20.6.03 each Application for a Preliminary Plat or a Final Plat shall include the following:

- (A) Engineering, surveying, and other drawings and report documents containing the specific information required for either a Preliminary Plat or a Final Plat which can be found in Subsections 10 and 12 of this Section;
- (B) All other documents or reports required pursuant to these Regulations and any associated bonds or letters of credit; and,
- (C) Any Subdivision proposal that is not exempt according to Section 20.3 shall be required to submit digital files for all drawings, documents, applications, and graphics of the Subdivision, as required under Section 10.7.

#### **20.6.06 Review Periods**

The Department review period for an Application for a Preliminary Plat or Final Plat shall begin on the first working day after an Application is submitted to the Department. The Administrative Review period shall begin on the first day and shall be in accordance Section 10.7.04 and shall be completed within 10 business days. The Department will notify the Applicant within that period if the application or checklist information is incomplete. Once considered Administratively Complete, the Technical Review period shall begin and shall be completed within 60 calendar days thereafter assuming the application material is administratively complete and subject to the review requirements and procedures in Section 10.7.05 providing for additional review time in the event the technical information is not complete, correct, or sufficient.

- (A) An application for a Preliminary Plat or Final Plat shall be deemed to be administratively complete for purposes of this Chapter when all of the materials required by these Regulations are delivered to the Department together with:
  - (1) For Preliminary Plats, those items required in Sections 20.5 and 20.10 and;
  - (2) For Final Plats, those items required in Sections 20.5 and 20.12.
- (B) Final action, including resolution of all appeals, of either a Preliminary Plat or Final Plat shall be no later than 60 calendar days from the date the application is considered administratively complete, subject to extensions as allowed by TLGC §232.0025(f).

#### **20.6.07 Technical Review Procedure**

Upon receipt of a completed application, the Department shall conduct a technical review of the Application and make a recommendation to the Commissioners Court as to whether the Application is in compliance with these Regulations and if the Preliminary Plat, Final Plat, or Construction Plans should be approved or denied.

- (A) In the event the Department determines that the Application is not complete, then the Department shall provide the Applicant with written comments detailing the outstanding or deficient items.

- (B) Upon receipt of the Department's written comments, the Applicant shall submit to the Department additional information or a revision to the Application, together with a written response to each comment of the Department. The Applicant may request that the Application be forwarded to the Commissioners Court without addressing the Department's comments, in which event the Department will make its recommendation and itemize the deficient or outstanding items for the Commissioners Court.
- (C) Upon written request of the Applicant, the Department may extend the Applicant's thirty (30) calendar day response time to provide supplemental information, but in no event for longer than sixty (60) additional calendar days.
- (D) In the event the Applicant fails to respond to the Department within the thirty (30) calendar day response period (or the period as extended by agreement), the Department shall return the Application to the Applicant, without a refund of fees incurred, and the Applicant will be required to re-file an original Application, with applicable fees, for further consideration of the Application. The Applicant will be liable for any review charges incurred by the County's Consulting Engineer.
- (E) All Applications whose technical review is completed shall be posted by the Department for consideration by the Commissioners Court at the next regularly scheduled meeting of the Commissioners Court.
- (F) The Department shall forward the results of its technical review and its recommendations with respect to the Application to the Commissioners Court in writing in accordance with the established schedule for posting items for the agenda of the meeting at which the Application will be considered by the Commissioners Court. The Department shall notify the Applicant of the results of its technical review.

### ***Sub-Section 7 - Minimum Lot Setbacks***

All lots in subdivided property shall meet the following minimum requirements.

- (A) Minimum sizes for lots to be served by an OSSF shall be determined based on the requirements of Section 30.3.02. Lot widths and depths shall meet those requirements at a minimum. Lots using an OSSF system and an individual water well shall not be less than one acre in size and lots that use an OSSF and a centralized water system shall not be less than ½ acre in size. All of these requirements shall be met in the lot sizing. Lot sizes smaller than required herein will be considered on a case by case basis. The Applicant shall submit a variance request in accordance with Section 10.8. Approval shall only be given by the Commissioner's Court upon recommendation by the Department.
- (B) Setbacks from road rights-of-ways shall be as shown in the Table 40.7.09. A front

setback shall be 25 feet. A rear setback of 10 feet from the rear property line shall be required on all lots. Setbacks from adjacent property lines shall be a minimum of five (5) feet. Setbacks herein shall not conflict with separation or setback distances required by rules governing public utilities, on-site sewerage facilities, or drinking water supplies. Setback lines required elsewhere in these Regulations shall control to the extent greater setbacks are therein required. The front setback and the required utility easement can overlap.

### ***Sub-Section 8 - Easements***

All lots in subdivided property shall meet the following minimum sizes and requirements.

- (A) Minimum utility easement width shall be fifteen (15) feet and shall be outside of the road right of way. Utility easements shall be along the frontage of every street ROW. Drainage improvements may encroach on the utility easement as long as utilities are not compromised.
- (B) Drainage easements shall be of sufficient width to accommodate the size ditch necessary to carry the design capacity of the ditch, plus adequate width for access and maintenance. Drainage easements shall be inclusive to every street ROW or shall be in accordance with Section 50.3.03(B)(1)(b)(iii) for drainage features not located within a street ROW.

### ***Sub-Section 9 - General Requirements for Preliminary Plats***

The following information is required to be submitted for both Preliminary Plats and Final Plats as part of the application discussed above:

#### **20.9.01 General Information to be Included on All Preliminary Plats**

Preliminary Plats and Final Plats shall consist of drawings and supporting documents. Drawings shall be prepared at a standard scale, in accordance with the media and size standards included in the Preliminary and Final Plat Sub Sections in this Section. The drawings and supporting documents shall contain the following information:

- (A) Name of the proposed Subdivision, which shall not be the same or deceptively similar to any other subdivision within the County unless the subdivision is an extension of a pre-existing, contiguous subdivision. Applications for subdivisions which are an extension of a pre-existing, contiguous subdivision shall include a designation of the sequence order for each separate application (e.g. Phase II, Section 3, etc.);
- (B) Proposed subdivisions which are part of a larger multi-application development shall provide a separate plan sheet(s) showing the relationship of the various Sections of the

Subdivision and how they will interface along with the Preliminary Plat submission.

- (C) The boundary lines and total acreage of the Original Tract, the Subject Property and the proposed Subdivision;
- (D) A note stating the total number of lots within the proposed subdivision;
- (E) Lot number and size, block numbers, building set back lines.
  - (1) Lot number.
  - (2) Minimum set back lines as required in the Section 20.7.
  - (3) Length of each block.
  - (4) Acreage and dimensions of each lot.
  - (5) Note the usage of each lot as single family, residential, commercial, or unrestricted.
- (F) Approximate acreage and dimensions of roadway and any parkland/open space tract, if provided;
- (G) Identify the location and widths of all utility easements and drainage easements.
- (H) Existing contours shall be shown at two-foot or one-foot intervals according to the requirements specified for construction plans in Section 40.8.01(F)(6).
- (I) If provided, the location of any proposed parkland, greenbelts, school tracts, open space or other public use facilities, and a notation that these areas shall be provided through dedication;
- (J) Names of adjoining subdivisions or owners of property contiguous to the proposed Subdivision (See Section 10.9.03);
- (K) Geographic Coordinates shall be reflected on the drawings for the main entrance point to the proposed subdivision from an existing public roadway and for the most extreme property boundary corners of the parent tract(s) constituting the boundaries of the Subject Property in each compass direction (e.g. northernmost, southernmost, etc.). Geographic coordinates for Preliminary Plats may be reported using navigational grade precision (using navigational grade Global Positioning System [GPS] equipment). Geographic coordinates obtained using more precise methods are also acceptable for Preliminary Plats;
- (L) Name and address of the Texas licensed professional land surveyor, Texas licensed



professional engineer, or Texas licensed land planner preparing the Application materials;

- (M) Name and address of the Owner(s) of the Subject Property, and Applicant if not the Owner;
- (N) Area map showing the general location of the Subdivision in relation to major roads, towns, cities or topographic features;
- (O) North arrow, scale and date. The scale shall not exceed 1" = 200';
- (P) Each sheet must be numbered consecutively, sheet x of y.
- (Q) Boundary lines of any incorporated municipality and the limit of the extraterritorial jurisdiction of any municipality that falls within or close to the Subdivision; and,
- (R) The location of Political Subdivision (e.g. school districts, municipal utility districts, groundwater conservation districts, emergency services districts, etc.) boundaries and/or a statement clearly indicating in which Political Subdivision(s) the Subdivision is located.

#### **20.9.02 Water, Wastewater, and Utilities Information**

A proposed Subdivision shall satisfy the requirements of Section 30 of these Regulations and shall make provision for serving the Subdivision with other utilities:

- (A) Designation of the water and sewer utility provider for the Subdivision, and the source of the water intended to serve each lot within the subdivided area.
- (B) Designation of the entity supplying electric, telephone and natural gas utilities to the development, or a statement that such utility is not available;
- (C) The location of all proposed utility easements and/or infrastructure, including water well sanitary control easements, if applicable;
- (D) If applicable, certification that all lots have been designed in compliance with the Rules of Liberty County for On-Site Sewage Facilities, together with a Facility Planning Report for On-site Sewage as provided for in Chapter 285 in the Texas Health and Safety Code.
- (E) If applicable, any applicable separation distance from identified streams or other applicable off-site receptors in accordance with the Rules of Liberty County for On-Site Sewage Facilities.

#### **20.9.03 Roadway and Right-of-Way Information**

A proposed subdivision shall satisfy the requirements of Section 40 relating to design of roadways. The information included with the Application shall illustrate:

- (A) Location, length and right-of-way widths of all proposed roadways and a depiction of how all proposed roadways shall connect with previously dedicated, platted or planned roadways within the vicinity of the Subdivision;
- (B) Location, size and proposed use of all proposed access easements, or Shared Access Driveways, if any;
- (C) A statement indicating whether the Applicant shall seek public dedication of the roadways or designation of roadways as private roadways;
- (D) The number of feet of frontage of each lot onto a regulated roadway;
- (E) A table shall be provided designating the classification of each roadway to be constructed or existing roadways abutting any lot as determined in accordance with Table 40.7.09;
- (F) Street and right of way widths, block lengths, and other dimensions shall meet the requirements in Table 40.7.09 for the various classifications of roadways.

#### **20.9.04 Flood Plain and Drainage Information**

A proposed Subdivision shall satisfy the requirements of Section 50 of these Regulations and the Liberty County Flood Damage Prevention Ordinance. Proposed subdivisions with five (5) or fewer lots meeting the minimum lot size requirements are exempt from this subchapter.

The information included with the Application shall illustrate:

- (A) A Preliminary Drainage Plan as required in Sections 50.1;
- (B) Elevation contours at no less detail than two-foot (2') intervals, based on North American Vertical Datum (NAVD) of 1988 (NAVD88);
- (C) Must be delineated based upon all Special Flood Hazard Areas identified by the most current Flood Insurance Rate Maps published by the Federal Emergency Management Agency;
- (D) For each lot containing a Special Flood Hazard Area, sufficient contours to identify and delineate the Special Flood Hazard Area (including the 100 year floodplain and regulatory floodway, if any) and the lowest allowable finished floor elevation. If the base flood elevations and lowest allowable finished floor elevations have not already

been established, they shall be established by a method satisfactory to the Department;

- (E) For each lot containing the Special Flood Hazard Areas, a finished floor elevation at a minimum of two feet (2') above the 100 Year Flood Plain must be identified on the plat. Structures at an elevation less than two feet (2') above the 100 Year Flood Plain shall be prohibited unless flood proofed in accordance with the flood damage prevention ordinance;
- (F) For each Subdivision containing the Special Flood Hazard Areas, at least one benchmark showing NAVD 88 datum elevation, as well as Geographic Coordinates, shall be established using the procedures presented in the Texas Department of Transportation (TXDOT) Survey Manual, latest edition;
- (G) A drainage plan depicting the anticipated flow of all storm water onto and from the Subdivision and showing all major topographic features on or adjacent to the property including all water courses, special flood hazard areas, ravines, swales, ditches, bridges, and culverts;
- (H) The location and size of all proposed storm water management structures and easements, including on-site retention and/or detention ponds and easements and the impact of lot and street layouts on drainage;

### ***Sub-Section 10 - Preliminary Plat Submittal***

#### **20.10.01 General Information**

A proposed Preliminary Plat shall include all of the information required in the application as identified by Section 10.7 and Sections 20.6, 20.7, 20.8, and 20.9 of this Section. It shall also include the following:

- (A) Application, Application Report, and required supplemental information required in Sub-Section 20.9.
- (B) Preliminary Plat Checklist and all documents and information required therein including:
  - (1) Copies of the Preliminary Plat;
  - (2) Application fee;
  - (3) The preliminary drainage plan;
  - (4) Facility Planning Report for OSSF systems, if applicable;

- (C) Where a proposed subdivision meets the requirements of Section 20.5, a Master Plan shall be submitted.

#### **20.10.02 Number of Copies**

The Applicant shall submit with the Application, four (4) 24"x36" black and white copies of the Preliminary Plat, the Preliminary Drainage Plan, and one digital data file of the Preliminary Plat and Preliminary Drainage Plan. All data and documents submitted in hard copy shall also be provided in digital format on a USB drive. FTP protocol may be accepted in lieu of USB drive format, at the discretion of the Department.

### ***Sub-Section 11 - Approval of Preliminary Plat***

#### **20.11.01 Criteria for Approval of Preliminary Plat**

The Commissioners Court shall approve a Preliminary Plat if it satisfies each of the requirements for a Preliminary Plat set forth in these Regulations.

#### **20.11.02 Construction Activities**

Approval of a Preliminary Plat does not authorize any construction or Development activities, but merely authorizes the Applicant to proceed with the preparation of a Final Plat, Construction Plans, and Final Drainage Plan. Clearing, grubbing, and temporary drainage shall not be considered construction activities and is, therefore, not prohibited at this stage.

#### **20.11.03 No Conveyance of Lots**

Conveyance of lots depicted on a Preliminary Plat shall not be permitted until the Final Plat, the Construction Plans, the Final Drainage Plan has been approved and the record plat filed with the County Clerk as provided by Property Code 212.002(d).

#### **20.11.04 Expiration**

In accordance with Section 245.005 of the Local Government Code, approval of a Preliminary Plat shall expire and be of no further force and effect in the event a Final Plat for a portion of the Subdivision is not filed within twelve (12) months following the date of the Commissioners Court approval of the Preliminary Plat or in the event that no progress has been made towards completion of the project within the project activity period. For purposes of this section, the term "project activity period" means the later of:

- (A) Two (2) years from the date of approval of the Preliminary Plat; or,

- (B) Five (5) years from the date the first application was filed for the project.

### ***Sub-Section 12 - Final Plat***

A proposed Final Plat shall comply with the general requirements noted in the requirements of the approved Preliminary Plat. The Final Plat and shall include the following additional information:

#### **20.12.01 Other Documents**

Final Plat Checklist and all information required therein including:

- (A) Copies of the Final Plat;
- (B) Application fee;
- (C) Construction plans for roads and drainage improvements;
- (D) Executed water and/or wastewater service agreements, if applicable;
- (E) Engineering reports as necessary including:
  - a. Onsite Sanitary Sewer Facilities, if required;
  - b. Final Drainage Plan;
  - c. Roadway Design Report;
  - d. The Water and Wastewater Service Engineering Report;
  - e. Flood plain issues.

#### **20.12.02 General Information**

- (A) Bearings and dimensions of the boundary of the Subdivision and all lots, parks, greenbelts, easements, or reserves. Dimensions shall be shown to the nearest one-hundredth of a foot (0.01') and bearings shall be shown to the nearest one second of angle (01"). The length of the radius and arc of all curves, with bearings and distances of all chords, shall be clearly indicated;
- (B) Description of monumentation used to mark all boundary, lot and block corners, and all points of curvature and tangency on street rights-of-way, in accordance with the regulations of the Texas Board of Land Surveying;

- (C) The Subdivision shall be located with respect to an original corner of the original survey of which it is part, in accordance with the regulations of the Texas Board of Land Surveying;
- (D) Lot and block numbers for each lot;
- (E) Acreage of all lots, calculated to the nearest one-hundredth (0.01) of an acre;
- (F) The building setback lines from Regulated Roadways identified in Section 40, Section 20.7, and Section 20.8;
- (G) All easements including but not limited to utility and drainage easements;
- (H) State Plane Coordinates or lat/long shall be reflected on the drawings for the main entrance point to the Subdivision from an existing public roadway and for two (2) property boundary corners;

#### **20.12.03 Flood Plain and Drainage Information**

- (A) For Subdivisions containing Special Flood Hazard Areas, a minimum of one (1) benchmark shall be provided and recommended finished floor elevations established for each lot in accordance with Liberty County Flood Damage Prevention Ordinance.
- (B) For each Subdivision containing a Special Flood Hazard Area, at least one (1) monument containing latitude and longitude and NAVD 88 datum elevation.
- (C) For each lot containing the Special Flood Hazard Areas, a finished floor elevation at a minimum of two feet (2') above the BFE must be identified on the plat.

#### **20.12.04 Roadway and Right-of-Way Information**

- (A) Total length of all roadways, to the nearest foot, and a declaration as to which category of roadway will be constructed, as described in Section 40.
- (B) Total area of all rights-of-way proposed for dedication.
- (C) The approved names or designations for all roadways, public access easements, and shared access driveways.
- (D) Construction plans, specifications, and cost estimates, prepared by a Texas licensed professional engineer. All engineering reports must also be submitted along with the construction plans including the Roadway Design Report and Final Drainage Plan.
- (E) A minimum of three (3) Geographic Coordinates for the purpose of establishing "911"

Street addresses within the Subdivision.

- (F) The following statement shall appear prominently on the Final Plat: "No driveway constructed on any lot within this subdivision shall be permitted access onto a public roadway unless:
  - (1) A culvert/driveway permit for use of the County Roadway Right-Of-Way has been issued; and,
  - (2) The driveway satisfies the minimum spacing requirement for driveways set forth in Table 40.7.09 of the Liberty County Subdivision and Development Regulations."
- (G) The minimum driveway culvert size for each lot presented in a table on the drainage plans.
- (H) A certification in the form of a plat note from a Texas Professional Engineer, Texas Registered Professional Land Surveyor, or Texas Licensed Land Planner that the location and dimensions of roadways as set forth are in accordance with these Regulations.

#### **20.12.05 Water, Wastewater and Utilities Information**

- (A) The following statement shall appear prominently on the Final Plat: "No structure in this subdivision shall be occupied until connected to a state approved individual water supply well or state approved community water system. Potable water service shall be provided to each lot by \_\_\_\_\_."
- (B) The following statement shall appear prominently on the Final Plat: "No structure in this subdivision shall be occupied until connected to a permitted public or private sanitary sewer system or to an on-site wastewater system that has been approved and permitted by Liberty County. Sanitary sewer service shall be provided to each lot by \_\_\_\_\_."
- (C) If the Applicant submits a Water and Wastewater Service Engineering Report under Section 30, the following statements, utilizing the words "water", "wastewater" or both, as required, shall appear prominently on the Final Plat:

"The filer of this plat has submitted to the Department a Water and Wastewater Service Engineering Report describing how [water] [and] [wastewater] service will be provided to this subdivision."
- (D) For Subdivisions exempt from submitting a Water and Wastewater Service Engineering Report under Section 40.2.02, the following statements shall appear prominently on the

Final Plat: "Under Department Regulations, this subdivision is exempt from the requirements to demonstrate the availability of water and wastewater service."

#### **20.12.06 Other Plat Notes and Certifications**

- (A) The following statement shall appear prominently on the plat: "No construction or development within the subdivision may begin until the final plat and construction plans have been approved by the Commissioners Court."
- (B) Plats shall contain the notes and certifications required by the Liberty County Plat Notes and Certifications in these Regulations in Appendix C
- (C) No more than one single family detached dwelling shall be located on each lot. A notation of this restriction shall be placed on the face of the final plat.

#### **20.12.07 Number of Copies for Final Plat**

The Applicant shall submit the two (2) mylars and four (4) 24"x36" copies of the Final Plat and one digital data file of the signed/sealed Final Plat. All data, documents, and reports submitted in hard copy shall also be provided in digital format on a USB drive. FTP protocol may be accepted in lieu of USB drive format, at the discretion of the Department.

### ***Sub-Section 13 - Approval of a Final Plat***

#### **20.13.01 Criteria for Approval of a Final Plat**

The Commissioners Court shall approve a Final Plat if it satisfies each of the requirements for a Final Plat set forth in these Regulations.

#### **20.13.02 Approval of a Final Plat**

The Department will review the Final Plat to determine whether it meets the required standards. The Commissioner's Court shall refuse to approve a Final Plat if it does not meet the requirements prescribed by or under these Regulations.

Approval of a Final Plat shall not authorize any construction activities. Construction plans and other required documents must be approved prior to commencement of construction. Construction plans should be approved along with the Final Plat. The approval of the Final Plat authorizes the Applicant to submit the Record Plat.

#### **20.13.03 Expiration of a Final Plat**

Approval of a Final Plat shall expire and be of no further force and effect in the event that a



Record Plat, as required by these Regulations, is not actually filed with the County Judge's office for signature within 60 days of the approval of the Final Plat.

#### **20.13.04 Review and Approval of Final Plats.**

Final plat approval shall not be granted unless the Applicant has accomplished the following:

- (A) Dedicated the sites for the adequate water and sewerage facilities identified in the final plat to the appropriate retail public or private utility responsible for operation and maintenance of the facilities; and
- (B) Obtained all necessary permits for the proposed water facilities and wastewater facilities, other than for OSSF permits on individual lots within the proposed subdivision, or provide a letter from the utility owner assuming responsibility to install all water and wastewater facilities in accordance with TCEQ requirements and to obtain all necessary TCEQ approvals permits.

### ***Sub-Section 14 - Record Plat***

#### **20.14.01 Submission of Record Plat to the Department**

Following approval of the Final Plat, the Applicant shall present a Record Plat to the Department for final approval and delivery to the County Judge for execution, in accordance with Section 10.12. The Record Plat shall contain, or be submitted with, the following:

- (A) All items required in Section 20.13 above;
- (B) Original signatures and original seals for licensed or registered professionals;
- (C) Construction securities; and
- (D) Certified tax certificates.

#### **20.14.02 Filing with the County Clerk**

Final Plats that have been executed by the County Judge or the County Judge's designated representative may be presented to the County Clerk for filing in the County plat records, in accordance with Section 10.12.

#### **20.14.03 Record Plat**

Two (2) 24" x 36" signed mylars plat shall be presented to the County Clerk for recording as the Record Plat. All writing and drawings on the Record Plat must be large enough to be easily

legible following recording. Scale should be 1"=100'. The record plat shall have the terms "RECORD PLAT" displayed in the title.

### ***Sub-Section 15 - Construction Plans***

Construction plans shall address all facilities necessary to be constructed in order to provide a complete development. The Applicant shall submit two (2) 24"x36" copies of the construction plans and Final Drainage Plans. Construction plans shall include, at a minimum, the following:

- A. All streets, signage, and drainage improvements within the Subdivision in accordance with the Preliminary and Final Plat requirements in this Section, with Section 40 - Roadway Standards, with Section 50 - Drainage Standards, and with Section 30 - Water and Wastewater Availability.
- B. Other documents required including specifications covering all equipment, materials, and workmanship to be included in the construction plans.
- C. All engineering reports must be submitted along with the construction plans including the Roadway Design Report, Final Drainage Plan, and the Water and Wastewater Service Engineering Report if not submitted with the Preliminary Plat.
- D. All plan sheets and documents shall be prepared by a Texas licensed professional engineer and shall bear the appropriate seal, signature, and date. The plans shall contain a certification under the seal of a Texas Registered Professional Engineer that the Construction Plans and pavement designs are in compliance with these Regulations.
- E. Evidence of all TCEQ approvals of plans for new water production, water distribution, wastewater treatment, and wastewater collection facilities in accordance with the requirements in Section 30 or a letter from the utility owner assuming responsibility to install all water and wastewater facilities in accordance with TCEQ requirements and to obtain all necessary TCEQ approvals and permits.
- F. All data, documents, and reports submitted in hard copy shall also be provided in digital format on a USB drive or other electronic format acceptable to the Department.
- G. Cost estimates shall include the total estimated construction cost of all of the streets and drainage improvements proposed for construction within the Subdivision.

In general, the construction plans are to be submitted along with the Final Plat for review and approval. The approval of the Final Plat does not, however, authorize any construction activities. A separate approval of Construction Plans and the Final Drainage Plan must be obtained from the Commissioners Court prior to beginning construction. This approval must be obtained along with the approval of the Final Plat.

### ***Sub-Section 16 - Plat Revisions***

This sub-section outlines the requirements and processes for plat cancellations, plat vacations, replats, and revised plats as authorized under Texas Local Government Code Sections 232.008, 232.009, and 232.0095.

#### **20.16.01 Cancellation**

Any Application to cancel an existing plat or any portion of an existing plat of a subdivision located outside of the extra-territorial jurisdiction of any municipality shall be submitted and considered in accordance with Texas Local Government Code Section §232.008, which establishes, among other things:

- (A) The Application shall be granted if it is shown that the cancellation of all or a part of the subdivision does not interfere with the established rights of any purchaser who owns any part of the subdivision, or it is shown that the purchaser agrees to the cancellation;
- (B) Notice of the Application must be published in English in a newspaper in the County for at least three weeks before action is taken on the application;
- (C) Upon Application of the owners of 75 percent of the property included in the subdivision, phase or identifiable part, the Commissioners Court shall authorize the cancellation upon notice and hearing as required under Texas Local Government Code Section §232.008, provided that if the owners of at least 10 percent of the property affected file written objections with the Commissioners Court, the grant of an order of cancellation is at the discretion of the Commissioners Court; and,
- (D) Establishing a certain private action for damages against the Applicant for persons who protest unsuccessfully against a cancellation application. In the event of any conflict or inconsistency between the summary set forth above and the actual terms of Texas Local Government Code §232.008, as amended, the terms of the Texas Local Government Code shall control in all respects.

#### **20.16.02 Plat Vacation**

Any application to vacate an existing plat or any portion of an existing plat of a subdivision located within the extra-territorial jurisdiction of any municipality shall be submitted and considered in accordance with Texas Local Government Code Section 212.013.

#### **20.16.03 Replats**

The Owner of an existing lot or lots in a platted Subdivision may submit an application to replat

such lots, unless prohibited by plat notes filed pursuant to these Regulations, by submitting the following to the Department:

- (A) The general information required by Section 20.4 of these Regulations;
- (B) A copy of all existing recorded plats affected by the proposed revision;
- (C) Two (2) mylars and four (4) 24"x36" black and white hard copies and electronic copies of the proposed revised plat, conforming in all respects to the requirements of these Regulations;
- (D) A statement giving the reason for the proposed revision;
- (E) A filing fee as established by the Commissioners Court.

#### **20.16.04 Revised Plats**

An Owner, Developer, or Applicant of an existing lot or lots in a platted Subdivision may submit an application to revise the recorded subdivision by submitting the following to the Department:

- (A) Revision Submittal Requirements:
  - (1) Subdivision Application;
  - (2) One (1) mylar and four (4) black and white copies of the proposed revised plat, conforming in all respects to the requirements of these Regulations; or, if submitted by a private homeowner who is not a developer in the Subdivision, can be on legal size paper as long as it clearly sets forth the desired amendment;
  - (3) A statement giving the reason for the proposed revision;
  - (4) The applicable filing fee.
- (B) Review Period

The County will meet the review standards established by Chapter 232.009 of the Texas Local Government Code.

#### **20.16.05 Criteria for Approval**

The Commissioners Court may approve an application to revise a Subdivision upon a finding that:

- (A) The revision will not interfere with the established rights of any owner of a part of the

subdivided land; or each owner whose rights may be interfered with has agreed to and signed the revised plat; and

(B) The plat as revised conforms to the requirements of the Regulations.

#### **20.16.06 Record Plat**

Upon approval of the Revised Plat by Commissioners Court, the Applicant shall prepare a Record Plat for recordation in the Liberty County Plat Records in accordance with these Regulations. The Record Plat must be recorded within 60 days of the approval of the Revised Plat or it will become void.

## **SECTION 30 - WATER AND WASTEWATER AVAILABILITY**

### ***Sub-Section 1 – Applicability***

#### **30.1.01. General Requirements**

This Section shall govern demonstrations of water and wastewater availability required in conjunction with the approval of subdivision plats, unless excluded or exempted under State law or in these Regulations. The establishment of a residential development with two (2) or more lots of five (5) acres or less where the water supply and sewer services do not meet the minimum standards of this Section is prohibited. A subdivision with lots of five (5) acres or less is presumed to be a residential development unless the land is restricted to non-residential use on the final plat and all deeds and contracts for deeds.

#### **30.1.02. Legal Authority**

Legal Authority for adopting and enforcing the regulations in this Chapter is granted to the County under TLGC in Chapter 232 and under Texas Water Code Chapter 35.

#### **30.1.03. Approval Required**

In accordance with TLGC Chapter 232, approval of the County is required prior to a utility furnishing water or wastewater service to subdivisions under the jurisdiction of these Regulations or a letter from the utility owner assuming responsibility to install all water and wastewater facilities in accordance with TCEQ requirements and to obtain all necessary TCEQ approvals and permits shall be provided to the County.

#### **30.1.04. Types of Water Supply Systems**

Acceptable water supply sources shall meet one or more of the types listed below. Where applicable, the systems shall meet the County On-Site Sewage Facilities rules. Specific definitions for these classifications are provided in Section 10.3.

(A) Existing Public or Non-Public Groundwater or Surface Water Supply System

Such systems are defined as those existing TCEQ approved water supply system which produce their own water supply through the treatment and distribution of groundwater or surface water.

(B) Public or Non-Public Groundwater Supply System

A Groundwater Supply System is any water supply system that obtains its water from groundwater sources. Public Groundwater Supply Systems are those owned and/or operated by a governmental entity recognized under the Texas Local Government Code or any system

designated a Public Water System by the Texas Commission on Environmental Quality (TCEQ). Non-Public Groundwater Supply Systems are any Groundwater Supply Systems that do not qualify as a Public Groundwater Supply System.

(C) Individual Water Supply Wells

The supply of potable water for a subdivision with no public or private water supply system but through private water wells for each lot shall constitute the supply through Individual Water Supply Wells. This is essentially a non-public groundwater supply system but shall be designated as Individual Water Supply Wells.

(D) Public or Non-Public Surface Water Supply System

Such systems are defined as those which produce their water supply through the treatment and distribution of surface water from a TCEQ approved surface water treatment plant.

(E) Transportation of Potable Water

The conveyance of potable water by transport truck or other mobile device to supply the domestic needs of the subdivision is not an acceptable method, except on an emergency basis. Absence of a water system meeting the standards of these rules due to the negligence of the subdivider does not constitute an emergency.

**30.1.05. Compliance with Regulations Constitutes No Warranty by County**

While these rules are intended to preserve and protect the water resources of Liberty County, the Commissioners Court of Liberty County does not make any warranty - express, implied or otherwise - that developments that comply with these rules will be able to meet the water or wastewater needs of those whom the development serves.

***Sub-Section 2 – Water and Wastewater Service Engineering Report Contents***

**30.2.01. Water and Wastewater Service Engineering Report Required**

An Applicant for a Development Approval shall prepare a Water and Wastewater Service Engineering Report demonstrating the availability of both water and wastewater service to the proposed development or how those services shall be provided. The report shall be signed and sealed by a Professional Engineer licensed in the State of Texas. It shall be submitted along with the Final Plat.

**30.2.02. Applicability**

The following developments are exempted from the requirements to submit Water and Wastewater Service Engineering Reports under these Regulations. The County encourages exempted

developments to comply with these Regulations.

The following categories of subdivisions are not required to submit water and wastewater service engineering reports, subject to the inclusion of a plat note prohibiting further subdivision or re-subdivision for a period of five (5) years following the filing of the Final Plat:

- (A) All subdivisions of five (5) lots or less in which all lots average at least two acres.
- (B) All subdivisions of ten (10) lots or less in which all lots are larger than ten (10) acres.

### **30.2.03. Preparation of Water and Wastewater Service Engineering Report**

The Water and Wastewater Service Engineering Report shall be prepared under the direction of and sealed by a Texas licensed professional Engineer, with the following exceptions:

- (A) For developments for which water availability is being demonstrated using only individual private water wells, the Applicant may include a water availability statement prepared by a Texas Licensed Professional Geoscientist or Professional Engineer; or,
- (B) For developments for which wastewater availability is being demonstrated using only On-site Sewage Facilities subject to permitting by the County under the Liberty County On-Site Sewage Facilities rules, the Applicant may include a wastewater availability statement from a Texas Registered Sanitarian in accordance with the Liberty County On Site Sewerage Facilities rules and regulations.

### **30.2.04. Contents of All Water and Wastewater Service Engineering Report**

The Water and Wastewater Service Engineering Report shall describe how the proposed development will be provided with both water and wastewater service. Each Water and Wastewater Service Engineering Report shall, at a minimum, contain the information in this section. In addition, other information shown in subsequent sections must be submitted depending on the method of providing water and wastewater service.

- (A) Identify if water and sewer services will be provided by an existing utility, a new utility, individual water wells, or on site sewer facilities.
- (B) Identify what, if any, TCEQ approvals are required in order for these facilities to be in compliance with TCEQ rules and regulations and when those approvals are anticipated to be obtained or identify that Applicants intent to provide a letter from the utility owner assuming responsibility to install all water and wastewater facilities in accordance with TCEQ requirements and obtain all necessary TCEQ approvals and permits.
- (C) The availability and methodology of providing water facilities and wastewater treatment to individual lots within the subdivision;



- (D) Identification of all water and wastewater facilities associated with the proposed development;
- (E) Identification of all water and wastewater facilities to be placed in County rights-of-way;
- (F) For phased developments, the description must address all water and wastewater facilities proposed to be utilized throughout full build-out of the development;
- (G) The report shall include a construction schedule for each significant element needed to provide adequate water or wastewater facilities. If financial guarantees are to be provided, the schedule shall include the start dates and completion dates.
- (H) The report shall certify that the development shall meet all aspects of TAC Sections 364.31-364.37 and 364.57-364.57.

### **30.2.05. WATER SYSTEM INFORMATION**

- (J) An estimate of the amount of water demand throughout all phases of development supported by engineering calculations based on the anticipated timetable for full build-out, including a statement describing the level of fire protection afforded to the proposed phase(s) of the development;
- (K) A statement as to whether there are plans for alternative or backup water service; if so, an identification of the alternative or backup water source;
- (L) A description of any anticipated new water facility improvements required to serve the development;
- (M) A map showing the proposed location of all water facilities throughout all phases of development as well as the proposed water service area, including any TCEQ-approved service area boundaries of a water service provider operating under a Certificate of Convenience and Necessity (CCN) within the boundaries of the proposed subdivision;
- (N) Based on the information available at the time the application is submitted, the anticipated owner(s) and operator(s) of all water facilities throughout all phases of development shall be identified and included in the application;
- (O) Where applicable, the Certification of Groundwater Availability For Platting Form as required by the TCEQ rules on Groundwater Availability Certification for Platting at 30 Tex. Admin. Code Section 230.3 shall be provided. The Department may require an applicant to submit any engineering calculations, studies or other data supporting the statements contained in the Certification of Groundwater Availability For Platting Form.
- (P) The provider shall obtain a Certificate of Convenience and Necessity (CCN) from the TCEQ and include evidence of the CCN issuance with the Final Plat.

- (Q) Prior to Final Plat Approval, Applicants must provide a written agreement with the utility if utilizing a new or existing utility. The agreement must provide that the retail public utility has or will have the ability and legal authority to supply the total flow anticipated from the ultimate development and occupancy of all phases of the proposed subdivision for a minimum of 30 years. The agreement must reflect that the subdivider has paid the cost of water meters and other necessary connection equipment, membership fees, water rights acquisition costs, or other fees associated with connection to the public water system so that service is available to each lot upon completion of construction of the water facilities described on the Final Plat. See Appendix D for a sample service agreement that may be used.
- (R) Before Final Plat approval, the construction plans and specifications necessary to serve all phases of the subdivision shall be approved by all entities having jurisdiction over the proposed project, including the TCEQ. This shall include plans and specifications for all water systems. All water systems shall be designed in accordance with the latest revision of 30TAC Chapter 290. In lieu of TCEQ approval, the Application may provide a letter from the utility owner assuming responsibility to install all water facilities in accordance with TCEQ requirements and obtain all necessary TCEQ approvals and permits.
- (S) The Applicant shall provide proof of written notification to all governmental entities having jurisdiction over any aspect of water supply to the proposed development requesting their comments on the letter from the provider.
- (T) A fully executed copy of the sanitary control easement shall be included.

#### **30.2.06. WASTEWATER SYSTEM INFORMATION**

- (A) A description of any new wastewater collection, treatment, storage, pumping and conveyance facilities. If the project is to be phased, the description must address all wastewater facilities proposed to be utilized throughout full build-out of the development.
- (B) An estimate of the amount of wastewater that will be treated and managed throughout all phases of development supported by engineering calculations based on the anticipated timetable for full build-out.
- (C) A statement as to whether there are plans for alternative or backup wastewater service; if so, an identification of the alternative or backup wastewater source.
- (D) A map showing the location of all wastewater facilities throughout all phases of development as well as the proposed wastewater service area, including any TCEQ- approved service area boundaries of a wastewater service provider operating under a Certificate of Convenience and Necessity (CCN) within the boundaries of the proposed development.
- (E) Include an estimated timetable for completion of facilities.

- (F) Identification of the proposed method of wastewater effluent disposal or re-use and a listing of any TCEQ permits that will be needed to implement the proposed wastewater disposal or re-use.
- (G) Based on the information available at the time the application is submitted, the anticipated owner(s) and operator(s) of all wastewater facilities throughout all phases of development shall be identified and included in the application.
- (H) The provider shall provide proof of a Certificate of Convenience and Necessity (CCN) from the TCEQ and include evidence of the CCN issuance with the Final Plat.
- (I) Prior to Final Plat Approval, Applicants must provide a written agreement with the utility if utilizing a new or existing utility. The agreement must provide that the retail public utility has or will have the ability and legal authority to supply the total flow anticipated from the ultimate development and occupancy of all phases of the proposed subdivision for a minimum of 30 years. The agreement must reflect that the subdivider has paid the cost of water meters and other necessary connection equipment, membership fees, water rights acquisition costs, or other fees associated with connection to the public water system so that service is available to each lot upon completion of construction of the wastewater facilities described on the Final Plat. See Appendix D for a sample service agreement that may be used.
- (J) Before Final Plat approval, the construction plans and specifications necessary to serve all phases of the subdivision shall be approved by all entities having jurisdiction over the proposed project, including the TCEQ. This shall include plans and specifications for all wastewater systems and an appropriate permit to discharge wastewater. All wastewater systems shall be designed in accordance with the latest revision of 30 TAC Chapter 217 and Chapter 305. In lieu of TCEQ approval, the Application may provide a letter from the utility owner assuming responsibility to install all wastewater facilities in accordance with TCEQ requirements and obtain all necessary TCEQ approvals and permits.
- (K) Additional information for developments utilizing individual On Site Sewage Facilities to provide wastewater service as outlined in Section 30.3.

### ***Sub-Section 3 – Additional Information Required for Systems***

#### **30.3.01 Additional Information Required for Systems Using Individual Private Water Wells**

In addition to the requirements outlined in Subsection 2.04, Applicants requesting approval to utilize one or more individual private water wells using Groundwater to serve the proposed development shall construct a test well located so as to be representative of the quantity and quality of water generally available from the supplying aquifer. Use of existing wells will be permitted if the wells

fully meet these regulations. Well analyses shall be performed by a Texas licensed professional engineer or Texas licensed professional geoscientist, qualified to perform the hydrogeological testing, geophysical well logging, and aquifer pump testing. The following information shall be included in the Engineering Report.

- (A) The produced waters shall be sampled and submitted to a private laboratory for a complete chemical and bacteriological analysis. The water quality of the water produced from the test well must meet the standards of water quality required for community water systems as set forth in 30 TAC Sections 290.103, 290.105, 290.106, and 290.110. All water quality information shall be included in the engineering report and shall be made available to all prospective property owners.
- (B) The engineering report shall include a groundwater availability study which shall include an analysis of the long term (30 years) quantity of the available groundwater supplies relative to the ultimate needs of the subdivision. Such statement may be based on information available from the Texas Water Development Board.
- (C) The Certification of Groundwater Availability For Platting Form as required by the TCEQ rules on Groundwater Availability Certification for Platting at 30 Tex. Admin. Code Section 230.3. The Department shall require an applicant to submit any engineering calculations, studies or other data supporting the statements contained in the Certification of Groundwater Availability For Platting Form.
- (D) Individuals marketing the development shall provide each purchaser or renter with a statement describing the extent to which water service will be made available, and how and when such service will be made available.

### **30.3.02 Developments to be served by On-Site Sewage Facilities:**

Applicants proposing to serve a development using on-site sewage facilities (OSSF) shall include the following information in the Water and Wastewater Service Engineering Report.

- (A) A design report sealed by a Texas licensed professional engineer or a Texas registered sanitarian describing how the proposed development will meet the requirements of the 30 TAC Chapter 285, the Liberty County OSSF rules, and this section.
- (B) Describe the minimum lot sizing that will be required based on the design of a typical OSSF system taking into account all applicable design items such as soil conditions for the subject property. If potable water is to be provided by individual water wells, the report must include minimum distances between water wells and OSSF spray fields or discharge fields in the determination of minimum lot sizes, in accordance with 30 TAC Chapter 285 requirements. Lots using an OSSF system and an individual water well shall not be less than one acre in size and lots that use an OSSF and a centralized water system shall not be less than ½ acre in size. All of these requirements shall be met in the lot sizing.

- (C) On-site facilities which serve single family or multi-family residential dwellings shall not have a capacity greater than 5,000 gallons per day in accordance with 30 TAC Chapter 285. Proposals for sewerage facilities for the disposal of sewage in the amount of 5,000 gallons per day or greater must comply with 30 TAC Chapter 217 which requires a domestic permitted wastewater treatment plant.
- (D) The TCEQ or its authorized agent shall review proposals for on-site sewage disposal systems and make inspections of such systems as necessary to assure that the system is in compliance with the Texas Health and Safety Code, Chapter 366 and rules in 30 TAC Chapter 285, and in particular Sections 285.4, 285.5, and 285.30-285.39. In addition to the unsatisfactory on-site disposal systems listed in 30 TAC Section 285.3(b), pit privies and portable toilets are not acceptable waste disposal systems for lots platted under these rules. Portable toilets are allowed on a temporary basis during the construction of a home.
- (E) After Liberty County agrees that all lots will meet requirements for an OSSF, no financial surety will be required for wastewater facilities.
- (F) Any proposal for on-site sewage disposal which includes provisions for greywater use shall meet the minimum criteria of 30 TAC Chapter 285.

## **SECTION 40 – ROADWAY STANDARDS**

### ***Sub-Section 1 – Applicability***

#### **40.1.01. Applicability**

This Section shall govern the following items related to Roadways within the County:

- (A) The design and construction of all Roadways as defined in 10.3.
- (B) Roadway classifications and definitions.
- (C) The minimum roadway widths and building set back lines for Regulated Roadways.
- (D) Streets and Roadway construction standards.

#### **40.1.02. Legal Authority**

Legal Authority for adopting and enforcing the regulations in this Section is granted to the County under TLGC in Chapters 232 and under the Texas Transportation Code (TTC) Chapters 251, 286 and 545.

#### **40.1.03. Approval Required**

Separate approvals by the Commissioners Court of the Construction Plans is required prior to construction and of the completed infrastructure prior to acceptance by the County of Streets and Roadways.

#### **40.1.04 References**

All references to “TxDOT Standards” found hereinafter in this document shall mean the latest revision of the TxDOT Highway Standards, “Standard Specifications for Construction of Highways, Streets and Bridges” as adopted by the Texas Department of Transportation. All references to the AASHTO Standards found hereinafter in this document shall mean American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, latest edition.

### ***Sub – Section 2 - General Engineering Standards***

#### **40.2.01.01 General**

In order to ensure the safe and proper construction design of new streets, driveways, storm sewer, and drainage ways, construction drawings and specifications, prepared and certified by a Registered Professional Engineer licensed to practice in the State of Texas, shall be submitted for review

and approval prior to construction of the improvements. All streets shall be constructed in accordance with these Regulations. Streets shall be paved and dedicated to the public in all Subdivisions. All roads shall consist of drainage facilities, subgrade preparation, base construction reinforced concrete pavement, roller compacted concrete, or compacted flexible base material and surface treatment, consisting of Hot Mix Asphaltic Concrete (HMAC), unless otherwise specified by the County.

A copy of the proposed Final Plat shall be included in the construction plans. Approval of construction plans by the Commissioners Court must be obtained prior to starting construction activities, unless specifically authorized by the Commissioners Court.

Drainage facilities including roadside ditched shall be designed in accordance with Section 50. All roads and streets shall be designed and constructed to withstand the impact of storm water being impounded adjacent to and flowing over the road or street. Streets or roadways that traverse defined areas of the 100-year flood plain shall not increase the water surface level or change the flood plain limits.

### ***Sub-Section 3 – Roadway Design Report***

#### **40.3.01 Report Content**

The Applicant shall submit a Roadway Design Report along with the Final Plat and the Construction Plans to identify street and roadway design criteria. The report shall be signed and sealed by a Professional Engineer licensed in the State of Texas. The report shall include at a minimum:

- (A) An Average Daily Traffic Report shall include estimates of the Average Daily Traffic (ADT) before and after the proposed development. The methodology for estimating ADT shall be based on recognized industry standards, including those utilized by the Texas Department of Transportation (TXDOT) and AASHTO. The post-development ADT shall be based on the maximum number of lots that would be permitted in the approved Preliminary Plat and the ultimate build out of the development and all other areas served by the roadway and all anticipated future areas to be served by the roadway. The design criteria and basis used shall be identified and justified in the report. The Applicant may, in lieu of submitting the ADT report, use 10 car trips per day per Subdivision lot served to determine traffic loading.
- (B) A copy of a geotechnical report, signed and sealed by a registered professional engineer, that reports the results of soil samples of the existing subgrade materials where streets will be constructed that were collected by a certified geotechnical laboratory (at a maximum spacing of 500') and tested showing the Atterburg Plasticity Index (PI) of the existing, in-place subgrade material. If, in the opinion of the Department, more frequent tests should be conducted, the Applicant shall conduct those additional tests at his sole expense.
- (C) A general discussion of the methods that will be used to stabilize the subgrade including stabilization or the use of a geo synthetic material. If a geo synthetic material shall be used,

the geotechnical evaluation required in Subsection 40.9.04 shall be included with the Roadway Design Report. A description of the roadway section proposed for each classification of road in the development. This shall include the subgrade, embankment, flexible base, and wearing surface. All physical dimensions shall be provided and any proposed variances from these Regulations discussed. If Hot Mix Asphaltic Concrete pavement is proposed to be used, the mix design shall be provided by a commercial laboratory.

- (D) A table showing the name of each road in the subdivision and its classification in accordance with Section 40.4 and Table 40.7.09.
- (E) Proposed temporary and permanent erosion and sedimentation control methods installed for all areas disturbed by the construction.
- (F) In addition, an engineer's summary letter shall be submitted outlining the nature of the project and any requests for the use of design standards other than those outlined herein.
- (G) Any other information that the Department might request to be included in a report for a specific development.
- (H) Provide the Engineer's opinion of probable construction costs.
- (I) After completion of construction, the Applicant shall submit a completion report that includes all documents, plans, and test reports for all stages of the construction, even if submitted previously on an interim basis. Such report shall be provided in electronic format, as required herein.

#### ***Sub-Section 4 - Roadway Classifications***

##### **40.4.01. Basis for Classification**

For the purposes of these Regulations, regulated roadways shall be designed to handle the average daily traffic (ADT) estimated to occur for a period of twenty (20) years following completion of construction of the roadway, with the pavement sections and widths required to accommodate the design ADT at the applicable speed limits adopted by the County. At a minimum, pavement sections and widths shall conform to the suggested minimum requirements established by AASHTO for the specified classification of roadway. Roadways shall also be classified under Texas Transportation Code (TTC) Chapter 251, "County Roads & Bridges". Roadway classification information is included in the table in Subsection 7.

##### **40.4.02. Neighborhood Roadway**

A Neighborhood Road shall be a two lane paved roadway, with improved shoulders or with curb and gutter if appropriate, and considered a Special Purpose Road with a design capacity of up to 500 ADT



with no more than 2% being truck traffic in accordance with AASHTO design standards. Neighborhood Roads will generally connect traffic to their final destination.

#### **40.4.03. Local Roadway**

A Local Roadway shall be a two lane paved roadway, with improved shoulders or curb and gutter, and considered a Local Rural Road with a design capacity of between 501 and 1,000 ADT with no more than 2% being truck traffic in accordance with AASHTO design standards. Neighborhood Roads can connect traffic to their final destination or provide access to Local Roadways.

#### **40.4.04. Minor Collector**

A Minor Collector shall be a two lane paved roadway, with improved shoulders or curb and gutter, and considered a Rural Collector with a design capacity of 1,001 to 2,500 ADT with no more than 2% being truck traffic in accordance with AASHTO design standards.

#### **40.4.05. Major Collector**

A Major Collector shall be a two lane or larger paved roadway, with improved shoulders or curb and gutter, and considered an Urban Collector with a design capacity of 2,501 to 5,000 ADT with no more than 5% being truck traffic in accordance with AASHTO design standards.

#### **40.4.06. Minor Arterial**

A Minor Arterial shall be a two lane or larger paved roadway, with improved shoulders or curb and gutter, and considered a Rural Arterial with a design capacity of 5,001 to 15,000 ADT with no more than 5% being truck traffic in accordance with AASHTO design standards.

#### **40.4.07. Principal Arterial**

A Principal Arterial shall be a two lane or larger paved roadway, with improved shoulders or curb and gutter, and considered a Rural/Urban Arterial with a design capacity of greater than 15,000 ADT with no more than 5% being truck traffic in accordance with AASHTO design standards. The design parameters of roads in this classification shall be considered by the Department on a case by case basis and upon the recommendations of the Applicant's engineer.

### ***Sub-Section 5 - Public Roadways***

#### **40.5.01. Dedication to Public**

No dedication shall be effective until the record document is recorded.

#### **40.5.02. Publicly Maintained and Dedicated Roadways**

Roadways dedicated to the public (Public Roadways) shall be required in all developments approved under these Regulations, except those satisfying the criteria for private roadways, as set forth below. All such Public Roadways shall be paved and shall be Regulated Roadways designed and constructed in accordance with the specifications set forth in Section 40.6. The boundary lines of all subdivision lots fronting onto a publicly dedicated right of way shall be contiguous with the boundary of the right of way.

#### **40.5.03. Construction of Public Roadways**

Public Roadways shall be considered public infrastructure, subject to the requirements of Section 60. Construction of public roadways shall not commence until such time as the Construction Plans and Final Drainage Plan have been approved by the County on an Application filed under these Regulations.

#### **40.5.04. Connections to Public Roadways under the Jurisdiction of Other Entities**

Certain Regulated Roadways and appurtenances governed by these Regulations may require connection to or construction on or within the right-of-way of public roadways under the jurisdiction of other public entities, including the Texas Department of Transportation (TXDOT), or any other authorized state or federal government entity. All construction and access to these roadways conducted in conjunction with a development authorized under these Regulations shall comply with the requirements of the entity having jurisdiction over the affected public roadway. The Applicant is responsible for coordinating with all other entities that might have jurisdiction over the development. This includes, but is not limited to, coordination, payment of fees, providing plans and documents, and obtaining approvals. Neither the Department nor any other employee or agent of the County will be responsible for providing documents or coordination with other entities on behalf of the Applicant.

### ***Sub-Section 6 - Private Roadways***

#### **40.6.01. General Requirements for Private Roadways**

All private roadways qualifying as Regulated Roadways (Regulated Private Roadways) shall be designed and constructed in accordance with the standards in Subsection 7 of this Section for Public Roadways. All Regulated Private Roadways shall have a surface suitable for all-weather access to all portions of the proposed development served by such Regulated Private Roadway.

#### **40.6.02. Criteria for Determining Private Roadway Status**

Regulated Private Roadways shall be permitted only in conjunction with a Development Approval under these Regulations if they satisfy each of the following criteria:

- (A) The person(s) responsible for the operation and maintenance of the Regulated Private Roadway has executed an agreement with the Commissioners Court acknowledging responsibility for such operation and maintenance;
- (B) The executed agreement includes financial assurance, as required by the Commissioners Court, and;
- (C) Lots within the development served by the Regulated Private Roadway shall have an average size greater than five (5) acres.

#### **40.6.03. General Requirements for Maintenance of Private Roadways**

Development Approvals that include the use of Private Roadways shall be subject to a Maintenance Agreement with the County. The person(s) responsible for maintenance under the agreement may be the Owner of the Subject Property, the Permittee, or another person or entity acceptable to the County. The following provisions apply to Private Roadways and shall be included in the Maintenance Agreement:

- (A) The following note shall be conspicuously displayed on the Record Documents/Maintenance Agreement filed in conjunction with the Development Approval:  
  

[Owner], by filing this Record Document, and all future owners of this property, by purchasing such property, acknowledge and agree that Liberty County shall have no obligation whatsoever to repair or accept maintenance of the roadways shown on this approved development plan until and unless [Owner] and/or the property occupants or tenants have improved the roadways to the then current standards required by Liberty County and the roadways have been accepted for maintenance by formal, written action of the County Commissioners Court and the roadways, with all required right-of-way and building setbacks, have been dedicated by the owners thereof, and accepted by the County, as public roadways. [Owner] and all future owners of property within the limits of the approved development plan shall look solely to the [Owner or Entity entering into Maintenance Agreement with the County] for future maintenance and repair of the roadways included in this development plan.
- (B) Any restrictive covenants establishing a responsibility for roadway operation and maintenance shall be placed on record concurrently with the recording of the Record Documents.
- (C) Private Roadways shall be operated and maintained to allow unrestricted ingress/egress by the occupants of the property and service providers, including emergency services. The Maintenance Agreement with the County shall include enforcement provisions for Private Roadways that are not properly operated and maintained.

#### **40.6.04. Additional Requirements for Private Roadways to be Maintained by an Association**

Concurrently with the filing of an Application for a Development Approval that will include Private

Roadways, the Applicant shall submit the following:

- (A) Ready-for-execution copies of the articles of incorporation and bylaws of the homeowners or property owners association; and,
- (B) The minimum annual assessments that will be imposed upon members of the association.

### ***Sub-Section 7 - Standards for Regulated Roadways***

#### **40.7.01. Applicability**

Regulated Roadways are defined in Section 10.3 and include all roadways associated with an Application for a Development Approval under these Regulations, including existing public roadways that are being connected to or modified to accommodate the effects of a proposed development, new roadways dedicated to the public as part of a Development Approval, new private roadways, shared access easements, shared access driveways used for emergency services access as a part of a Development Approval, driveways, utilities, drainage facilities, or other facilities within the right-of-way of a Regulated Roadway.

#### **40.7.02. Design Requirements**

All Regulated Roadways and related improvements shall be designed and installed so as to provide, to the maximum extent feasible, a logical system of utilities, drainage and roadways and to permit continuity of improvements to adjacent properties. A Roadway Design Report, prepared by a Texas licensed professional engineer, certifying compliance with these Regulations and other applicable standards shall be prepared and submitted with the Application as required in Subsection 3 of this Section.

#### **40.7.03. Minimum Rights of Way and Building Setbacks**

All Regulated Roadways shall comply with the established minimum right of way widths and building setback lines based on the roadway classification. Private construction is prohibited within the established building setback lines. Building setback lines apply on each side of a Regulated Roadway. The established minimum right of way widths and building setback lines are presented in Table 40.7.09.

#### **40.7.04. Design and Construction Standards**

- (A) The classification and construction standards for all Regulated Roadways shall be determined according to the Average Daily Traffic and the geotechnical characteristics of the existing subgrade.

- (B) The geometric requirements for Regulated Roadways shall be identified in the Roadway Design Report and shall be designed to accommodate the design ADT of the roadway. The minimum geometric standards for Regulated Roadways are summarized in the table in Subsection 40.7.09.
- (C) The design and construction of all Regulated Roadways shall conform to the applicable sections of these regulations as adopted by the Department, and shall include all necessary improvements, including necessary signage and traffic control devices. All signage and traffic control devices shall conform to the "Texas Manual of Uniform Traffic Control Devices," latest edition, as adopted by TXDOT. Speed bumps are not authorized as traffic control devices on Public Roadways.
- (D) All items not specifically covered in these Regulations shall be governed by the latest edition of the "TxDOT Standard Specification for Construction and Maintenance of Highways, Streets and Bridges".
- (E) All structures projecting above the ground surface (including signs, etc.) installed within the right-of-way of public roadways shall be made of break-away or collapsible materials, as defined by the Department, unless those structures are located along internal subdivision roads with speed limits of 30 MPH or less or non-thoroughfare roadways with speed limits of 30 MPH or less.
- (F) Mailboxes shall not be allowed in the County Right-of-Way.

#### **40.7.05. Access to Regulated Roadways**

Except with respect to lots served by Shared Access Driveways, each lot shall have the minimum direct frontage onto a Regulated Roadway and Driveways shall be spaced no closer than the minimum space intervals as set forth in Table 40.7.09, depending on the classification of road onto which the lot has frontage and the driveway has access. All such driveways shall conform to the Liberty County Culvert/Driveway Permit that they must obtain, as adopted by the Department.

Flag Lots shall generally not be permitted, except if approved by the Commissioners Court as consistent with the intent and spirit of these Regulations. The Department shall advise the Commissioners Court if a proposed lot constitutes a "Flag Lot" and the Commissioners Court shall, in reviewing all the circumstances, make the final determination.

#### **40.7.06. Commercial Driveways**

Driveways serving commercial development shall be spaced at the minimum intervals of one hundred fifty feet (150'). Joint-use driveways may be utilized in situations that limit the number of driveway access permits that are issued by either the State of Texas or Liberty County to a public roadway, or where safety concerns provide a satisfactory explanation for its use.

#### **40.7.07. Shared Access Driveways**

Up to one (1) lot without independent access to a Regulated Roadway may obtain access to a Regulated Roadway by means of a Shared Access Driveway if approved by the Commissioners Court. An additional two (2) lots having independent access to a Regulated Roadway may also share the use of the Shared Access Driveway. Shared Access Driveways are intended as a means to provide flexibility in the development process, preserve the rural character of the land and avoid excessive infrastructure costs when such costs would provide little or no social benefit.

Shared Access Driveways are not intended to serve as a substitute for interior roads. Excessive use of Shared Access Driveways will not be permitted. Any application proposing shared access driveways shall also satisfy the following requirements:

- (A) A plat note must be conspicuously displayed on the plat stating:
  - (1) All lots served by a Shared Access Driveway are restricted to one single family residence per lot and if any other Development of a Dwelling Unit occurs on any of the lots obtaining access through the Shared Access Driveway, then such new Dwelling Unit must be constructed on a separately platted lot with direct frontage onto and physical access to a Regulated Roadway prior to construction of the Dwelling Unit. A duplex will not be considered a single family residence for purposes of this subparagraph.
  - (2) The owners of the Single Family Residences obtaining access through the Shared Access Driveway shall be solely responsible for all maintenance of the driveway, including maintaining any drainage structures associated with the driveway. The driveway must be maintained at all times in a condition that will permit unencumbered vehicular access by emergency vehicles.
- (B) Each of the lots sharing the use of the Shared Access Driveway shall hold equal, indivisible and unrestricted rights in the Shared Access Driveway, which rights shall be established by recorded easement and the easement shall run with the land of each of the benefited lots. The easement instrument shall clearly state each lot's pro rata responsibility with respect to future maintenance or repairs of the Shared Access Driveway.
- (C) The Shared Access Driveway shall be no longer than one quarter mile in length and must have a minimum distance of 200 feet from any other driveway entering onto the Regulated Roadway and 500 feet from any other Shared Access Driveway.
- (D) The Shared Access Driveway shall have a name or designation approved by the LCCAD and a separate "911" address shall be established as for each lot which relies on a Shared Access Driveway for access.
- (E) Up to three (3) lots not having independent access to a Regulated Roadway may share a Shared Access Driveway with up to two (2) lots having independent access to a Regulated Roadway

if all other requirements of this are met and all lots using or adjacent to the Shared Access Driveway are larger than five acres in size and restricted by Plat note limiting development to one single family residence per lot and prohibiting TCEQ Regulated Development.

**40.7.08. Coordination with “911” Addressing System**

All Applications for Development Approvals submitted to the County that include a new or altered Regulated Roadway, shared access easement, or a shared access driveway shall have names and/or designations for such roadways developed by the Department in accordance with Section 10.16.

**40.7.09. Design Requirements Based on Roadway Classification**

All roadways shall be designed in accordance with Table 40.7.09 below.

Table 40.7.09 – Design Requirements Based on Roadway Classification

Functional Classification	Neighborhood Road	Local Roadway	Minor Collector	Major Collector	Minor Arterial	Principal Arterial
AASHTO Classification	Special Purpose	Local Rural	Rural Collector	Urban Collector	Rural Arterial	Rural/Urban Arterial
Average Daily Traffic (ADT - one way trips*)	Up to 500	501-1,000	1,001-2,500	2,501-5,000	5,001-15,000	> 15,000
Design Speed (mph)	25 mph	30 mph	45 mph	45 mph	55 mph	**
No. of Travel Lanes	2	2	2	2	4	**
Turn Lanes	No	No	No	**	**	**
Min. ROW Width (ft) (Open Ditch)	60	60	80	100	120	**
Min. ROW Width (ft) (Curb and Gutter)	50	50	70	80	**	**
Building Setback (ft)	25	25	25	50	50	50
Min Width of Each Lane (ft)	10	12	12	12	12	**
Width of Each Paved Shoulder (ft)	1	1	1	1	1	**
Minimum Unimproved Shoulder (ft)	2	2	2	2	2	**
Minimum Centerline Radius (ft)	225	300	450	750	975	**
Min. Tangent Length between Reverse or Compound Curves (ft)	0	0	100	100	300	**
Min. Radius for Edge of Pavement at Intersections (ft)	25	25	25	25	25	**
Intersection Street Angle Range (degrees)	80-100	80-100	80-100	80-100	80-100	**
Max. Grade (%):	11	11	10	9	8	**
Min. Street Centerline offset at Adjacent Intersections (ft)	75	75	75	100	100	**
Min. Stopping Sight Distance (ft)	175	175	250	350	550	**
Min. Intersection Sight Distance (ft)	250	250	350	450	550	**
Ditch Foreslope Grade	4:1	4:1	4:1	6:1	6:1	**
Ditch Backslope Grade	3:1	3:1	4:1	4:1	4:1	**
Min. Cul-de-sac ROW/ Pavement Radius (ft)	70/50	70/50	N/A	N/A	N/A	N/A
Maximum Block Length (ft)	2,000	2,000	N/A	N/A	N/A	N/A
Maximum Block Length with Cul de Sac (ft)	800	N/A	N/A	N/A	N/A	N/A
Min. Driveway Spacing (ft)	25	25	75	120	120	**
Min. Driveway Distance from an Intersection (ft)	25	25	40	100	100	**



**Notes for Table 40.7.09**

\*\* These items shall be considered by the Department on a case by case basis.

1. Any Deviation from these standards must be approved by the Commissioner's Court.
2. Although the minimum right of way width is 60', additional right of way will be required if the anticipated improvements require it.
3. No Cul-de-Sac shall have a cross slope that exceeds six percent (6%).
4. Guardrails shall be designed and located in accordance with the latest edition of the Roadway Design Manual as adopted by TxDOT.
5. Unimproved shoulders shall be defined as the area from the edge of the paved shoulder to the top of the roadside ditch and shall be constructed of stabilized base material or compacted fill. Curb and gutter sections will not have an unimproved shoulder.

## ***Sub-Section 8 – Construction Plans and Requirements***

### **40.8.01. Construction Plan Requirements.**

The Applicant shall submit Construction Plans along with a Final Drainage Plan for review and approval prior to beginning construction. The construction plans shall address site development, streets, drainage, bridges and/or bridge-class culverts, water infrastructure, wastewater infrastructure, utilities, roadway signage plan, and any other element necessary for a complete project. The Construction Plans shall conform to all submitted engineering reports including the Roadway Design Report and the Water and Wastewater Service Engineering Report. The Construction Plans and the Final Drainage Plan shall be signed and sealed by a Professional Engineer licensed to practice in the State of Texas.

#### **A. Cover Sheet. Show the following:**

- (1) Subdivision Name.
- (2) Legal description of property.
- (3) Name, address, and phone number of Owner, surveyor and engineering firm that prepared the plans.
- (4) North arrow.
- (5) Name of watershed(s).
- (6) Project location map, clearly identifying the precise construction location.
- (7) Tabulation sheet index.
- (8) Legible Professional Engineer's seal, signature, and date of signature.
- (9) The following note: "The Engineer who prepared these plans is responsible for their adequacy. In approving these plans, Liberty County must rely upon the adequacy of the work of the design engineer."
- (10) The following note: "I, \_\_\_\_\_, a Texas Registered Professional Engineer, certify that these plans are prepared in accordance with the Liberty County Subdivision and Development Regulations."

#### **B. Master Plan Sheet**

If this development is part of a master plan development or a phase of a multi-phase development, provide an overall drawing showing this phase in relation to the other phases or master plan.

#### **C. Notes Sheet.**

- (1) Applicable general construction notes.

- (2) Any applicable special notes.
- (3) Construction sequencing.
- (4) Standard Details.
- (5) Average Daily Traffic Counts – should match that provided in the Roadway Design Report.

D. Subdivision Plan Map Sheets.

- (1) Include a copy of the proposed Final Plat of the subdivision.
- (2) Scale, north arrow, and legend.
- (3) Detail information, as required on the plat for filing, will not be required on this map.
- (4) Layout for road right-of-ways, drainage easements, and location of other easements, encroachments or limiting items (streams, rivers) must be shown.

E. Erosion and Sedimentation Control Sheets.

- (1) Scale, north arrow, and legend.
- (2) Proposed temporary erosion and sedimentation control and tree protection measures for street, drainage, and utility construction.
- (3) Stabilized construction entrance detail for location where construction vehicles will enter or exit directly onto public streets.
- (4) Survey and location of all trees six inches in diameter or greater which are proposed to remain within the limits of a clear zone or sight distance area, showing locations, diameters, and species. (Show method to be used to preserve trees, i.e., boring, tree walls, guard rails, etc.)
- (5) Permanent erosion control measures including revegetation, matting, and any erosion control methods not included on other plan sheets, such as riprap, gabions, retards, etc.
- (6) Proposed construction waste disposal must be approved by the Department and the local Commissioner.
- (7) Legible Professional Engineer's seal, signature, and date of signature.

F. Drainage Layout Sheets.

- (1) Scale, north arrow, and legend.

- (2) Drainage layout of the subdivision or area of construction, distinguishable line delineating the limits of construction.
- (3) Existing adjoining street layout or other property adjacent to the project, including adjacent subdivision names.
- (4) Location of all existing drainage structures on or adjacent to the project.
- (5) Street names, lot, and block numbers and right-of-way lines.
- (6) Construction plans shall be drawn at a scale of 1" = 50' and shall contain contour lines based upon the following criteria, except in areas located within the 100-year flood plain (as indicated on current FEMA maps), where existing contours shall be shown at two-foot (2') or one-foot (1'0) intervals, depending upon the slope of the land under consideration for development:
  - (a) In those development areas where ground slopes are less than 5%, one-foot (1') contours are required;
  - (b) In those development areas where ground slopes are from 5% up to the 20%, two-foot (2') contours are required; and
  - (c) In those development areas where ground slopes are greater than 20%, five-foot (5') contours are required.
- (7) Show entire upstream drainage areas, existing drainage areas, and proposed drainage areas based on improvements and final grading.
- (8) Size in acres, Runoff coefficient (C), and Time of Concentration (Tc) for each drainage area based on pre- and post-development conditions.
- (9) Arrows indicating drainage flow direction for streets and lots.
- (10) All high and low points.
- (11) Proposed drainage facilities.
- (12) All existing and proposed drainage easements as per Final Plat or by separate instrument, including volume and page information.
- (13) Existing and proposed 100-year flood plains for all waterways.
- (14) Clearly show limits of construction.
- (15) Location of applicable city limits, governmental entity, or County lines.
- (16) Legible Professional Engineer's seal, signature, and date of signature.

G. Street Plan and Profile Sheets.

(1) Plan.

Show a key map in the top left or right of the sheet showing the location of the streets addressed on that page in relation to the entire development.

- (a) The street name.
- (b) Scale, north arrow, and legend.
- (c) Stationing south to north or west to east with street layout directly over the profile stationing.
- (d) Right-of-Way and paving dimensions.
- (e) Lot numbers, block numbers, and frontage dimensions.
- (f) Street names within respective right-of-way.
- (g) Existing or proposed easements and intersecting right-of-way.
- (h) Centerline "TIC" marks every 50 feet.
- (i) Drainage facilities within or intersecting right-of-way and indicate stationing on both sides of structure.
- (j) Match lines on street plan sheets for continuation of streets on other sheets.
- (k) Show proposed tie-in to existing streets.
- (l) Sheet numbers for intersecting streets, and show full intersection, provide dimensions, and give streets names.
- (m) Plan view must transpose directly above profiles stationing when possible. (Station limits shown on the plan view must be the same as the station limits shown on the profile.)
- (n) Clearly show the beginning and ending of the project.
- (o) Clearly show all points of curvature (PC), points of tangency (PT), points of intersection (PI), and all relevant curve data with their corresponding station.
- (p) Legible Professional Engineer's seal, signature, and date of signature.

(2) Profile.

- (a) Scale and legend.

- (b) Even stations on vertical division lines.
- (c) Even elevations on horizontal division lines (in right and left margins).
- (d) Natural ground profiles at left and right right-of-way and street centerline.
- (e) Proposed barrow ditch flow lines.
- (f) Identify and give elevations at all points of curvature (PC), points of tangency (PT), points of intersection (PI), vertical curve beginning points (PVC), vertical curve ending points (PVT), and vertical curve points of intersection (PVI).
- (g) Label all vertical curves with the following information: curve length, PVI station and elevation, tangent intercept, tangents and tangent grades, and design “K” values.

#### H. Construction Detail Sheets.

- (1) Typical pavement design cross-section – if multiple sections are required due to PI conditions and different ADT’s, all relevant section information shall be provided in the details and referenced to the plan and profile sheets.
- (2) Safety end treatment details for culvert pipe ends within the roadway clear zone and riprap or headwall details.
- (3) Guard rail details if required.
- (4) Legible Professional Engineer’s seal, signatures, and date of signature.

#### I. Traffic Control Plan Sheet.

A traffic control plan sheet is required for any construction conducted in public right-of-way, which may impede or has the potential to interrupt normal traffic flow.

- (1) Street plan showing all traffic control devices, taper distances, and traffic flow diagram.
- (2) The traffic control plan must be consistent with the *Texas Manual on Uniform Traffic Control Devices (TxMUTCD)*.
- (3) Legible Professional Engineer’s seal, signature, and date of signature.

#### J. Roadway Signing, Signalization, and Striping Plan Sheet.

A roadway signing and striping plan shall be submitted along with the street plans.

- (1) Street plan showing the locations of all traffic control devices including signs, striping, signals, and pavement markers.
- (2) All traffic control devices shall be fabricated and installed in accordance with the

requirements of the *Texas Manual on Uniform Traffic Control Devices (TxMUTCD)*.

- (3) Legible Professional Engineer's seal, signature, and date of signature.

**K. Utility Plans.**

Plans for water and wastewater utilities proposed by the developer to be located within the County right of way shall be designed by a Registered Professional Engineer, licensed to practice within the State of Texas, and shall conform to the standards and specifications established for that particular utility. The plans shall provide all construction plans necessary to meet the water and wastewater plan presented in the Water and Wastewater Service Engineering Report. Any deviation from that report must be specifically identified and justified. The County review of Utility Plans will be for the purpose of verifying that appropriate details are used for street cuts, and traffic control, and utility placement within roadway right of way. The County will not review Utility Plans for the purpose of verifying that the design is done according to relevant utility design standards. The Engineer of Record shall be solely responsible for the design of the utility improvements to meet all hydraulic requirements. A legible Professional Engineer's seal, signature, and date of signature are required on each sheet.

***Sub-Section 9 – Construction Requirements for Paving and Drainage  
Improvements***

**40.9.01. General**

All road construction shall conform the requirements of this Section regarding design standards and shall be constructed in accordance with the subgrade, base, and wearing surface requirements in this Subsection.

**40.9.02. Section Requirements for Regulated Roadways.**

Road and base sections shall be determined based on the existing subgrade geotechnical characteristics and the ADT of the roadway. Minimum subgrade characteristics, flexible base characteristics, and pavement sections shall be as per Table 40.9.02 below. In lieu of using Table 10.9.02, the Applicant may submit an alternate road section as long as a properly prepared geotechnical report and engineering design report is submitted to support the alternate section. The Applicant shall submit the alternative section to the Department and the County Commissioner for review and approval.

**Table 40.9.02 – Minimum Section Requirements for Regulated Roadways**

Traffic Category	Pavement Options	Subgrade Category			
		Poor (CBR < 5) PI > 30	Medium (5 < CBR < 10) 15 < PI < 30	Good (CBR > 10) 5 < PI < 15	Good (CBR > 10) NP < PI < 5
<b>Principal Arterial</b>  ADT > 15,000  5% Truck Traffic	Concrete	9" Concrete 8" Stabilized Subgrade	8.5" Concrete 8" Stabilized Subgrade	8.5" Concrete 8" Stabilized Subgrade	8" Concrete 8" Cement Stabilized Subgrade
		2" HMAC 7" 12" Flex Base 8" Stabilized Subgrade	2" HMAC 12" Flex Base 8" Stabilized Subgrade	2" HMAC 12" Flex Base 8" Stabilized Subgrade	2" HMAC 12" Flex Base 8" Cement Stabilized Subgrade
	Rolled Compacted Concrete (RCC)	9" RCC 8" Stabilized Subgrade	8.5" RCC 8" Stabilized Subgrade	8.5" RCC 8" Compacted Subgrade	8.5" RCC 8" Cement Stabilized Subgrade
		8.5" Concrete 8" Stabilized Subgrade	8" Concrete 8" Stabilized Subgrade	7.5" Concrete 8" Stabilized Subgrade	7.5" Concrete 8" Cement Stabilized Subgrade
<b>Minor Arterial</b>  ADT 5,001 - 15,000  5% Trucks	Concrete	2" HMAC 7" 12" Flex Base 8" Stabilized Subgrade	2" HMAC 12" Flex Base 8" Stabilized Subgrade	2" HMAC 12" Flex Base 8" Stabilized Subgrade	2" HMAC 12" Flex Base 8" Cement Stabilized Subgrade
		8.5" RCC 8" Stabilized Subgrade	8" RCC 8" Stabilized Subgrade	7.5" RCC 8" Stabilized Subgrade	7.5" RCC 8" Cement Stabilized Subgrade
	Rolled Compacted Concrete (RCC)	7.5" Concrete 8" Stabilized Subgrade	7" Concrete 8" Stabilized Subgrade	6.5" Concrete 8" Stabilized Subgrade	6.5" Concrete 8" Cement Stabilized Subgrade
		2" HMAC 12" Flex base 8" Stabilized Subgrade	2" HMAC 12" Flex base 8" Stabilized Subgrade	2.5" HMAC 12" Flex base 8" Stabilized Subgrade	2.5" HMAC 12" Flex base 8" Cement Stabilized Subgrade
<b>Major Collector</b>  ADT 2501-5000  5% Trucks	Concrete	7" Concrete 8" Stabilized Subgrade	6.5" Concrete 8" Stabilized Subgrade	6.5" Concrete 8" Stabilized Subgrade	6" Concrete 8" Cement Stabilized Subgrade
		2" HMAC 12" Flex base 8" Stabilized Subgrade	2" HMAC 10" Flex base 8" Stabilized Subgrade	2.5" HMAC 8" Flex base 8" Stabilized Subgrade	2.5" HMAC 7" Flex base 8" Cement Stabilized Subgrade
	Rolled Compacted Concrete (RCC)	7.5" RCC 8" Stabilized Subgrade	7" RCC 8" Stabilized Subgrade	6.5" RCC 8" Stabilized Subgrade	6.5" RCC 8" Cement Stabilized Subgrade
		7" Concrete 8" Stabilized Subgrade	6.5" Concrete 8" Stabilized Subgrade	6.5" Concrete 8" Stabilized Subgrade	6" Concrete 8" Cement Stabilized Subgrade
<b>Minor Collector</b>  ADT 1001-2500  2% Trucks	Concrete	2" HMAC 12" Flex base 8" Stabilized Subgrade	2" HMAC 10" Flex base 8" Stabilized Subgrade	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 7" Flex base 8" Cement Stabilized Subgrade
		7" RCC 8" Stabilized Subgrade	6.5" RCC 8" Stabilized Subgrade	6.5" RCC 8" Compacted Subgrade	6" RCC 8" Cement Stabilized Subgrade
	Rolled Compacted Concrete (RCC)	6" Concrete 8" Stabilized Subgrade	6" Concrete 8" Stabilized Subgrade	5.5" Concrete 8" Stabilized Subgrade	5.5" Concrete 8" Cement Stabilized Subgrade
		2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 7" Flex base 8" Cement Stabilized Subgrade
<b>Local Roadway</b>  ADT 501 - 1,000  2% Trucks	Concrete	5.5" RCC 8" Stabilized Subgrade	5.5" RCC 8" Stabilized Subgrade	5.5" RCC 8" Stabilized Subgrade	5.5" RCC 8" Cement Stabilized Subgrade
		6" Concrete 8" Stabilized Subgrade	5.5" Concrete 8" Stabilized Subgrade	5.5" Concrete 8" Stabilized Subgrade	5.5" Concrete 8" Cement Stabilized Subgrade
	Rolled Compacted Concrete (RCC)	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 7" Flex base 8" Cement Stabilized Subgrade
		5.5" RCC 8" Stabilized Subgrade	5.5" RCC 8" Stabilized Subgrade	5.5" RCC 8" Stabilized Subgrade	5.5" RCC 8" Cement Stabilized Subgrade
<b>Neighborhood Road</b>  ADT 0-500  2% Trucks	Concrete	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 7" Flex base 8" Cement Stabilized Subgrade
		5.5" RCC 8" Stabilized Subgrade	5.5" RCC 8" Stabilized Subgrade	5.5" RCC 8" Stabilized Subgrade	5.5" RCC 8" Cement Stabilized Subgrade
	Rolled Compacted Concrete (RCC)	6" Concrete 8" Stabilized Subgrade	5.5" Concrete 8" Stabilized Subgrade	5.5" Concrete 8" Stabilized Subgrade	5.5" Concrete 8" Cement Stabilized Subgrade
		2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 8" Flex base 8" Stabilized Subgrade	2" HMAC 7" Flex base 8" Cement Stabilized Subgrade

Design thickness for Concrete & RCC were provided using [www.pavementdesigner.org](http://www.pavementdesigner.org) with the following assumptions: Design Inputs: Design life - 20 yrs, Traffic Growth = 1%, Directional Distribution - 100%, Design Lane Distribution - 100%, 95% reliability, % Slabs Cracked at End of Design Life - 15%, Flexural Strength = 600psi, Edge Support - Yes  
Design Period=20 years  
Traffic Counts should be used as a guide, If ADT is expected to exceed these estimates a traffic study will be warranted  
If RCC is utilized a pavement design will be required  
ASB Item 345 TxDOT  
Flex Base Item 247 TxDOT  
HMAC Item 340 TxDOT  
An approved bond breaker shall be placed between the cement stabilized material and the concrete



#### **40.9.03. Construction Quality Assurance for Regulated Roadways.**

The Permittee shall submit all required inspections and tests as detailed in section for each phase of construction of the roadway. The Department shall maintain a list of acceptable testing laboratories. Construction testing shall comply with the following:

- (A) Tests on all components of the pavement system, including Atterberg limits, gradation, tests for compacted density, depth of base, distribution of asphalt, thickness, slump, and other quality assurance tests.
- (B) All testing shall be done by a commercial laboratory on the Department's list of acceptable testing laboratories with personnel certified by the TxDOT-approved certification programs and not by any company or person affiliated with the Applicant. The Department shall be provided with a list of all certified testing personnel along with copies of their current certifications before any testing services are performed.
- (C) If the Department objects to the selected testing laboratory, the Applicant shall use a laboratory acceptable to the Department.
- (D) It is the responsibility of the Permittee to coordinate all inspections and laboratory tests with the Department and not to proceed with the next phase of construction until proper inspections have been conducted by the Department, tests have been performed and results submitted to the Department, and Department approvals have been obtained for each individual stage of construction.
- (E) All laboratory tests, test holes, and test hole repair shall be at the expense of the Permittee.
- (F) In no event will any subsequent component be placed on the roadway until the underlying components have been approved in writing by the Department.
- (G) Sampling and testing shall be as detailed in 40.9.03(H) below and 40.9.04 below. In the case of conflicting requirements, the more stringent requirement shall apply.
- (H) Below is a summary of the minimum testing required within the various Subsections in this Section:
  - (1) Sub-grade stabilization – geotechnical testing for Atterberg Limits and gradations every 500 linear feet in alternating lanes and field density testing every 500 linear feet in alternating lanes for each compacted lift at locations representative of the entire sub-grade;
  - (2) Embankment - geotechnical testing for Atterberg Limits, gradation, and field density testing for each compacted lift at locations representative of the entire embankment;
  - (3) Flexible base - geotechnical testing for Atterberg Limits and gradation for raw

materials every 500 linear feet in alternating lanes and field density testing every 500 linear feet in alternating lanes;

- (4) Hot Mix Asphaltic Concrete pavement – in accordance with TxDOT Guidance as specified in Tex-221-F and/or Tex-222-F;
- (5) Concrete pavement – slump and compressive strength every 500 feet in alternating lanes or for every 10 trucks, whichever is less and;
- (6) Roller compacted concrete – testing shall include field density tests, temperature, compression test cylinders, thickness, and ride quality in accordance with the latest revision of the “Special Specification 3016 Roller Compacted Concrete”.

#### **40.9.04. Roadway Sub-Grade Preparation**

Roadway subgrade preparation shall consist of excavation and grading necessary for preparation of right of way, subgrade, roadway, shoulders, and drainage ditches. It shall include the removal and satisfactory disposal of all trees, shrubs, brush, rock and other debris cleared within the right of way.

##### **(A) Construction Methods**

After the work site has been properly cleared, excavation and grading may proceed in conformity with the plans and specifications and as directed by the Geotechnical Report.

- (1) Existing Subgrade  
All subgrade for roads and shoulders shall be compacted to 95% STD density, or when proof rolled with 50,000 pound heavy pneumatic roller (or equal), produce ruts or deflection no greater than one (1) inch in depth.
- (2) 8” Subgrade Stabilization – PI less than 5  
All subgrade material within the subdivision project that possesses an overall average Atterberg Plasticity Index (PI) of 5 or less, that is to be utilized directly below the flex base, concrete, or roller compacted concrete, shall be treated with portland cement to a minimum compacted (95% STD density) depth of eight inches (8”) in strict conformance to Item 275 Cement Treatment (Road-Mixed) as contained in “TxDOT Standards.”
- (3) 8” Subgrade Stabilization – PI from 5 to 15  
All subgrade material within the subdivision project that possesses an overall average Atterberg Plasticity Index (PI) above 5 up to 15, that is to be utilized directly beneath the roadway flexible base, concrete, or Roller Compacted Concrete shall be fly ash, lime, cement, or a combination of portland cement and lime (in a 1:1 ratio) treated to a minimum compacted (95% STD density) depth of eight inches (8”) in strict conformance with the following items: Item 260 Lime Treatment for Materials Used As Subgrade (Road Mixed), Item 265 Fly Ash or Lime-Fly Ash Treatment (Road-Mixed), or Item 275 Cement Treatment (Road-Mixed) as contained in the “TxDOT Standards.” When using a combination of lime and cement, the lime shall mellow for a minimum of 24

hours prior to beginning cement treatment. Once cement treatment begins, Item 275 shall be followed in strict conformance. Said stabilized treatment shall extend a minimum of two feet (2') beyond the edge of the pavement in all cases.

- (4) 8" Subgrade Stabilization – PI from 15 to 30  
All subgrade material within the subdivision project that possesses an overall average Atterberg Plastically Index (PI) above 15 up to 30, that is to be utilized directly beneath the roadway flexible base, concrete, or Roller Compacted Concrete shall be fly ash, lime, cement, or a combination of portland cement and lime (in a 1:1 ratio) treated to a minimum compacted (95% STD density) depth of eight inches (8") in strict conformance with the following items: Item 260 Lime Treatment for Materials Used As Subgrade (Road Mixed), Item 265 Fly Ash or Lime-Fly Ash Treatment (Road-Mixed), or Item 275 Cement Treatment (Road-Mixed) as contained in the "TxDOT Standards." When using a combination of lime and cement, the lime shall mellow for a minimum of 24 hours prior to beginning cement treatment. Once cement treatment begins, Item 275 shall be followed in strict conformance. Said stabilized treatment shall extend a minimum of two feet (2') beyond the edge of the pavement in all cases.
- (5) For all subgrade treatments, said treatment shall extend a minimum of two feet (2') beyond the edge of the pavement in all cases. Following the lime, cement, or lime - cement treatment of the subgrade.
- (6) 8" Subgrade Stabilization – PI Greater than 30  
All subgrade material within the subdivision project that possesses an overall average Atterberg Plastically Index (PI) of 30 or greater, that is to be utilized directly beneath the roadway flexible base, concrete, or Roller Compacted Concrete shall be treated with a combination of portland cement and fly ash or lime (in a 1:1 ratio) to a minimum compacted (95% STD density) depth of eight inches (8") in strict conformance with the following items: Item 260 Lime Treatment for Materials Used As Subgrade (Road Mixed) and Item 265 Fly Ash or Lime-Fly Ash Treatment (Road-Mixed) or Item 275 Cement Treatment (Road-Mixed) as contained in the "TxDOT Standards." When using a combination of lime and cement, the lime shall mellow for a minimum of 24 hours prior to beginning cement treatment. Once cement treatment begins, Item 275 shall be followed in strict conformance. Said stabilized treatment shall extend a minimum of two feet (2') beyond the edge of the pavement in all cases.
- (7) Testing and Inspection  
Following the stabilizing treatment of the subgrade, Geotechnical tests shall be performed at a minimum of once every five hundred feet (500') in alternating lanes to ensure that the Atterberg Plasticity Index (PI) has been reduced below fifteen (15), and that gradation requirements have been met according to the appropriate TxDOT Spec Item. Additional tests may be required at the discretion of the Department and at the expense of the Applicant. The Applicant shall submit a drawing showing the location of each test or identify the location by station numbers that are referenced to the approved Construction Plans. If station numbers are used, the description should indicate in which lane the test was taken.

The Applicant shall submit Atterburg limit and gradation test results to the Department as they are received. Prior to the installation of the base material, the proof rolling and compacted subgrade shall be inspected by the Department. The owner or agent notify the Department at least forty-eight (48) hours prior to the time when the inspection is needed. In lieu of notifications, a schedule of anticipated inspections may be provided to the Department as long as it is updated weekly or bi-weekly depending on the magnitude of the activities. At this time, all required Atterburg and gradation test data shall have already been submitted and approved by the Department. The cost of these tests shall be the responsibility of the Applicant.

(8) Lime Stabilization Testing

TxDOT Test Method Tex-121-E Method shall be used for determining lime for pavement and subgrade stabilization recommends percentages of lime where lasting effects are desired. Percentage of lime and/or lime-fly ash used for stabilization of the layer just below the base should be determined from lab tests. A minimum of 6.0% lime for treating a subgrade with a PI greater than 30. Higher percentages of lime are recommended for increased stabilization for soils with higher PI's Portland cement or lime/cement combinations shall be proportioned such that the minimum seven-day (7-day) compressive strength, according to ASTM D1633 (Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders), is at least 150 psi.

(9) Fly Ash Stabilization Testing

TxDOT Test Method Tex-127-E Method shall be used for determining fly ash for pavement and subgrade stabilization recommends percentages of fly ash where lasting effects are desired. Percentage of lime-fly ash used for stabilization of the layer just below the base should be determined from lab tests. A minimum of 6.0% fly ash for treating a subgrade with a PI greater than 30. Higher percentages of fly ash are recommended for increased stabilization for soils with higher PI's. Portland cement or fly ash/cement combinations shall be proportioned such that the minimum seven-day (7-day) compressive strength, according to ASTM D1633 (Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders), is at least 150 psi.

(10) Geotextile or Geogrid Use in Roadways

In conjunction with stabilization, a non-woven Geotextile and Geogrid Material may be used in combination between the subgrade and the flexible base to provide an alternative for stabilization between these two layers. When non-woven Geotextile and Geogrid Material is used, the Applicant shall provide a geotechnical evaluation of the underlying soil and shall be designed by an Engineer in accordance with the recommendations made by that evaluation. The evaluation shall demonstrate that the selected material will provide equal or better support than subgrade stabilization. The evaluation shall be included in the Roadway Design Report.

(a) Geo-Material Installation Methods

The geo-material shall be stored in a dry condition and protected from exposure to direct sunlight.

The surface to receive the geo-material shall be prepared to a smooth condition, free of obstructions and debris that may damage the fabric during installation.

Geo-materials shall be laid so that the stronger direction of reinforcement is transverse to the roadway centerline. The geo-materials shall be overlapped a minimum of one foot (1') onto the next row of geo-material and it shall be pinned in place at the beginning of a section to prevent slippage, tied together along the overlap, or otherwise secured to prevent separation during subsequent fill or cover operations. Along the length of the project the geo- material shall remain free to relieve wrinkles or folds from occurring during fill placement.

Geo-materials shall be covered, a minimum of four inches (6") with fill materials as soon as practical after being laid to protect the geo-material from equipment overrunning it.

Damaged geo-material sections shall be repaired by over- placing a layer of geo-material that is large enough to cover the damaged area, allowing an overlap of one foot (1') in each direction to allow the locking of layers.

- (b) Information Required on all Geo Material Proposed to be Used  
Material packages shall be submitted as part of the Roadway Design Report. They shall include full-scale laboratory testing and in-ground testing of pavement structures reinforced with the specific geo- material, which quantifies the structural contribution of the geo-material to the pavement structure. The increase in the structural layer coefficient of the base course must meet or exceed that of the design geo-material.
  - (i) A list of five comparable projects, in terms of size and applications, in the U.S., where the results of the specific alternate geo-material use can be verified.
  - (ii) A sample of the geo-material and certified specificationsheets.

#### **40.9.05 Embankment**

- (A) Description: Embankments or roadway fills shall be constructed at the locations and to the lines and grades shown on the drawings, or as established. Materials placed in fill shall be free from all vegetative matter, trash, and stone having a maximum dimension greater than six inches.
- (B) Construction Methods: Embankments shall be formed of excavated materials placed in successive layers of such widths and lengths as are suited to the sprinkling and compaction method utilized. Embankments shall be constructed in layers not exceeding six inches in thickness after compaction.

All road subgrade and embankment shall be compacted to a minimum density of ninety- five percent (95%) as defined in TXDOT Specification 132.2.

Testing of embankment material shall include geotechnical testing for Atterberg Limits, gradation, and field density testing for each compacted lift at locations representative of the entire embankment. The cost of these tests shall the responsibility of the Applicant. The

Applicant shall submit compaction test results to the Department as they are received. The test data shall be accompanied by a plan sheet map showing the location of each test or a description identifying the location by station numbers that are referenced to the approved Construction Plans. If station numbers are used, the description should indicate in which lane the test was taken.

The Contractor shall add moisture to, or shall dry by aeration, each layer as may be necessary to meet the requirements of this specification for compaction. Thorough mixing must be made of all material in each layer to obtain uniform moisture content.

Compaction shall be accomplished with tamping rollers, discs, and pneumatic rollers.

Soft ("pumping") areas that develop under construction operations shall be scarified, aerated or moistened as required, and recompacted to the full depth required to obtain the specified density for each layer. When objectionable material is encountered, the contractor shall remove said material and replace with select, borrowed or salvaged material with a P.I. between 15 and 30. Portions of embankments which are too near adjacent walls, pavements or other fixed objects to permit use of the above specified rolling equipment for compacting, and other portions which mechanized equipment cannot reach for any reason, shall be thoroughly compacted by tamping in two-inch layers with mechanical hand tampers or other equipment as approved by the Department.

Any damage to adjacent walls, pavements or other fixed objects, shall be replaced or repaired at the expense of the Contractor.

#### **40.9.06 Flexible Base**

- (A) Description: This item shall consist of a foundation course for the asphaltic concrete or other paving, and shall be composed of crushed material constructed as herein specified in two (2) or more lifts in conformity with the typical sections shown on the plans and to the lines and grades established. Flexible base widths shall match that of the subgrade treatment and shall extend a minimum distance beyond the edge of the pavement in all cases as shown in Table 40.7.09.
- (B) Materials: The flexible base shall be material from an approved source. Stabilization shall be provided as required by these Regulations. The flexible base material shall consist of crushed or uncrushed stone as necessary to meet the requirements herein, and shall consist of durable coarse aggregate particles and binding materials. The material shall meet the requirements of a Type A or B, or D, Grade 1 or 2 flexible base materials as defined in Item 247 Flexible Base of the "TxDOT Standards". The Department may, at its option, keep a separate list of alternate approved Flexible Base materials. The Department should be contacted for specific information.
- (C) Construction Methods: The base material shall be placed on the prepared subgrade in uniform courses with the total compacted thickness to be no less than that required in Table 40.9.02. Material deposited on the subgrade shall be spread and shaped the same day unless otherwise directed by the Department. The course shall then be sprinkled as required and rolled as directed until a uniform compaction is secured. Through this entire operation, the shape of the

course shall be maintained by blading and the surface, upon completion, shall be smooth and in conformance with the typical sections shown on the plans and to established lines and grades. All irregularities, depressions, or weak spots that develop shall be corrected immediately by scarifying the area affected, removal and replacement of soft areas or adding suitable material as required, reshaping and re-compacting by sprinkling and rolling. Material excavated in preparation of the subgrade may be utilized in the construction of adjacent shoulders and slopes or otherwise disposed of as directed.

Any additional material required for the completion of the shoulders and slopes shall be secured from approved sources designated by the Department. Each course of base shall be compacted to a minimum density of 100 percent (100%), according to TxDOT Test Method TEX-113-E.

Geotechnical testing for Atterberg limits, gradation for raw materials, and field density testing shall be performed at a minimum of once every five hundred feet (500') in alternating lanes. Field density testing shall be at locations representative of the entire road base. Intermediate points will be tested if required by the Department. The cost of these tests shall be the responsibility of the Applicant. The test data shall be accompanied by a plan sheet map showing the location of each test or a description identifying the location by station numbers that are referenced to the approved Construction Plans. If station numbers are used, the description should indicate in which lane the test was taken.

The minimum compacted thickness of the flexible base material required for placement on compacted subgrade for all roadways shall be in accordance with the Table 40.9.02. The base materials shall be placed and compacted in four-inch (4") lifts.

- (D) Thickness Control: The thickness of the compacted flexible base may not vary more than a maximum of one-quarter inch (1/4") in 16' from the specified thickness of the base material. Deviations not within this tolerance shall be corrected.
- (E) Inspection: Prior to the installation of the paving, the compacted base material shall be inspected by the Department. The Owner or Agent shall notify the Department forty-eight (48) hours prior to the time when the inspection is needed.

#### **40.9.07 Hot Mix Asphaltic Concrete Pavement**

- (A) Description: This item shall consist of a surface course to be composed of a compacted mixture of aggregate and asphaltic material to be constructed on the previously complete base as herein specified, and in accordance with the details shown on the plans and in accordance with the most current TXDOT HMAC Design of the "TxDOT Standards."
- (B) Materials: Pavement shall meet the requirements of Item 340 of the "TxDOT Standards" for Hot Mix Asphaltic Concrete Pavement, or for Hot mix Asphaltic Concrete Pavement Type "B" or, Type "D" as follows:

**Master Gradation Limits (% Passing by Weight or Volume) and VMA Requirements**

Sieve Size	B	D
2"		
1-1/2"	100.0	
1"	98.0-100.0	
3/4"	84.0-98.0	100.0
1/2"		98.0-100.0
3/8"	60.0-80.0	85.0-100.0
#4	40.0-60.0	50.0-70.0
#8	29.0-43.0	35.0-46.0
#30	13.0-28.0	15.0-29.0
#50	6.0-20.0	7.0-20.0
#200	2.0-7.0	2.0-7.0
<b>Design VMA, % Minimum</b>		
	13.0	15.0
<b>Production (Plant-Produced) VMA, % Minimum</b>		
	12.5	14.5

The mix design shall consist of the combined aggregate gradation, target laboratory-molded density, and target asphalt percentage used to meet the laboratory mix design properties as defined in TXDOT Item 340.4.3.

Furnish the type and grade of performance-graded (PG) asphalt specified on the plans.

The asphalt materials for tack coat shall meet the requirements for cut back asphalt, RC-250. Asphalt for prime coat shall be MC-30, AEP or SS-1. All asphalt materials shall meet the requirements of Item 300 of the "TxDOT Standards".

The Coarse and Fine Aggregates shall meet the requirements of Item 340.2 of the current "TxDOT Standards".

- (C) Construction Methods: Before the asphaltic concrete is placed, the surface on which the mixture is to be placed shall be thoroughly cleaned and the prime coat of MC-30, AEP or SS-1 in accordance with Item 310 applied as directed with sprayer at the rate of 0.20 gallons minimum per square yard of surface. A single course seal coat shall be placed in accordance with Item 316 prior to placement of HMA CP. The asphaltic concrete mixture, heated and prepared as specified, shall be hauled to the project in tight vehicles previously cleaned of all foreign material. The mixture shall be at a temperature within 25° F of the target discharge temperature during production, not to exceed 350°F, unless warm mix asphalt is used. At which point, the target discharge temperature is 275°F. It shall be spread into place with an approved mechanical finishing machine to the compacted depth shown on the plans.

The minimum thickness standard for Hot Mix Asphaltic Cement, if selected, should be the thickness shown in the Table 40.9.02. The finishing machine shall be of the screeding and/or tamping type. While still hot, as soon as it will bear the roller without undue displacement or hair cracking, the surface shall first be compressed thoroughly and uniformly with acceptable power-driven three-wheel pneumatic rollers weighing 12 tons or a vibratory dual wheel roller weighing 8 tons. Subsequent compression shall be obtained by starting at the sides and rolling longitudinally toward the center of the pavement, over-lapping on successive trips by at least one-half (1/2) of the width of the rear wheels. Alternate trips of the roller shall be



slightly different in lengths. Rolling shall be continued until no further compression can be obtained and all roller marks are eliminated. To prevent adhesions of the surfacing mixture to the roller, the wheels shall be kept properly moistened with water, but excess use of water will not be permitted. After rolling with the tandem or vibratory roller the entire surface shall be rolled with a pneumatic-tire roller to seal the asphalt surface prior to opening for traffic. Along curbs, headers, and similar structures, and at all places not accessible to the roller, the mixture shall be compacted thoroughly with lightly oiled hand tamp.

The completed surface, when tested with a ten foot (10') straight-edge laid parallel to the centerline of the roadway, shall have a maximum ordinate measured from the face of the straight-edge that does not exceed one-eighth inch (1/8") at any point. Approved templates shall be furnished by the Contractor for checking subgrade and finished sections. The templates shall be of such strength and rigidity that if the support is transferred to the center there will not be a deflection of greater than one-eighth inch (1/8").

- (D) Equipment: Mixing plants that will not continuously produce a mixture meeting all requirements of this specification will not be accepted.

Mixing plants may be either the weight-batching type or the continuous mixing type. Both types of plants shall be equipped with satisfactory conveyors, power units, aggregate handling equipment, hot aggregate screens and bins and dust collectors and shall consist of the following essential pieces of equipment:

The Cold Aggregates Bin and the Proportioning Device, Dryer, Screens, Aggregate Weight Box and Batching Scales, Mixer, Asphalt Storage and Heating Devices, Asphalt Measuring Devices and Truck Scales if used, shall be of the type to adequately supply materials within the tolerances set out in these specifications.

- (E) Testing: The Applicant, at his expense, shall employ a commercial testing laboratory approved by the Department to conduct the required material checks and design the mix. This information shall be provided in the Roadway Design Report. During the production of the plant mix, the Applicant will provide, at his expense, continuous inspection and testing at the plant by a commercial testing laboratory approved by the Department. Minimum density in place should reach 90%;
- (F) Construction Methods: Before the asphaltic concrete is placed, the surface on which the mixture is to be placed shall be thoroughly cleaned and the prime coat of MC-30, SS-1 or AEP applied as directed with sprayer at the rate of 0.04 to 0.1 gallons per square yard of surface.

#### **40.9.08 Portland Cement Concrete Pavement**

- (A) Description: This item shall be in accordance with the Roadway Design Report.
- (B) Construction: Construction of concrete pavement shall conform to Item 360 of the "TxDOT Standards".

Design: Pavement thickness shall be as required in the table 40.9.02. Concrete pavement

type shall be in accordance with the latest revision of TxDOT concrete Pavement Contraction Design CPCD – 14. Joint requirements shall be as per the latest revisions of TxDOT Concrete Paving Details – Joint Seals JS-14. These standards are included in Appendix F.

Testing: Testing shall include, at a minimum, slump and compressive strength, every 500 feet in alternating lanes or for every 10 trucks, whichever is less.

#### **40.9.09 Roller Compacted Concrete Pavement**

- (A) Description: This item shall be to the standards of the recommendation of a Registered Professional Engineer who conducts a geotechnical study and shall meet the criteria Table 40.9.02 of these Standards. This construction shall conform to Special Specification 3016 Roller Compacted Concrete of the “TxDOT Standards”, except for the combined aggregate gradation as modified below:

Sieve size	Percentage passing	
	1/2 inch max	3/4 inch max
1 inch	--	100
3/4 inch	100	95–100
1/2 inch	90-100	70–90
3/8 inch	78-95	60-85
No. 4	55-70	40-60
No. 16	25-40	20-40
No. 100	2–16	3-18
No. 200	0–10	0-10

Pavement thickness shall be as required in Table 40.9.02. Contraction joints shall be sawcut at a maximum of 15’ intervals for pavements six inches (6”) or less; a maximum of 20’ intervals for pavements greater than six inches (6”). Expansion joints, contraction joints and construction joints shall be filled with a TxDOT approved joint sealer when paving on soils consider poor or poor to fair in Table 40.9.02. Contraction joints shall be cleaned before sealing, however widening of joint is not required.

#### **40.9.10 Drainage Facilities**

- (A) Description  
This item shall govern the furnishing of all drainage culvert pipe, concrete headwalls, and reflector posts as shown on the plans and herein specified, and installing the same as designated on the Plans.
- (B) Materials  
The culvert pipe shall be of size and length shown on the construction plans. Corrugated metal pipe is not acceptable for use. Reinforced concrete pipe shall be C76 Class III pipe furnished and installed according to Item 464 of the “TxDOT Standards”. All culvert pipes shall be new and unused and shall not have been damaged by handling or shipping. All concrete culvert pipe joints shall be primed and joints shall be installed with Ram Neck joining material.

- (1) Alternative Culvert Pipe – ADS Heavy Duty Corrugated Polyethylene Pipe: This type of culvert pipe may be required where known corrosive soil conditions are present. Manufactured by Advanced Drainage Systems, Inc. (ADS) pipe specifications are for Smooth Interior Corrugated Polyethylene Pipe (dated June 2002) applies to high-density polyethylene corrugated pipe with an integrally formed smooth waterway. Pipe manufactured for this specifications shall comply with the requirements for test methods, dimensions and markings found in AASHTO Designations M252, M294, and MP7. Pipe fittings shall be made from virgin polyethylene compounds that conform to the applicable current edition of the AASHTO Material Specifications for cell classification as defined and described in ASTM D3350. The fittings shall not reduce or impair the overall integrity or function of the pipeline. Fittings may be either molded or fabricated and only those fittings supplied or recommended by the manufacturer shall be used. Where designated on the plans or project specifications, an elastomeric gasket meeting the requirements of ASTM F477 shall be supplied.
- (2) Installation  
Installation of the ADS specified pipe should be in accordance with either AASHTO Section 30, ASTM Recommended Practice D2321, or as recommended by the manufacturer.
- (3) Reflector Posts  
Reflector posts shall be constructed from one and one-half inch (1½”) schedule 20, galvanized steel posts equipped with three inch (3”) amber reflectors. The length of the post shall be adequate to place the reflector assembly forty-eight inches (48”) above the centerline elevation of the street and anchor the post approximately forty- eight inches (48”) into the ground.
- (C) Concrete Headwalls and/or Riprap  
Concrete headwalls and/or riprap shall be constructed of 3600 psi, six sack, concrete meeting the requirements of Item 421 of the “TxDOT Standards” and reinforced with deformed bars or wire mesh meeting the requirements of Item 440 of the “TxDOT Standards”. All culvert or bridge headwalls and/or riprap shall be of the dimensions and in the locations shown on the plans.
- (D) Construction Methods  
Culvert pipe shall be sized and installed according to the lines and grades shown on the Construction Plans as required by the drainage calculations prepared by the design engineer. The pipe shall be bedded along its complete length and the backfill around the pipe shall be compacted. The installation of all culvert pipes shall be in general conformance with the appropriate sections of the “TxDOT Standards”. All culvert pipes located at street intersections shall be provided with reflector posts. The reflector post shall be equipped with one reflector facing in each direction of traffic flow. Reflector posts shall be provided on the ends of the concrete headwalls or riprap as shown on the plans. The headwalls shall be formed on their exposed surfaces, which shall be grouted and broom finished upon removal of the forms.

(E) Culverts

Culvert pipe shall be clean and free of debris following installation and before acceptance by the County Commissioner or Designated Agent.

(F) Bridges

If the developer proposes to construct a major structure such as a box culvert or bridge across a drainage channel, such structure shall conform to TxDOT "Standard Bridge Design". Reinforced concrete box culverts shall meet the design of TxDOT Standard Specifications for Construction of Highways, Streets and Bridges. The County will not allow Rail Car bridges. Timber and Corrugated Arch Pipe bridges will be considered on a case-by-case basis.

Bridge design shall be submitted to the County for review and approval prior to finalizing construction plans.

#### **40.9.11 Channel Excavation**

(A) Description: Channel Excavation shall consist of required excavation for all channels, the removal and proper utilization or disposal of all excavated materials, and constructing, shaping and finishing of all earthwork involved in conformity with the required lines, grades and typical cross sections and in accordance with the specifications and requirements herein outlined. Excavated topsoil can be used in accordance with County standards. It is the responsibility of the contractor to dispose of excavated trash and spoils in accordance with County standards.

(B) Construction Methods: All suitable materials removed from the excavation shall be utilized, insofar as practicable, in the formation of embankments where required, or shall be otherwise satisfactorily disposed of as indicated on the plans, or as directed. Completed work shall conform to the established alignment, grades and cross sections for the drainage structure. During construction, the channel shall be kept drained, insofar as practicable, and the work shall be performed in a neat and workmanlike manner.

Unsuitable channel excavation materials, or excavation in excess of that needed for construction, shall become "Waste" and shall become the property of the Contractor to be disposed of properly by him.

Channel excavation shall include the removal and replacement of all fence lines crossing the channels and the installation of gates and water gaps as shown on the plans. All channels, and adjacent area, which has been disturbed by construction equipment shall be seeded with Bermuda grass or other grass as approved by the Precinct Commissioner or Designated Agent at the rate of eight pounds per acre (8 lb/ac). Fertilizer shall conform to Item 166.3 Fertilizer of the "TxDOT Standards".

#### **40.9.12 Signage and Striping**

The Applicant shall include a signage and striping plan as part of the Roadway Design Report. All street name signs, traffic control signs, speed limit signs, striping, etc., shall conform to the requirements of the "TxDOT Standards" and the "Manual of Uniform Traffic Control Devices" (TxMUTCD).

## **SECTION 50 - DRAINAGE STANDARDS**

### ***Sub-Section 1 – Applicability***

#### **50.1.01.      Applicability**

This Section shall govern the design, construction and public dedication and use of all drainage, flood control and storm water management facilities and features (hereafter “drainage facilities”) for Subdivisions and Manufactured Home Rental Communities within the County but outside the incorporated limits of any municipality in the County.

#### **50.1.02.      Legal Authority**

Legal Authority for adopting and enforcing the regulations in this Section is granted to the County under TLGC in Chapters 232 and 562.

#### **50.1.03.      Approval Required**

Approval of the Commissioners Court is required prior to acceptance by the County of drainage, flood control or storm water features. Separate approval is required for any use of County facilities, including roadway rights of way.

#### **50.1.04      Review And Approval Of Drainage Plans**

##### **(A)      Types of Submittals**

The types of engineering submittals typically made in connection with new development or drainage studies include the following:

- (1)      Drainage Reports: Also referred to as Engineering Report in portions of this Document. These documents, which may take the form of letter reports or more extensive and formal bound reports, normally describe the results of analyses of existing and/or proposed drainage conditions. Drainage reports may be submitted as a basis for better understanding of existing conditions (i.e., a flood plain revision report), to support a request for approval of construction documents for a proposed facility (i.e., a preliminary engineering report for a roadway improvement project), or to serve as a plan for future conditions (i.e., a master drainage report for a given watershed).
- (2)      Construction Documents: These include engineering drawings and specifications for a proposed facility or development which will affect storm water drainage or flood control.

(B) Activities for Which Submittals to the County Are Required

Liberty County requires that engineering submittals be prepared for all activities which may affect the rate, direction, or volume of storm water runoff, or the depth and velocity of flow in primary or secondary drainage facilities, and other infrastructure within the County's jurisdiction as applicable. The County will review the following three types of projects:

- (1) Construction of new projects, modification and/or improvement of existing facilities, or impacting the existing facilities which are maintained by the County, which include:
  - (a) Open channels
  - (b) Bridges, culverts, and other hydraulic structures associated with open channels
  - (c) Detention basins
- (2) Construction of drainage facilities which are physically located in, on, over, under, or adjacent to a drainage facility maintained by the County:
  - (a) Land development projects
  - (b) Roads and highways
  - (c) Bridges and culverts
  - (d) Storm sewer outfall pipes
  - (e) Water and sanitary sewer lines
  - (f) Pipelines and public utilities
  - (g) Environmental features (tree plantings, landscaping, etc.)
  - (h) Recreation amenities (hike and bike trails, parks, etc.)
  - (i) Encroachments
- (3) Development or public projects that do not affect the facilities maintained by the County such as natural channels, lakes, drainage-ways, etc. or future drainage facilities described in a drainage master plan:
  - (a) Proposed subdivision development

- (b) Residential and commercial site development
- (c) Roads and highways

(C) General Requirements for Various Submittals

The various submittals presented to Liberty County for review should be as complete and as well-documented as possible. The general requirements described in this section should be satisfied for all submittals. The intent of these requirements is to insure that the following aspects of the proposed activity are made clear to the reviewer:

(1) New Development

Submittals for all new development shall include the following items:

- (a) plat of the development illustrating property boundaries, individual lot boundaries, streets, drainage easements, etc.
- (b) a hydrologic impact analysis which identifies the potential effects of the development on downstream peak flow rates, at a location immediately downstream of the proposed development.
- (c) if necessary, a hydraulic impact analysis which identifies the potential effects of the development on upstream flood levels, at a location immediately upstream of the proposed development.
- (d) a preliminary drainage report which presents the results of impact analyses, describes proposed mitigation measures, provides construction cost estimates, etc.

Preliminary construction plans for proposed streets, storm drainage facilities, utilities, and other features may be submitted along with the preliminary engineering report. Final construction plans should be prepared after Liberty County has completed its review of the report and issued written comments.

(2) Hydrologic Studies

Major watershed hydrologic studies will be summarized in a report which contains sufficient text, exhibits, and computer output to completely describe the methods, data, and assumptions used in the analysis, as well as the results obtained. Information provided in the report should include the following:

- (a) description of the analysis and the results obtained
- (b) tabulations of all hydrologic modeling parameters
- (c) tabulations of all computed peak flow rates

- (d) a watershed map which illustrates the borders of each sub-area included in watershed modeling
  - (e) a hydrologic parameter map which illustrates all watercourse lengths, drainage areas, and developed areas
  - (f) output from all hydrologic models used in the analysis
  - (g) a digital media containing input files for all hydrologic and hydraulic models
- (3) Hydraulic Studies of Primary Drainage Facilities

For hydraulic analyses and designs of primary drainage system components, an engineering report containing the following items should be submitted:

- (a) sufficient text to summarize the methods, data, and assumptions used in completing the analysis, as well as the results obtained
- (b) calculations and other information supporting the flow rates used in the analysis
- (c) tabulations of hydraulic modeling data and results
- (d) vicinity and site maps which illustrate the location of the project area and the extent of the stream reach being analyzed
- (e) a plotted stream profile(s)
- (f) a copy of the effective Flood Insurance Rate Map (FIRM) for the project area and, as needed, a proposed conditions flood plain and floodway map which illustrates proposed changes in flood plain and floodway boundaries
- (g) copies of all hydraulic calculations
- (h) an analysis of the effects of proposed improvements on downstream peak flow rates and upstream flood levels
- (i) recommendations for mitigating any adverse impacts associated with proposed improvements to channels or structures
- (j) output from all hydraulic computer models used in the analysis



- (k) a digital media containing input files for all hydraulic models

For studies involving improvements to open channels and hydraulic structures or designs of new open channels, a right-of-way (ROW) map should also be submitted. Preliminary construction plans may be submitted along with the drainage report. Final plans should be prepared after Liberty County has completed its review of the engineering report and issued comments.

(4) Hydraulic Studies of Secondary Drainage Facilities

For submittals involving the design of storm sewer systems, ditches, swales, and other secondary drainage facilities, the following items should be included:

- (a) a report which summarizes the methods, data, and assumptions used in completing the design analysis, as well as the results obtained
- (b) vicinity and site maps which illustrate the location of the project area and the location and configuration of the proposed facilities
- (c) a watershed map which illustrates the boundaries of all sub-areas included in the analysis of the proposed facilities
- (d) calculations and other information supporting the flow rates used in the analysis
- (e) hydraulic calculations used in designing the facilities and in assessing their hydraulic performance under design storm conditions
- (f) an analysis of the effects of proposed improvements on downstream peak flow rates and upstream flood levels
- (g) recommendations for mitigating any adverse impacts associated with proposed drainage improvements
- (h) a plotted profile(s) of the storm sewer system, ditch, swale, etc.
- (i) for ditches and swales, a typical cross-section(s)
- (j) output from computer programs used in the analysis
- (k) a digital media containing input files for any computer programs used in the analysis

Preliminary construction plans may be submitted along with the drainage report. Final plans should be prepared after the Liberty County has completed its review of the drainage report

and issued comments.

(5) Detention Studies

The following information must be submitted in support of designs for detention facilities:

- (a) vicinity, site, and watershed maps which clearly illustrate the location of the facility, its physical extents and configuration, its drainage area, and the relationship of its drainage area to the overall boundaries of the major watershed in which it is located
- (b) a ROW map which illustrates all existing and proposed ROWs in the immediate vicinity of the detention facility
- (c) discharge calculations which identify peak flow rates for pre-development and post-development conditions for the design storm event
- (d) hydraulic calculations on which the design of the detention discharge structure is based
- (e) for facilities with a drainage area of less than 200 acres, calculations establishing the required detention storage volume
- (f) for facilities having a drainage area of 200 acres or more, a detention flood routing analysis which assesses the effectiveness of the detention basin in mitigating impacts on downstream peak flow rates
- (g) calculations involving the required capacity of supplemental and/or emergency discharge structures
- (h) exhibits which illustrate the configuration of the detention facility, inflow structure, and discharge structure
- (i) benchmark information
- (j) a soils report which discusses the suitability of the soil for construction of the proposed facilities

These items should be submitted in supported of a written report which describes the proposed location and configuration of the detention facility, the methods used in the design of the facility, and the conclusions of the detention analysis with regard to the effectiveness of the facility in mitigating increases in downstream peak flow rates. Preliminary construction plans may be submitted along with the drainage report. Final plans should be prepared after Liberty County has completed its review of the drainage report and issued comments

(6) General Drainage Report Requirements

It is recommended that drainage reports be prepared in such a manner as to include all of the necessary information without referencing previous submittals. Each report should utilize text, tables, and exhibits to thoroughly document the methods, data, and assumptions used in completing analyses of the proposed activity as well as the results obtained. Detailed computations and computer printouts should be attached to the report in the form of appendices. All reports should be bound to insure that the report text, exhibits, and attachments stay together. All reports and accompanying materials should be submitted in a manageable format. Maps for the drainage report should be 24" x 36" or smaller. All maps and other exhibits must be legible and information should be presented a clear and concise manner Report may be presented as pages incorporated into the construction plans.

The following exhibits and calculations should be submitted with drainage reports as appropriate:

- (a) Vicinity Map: A map showing the project site with respect to recognizable landmarks in the vicinity. This could be a city map with the boundaries of a new development or the limits of a channel improvement project indicated to mark the project location.
- (b) Site Map: This is a detailed map of the project site which illustrates the type and extent of activities which are proposed to be completed. For new developments, a plat with all proposed streets, lot boundaries, etc. may be used to satisfy this requirement.
- (c) Watershed or Drainage Map: A watershed or drainage map which illustrates all drainage boundaries, flow directions, and computation points for pre and post development conditions.
- (d) Discharge Calculations: Calculations specifying computed discharges at key locations, with comparisons of existing and proposed discharges where appropriate. Drainage areas, runoff coefficients, rainfall depths and intensities, infiltration loss parameters, unit hydrograph parameters, and other applicable hydrologic data should be included and clearly documented. For computer applications, printouts should be attached. Calculations methods presented herein are for guidance, the design Engineer may use other industry standard methods where appropriate
- (e) Hydraulic Calculations: Hydraulic calculations specifying the methods used in analyzing channels, storm sewers, and other hydraulic structures and providing a summary of the results obtained. Cross-section data, roughness coefficients, flow rates, and other data should

be clearly documented. For computer applications, printouts should be attached. Calculations methods presented herein are for guidance, the design Engineer may use other industry standard methods where appropriate.

- (f) **Benchmark Information:** A description of the benchmark used to establish existing and proposed elevations in the project area, including the exact location, the elevation, and the source of the elevation.
- (g) **Right-of-Way Map:** A map which illustrates existing and proposed channel and utility ROWs and easements. Include both underground and overhead utilities and all drainage easements. Sufficient ROW must be permanently set aside to allow for the construction of the most extensive permanent drainage facilities proposed to pass through the development in the future. These facilities may include open or enclosed channels, storm sewers, ditches, or swales. For channels, the width of the ROW must be adequate to provide for the channel itself plus minimum maintenance berm widths. For enclosed systems, the minimum ROW width is equal to the widest dimension of the underground conduit plus two times the maximum depth from finished ground to the invert of the conduit, or 30 feet, whichever is greatest
- (h) **Soils Report:** A soils report, prepared by a qualified geotechnical engineer, which identifies the existing soil types and assesses the suitability of the soil for the proposed activity. The soils report should address erosion and slope stability in areas subject to the action of storm runoff.
- (i) **Plotted Stream Profile:** A profile of the subject stream which includes computed water surface profiles, existing and proposed flow-line profiles, the locations of existing and proposed bridges, culverts, and utility crossings, the locations of tributary confluences and major storm sewer outfalls in or near the project area, and the locations of hydraulic structures such as dams, weirs, and drop structures.
- (j) **Plotted Cross-Sections:** Typical cross-sections of the subject stream for both existing and proposed conditions.
- (k) **Flood Plain Maps:** A FIRM showing the boundaries of the existing 100-year flood plain and floodway in the project area and a separate map which illustrates proposed changes in flood plain or floodway boundaries.
- (l) **Facility Layout Map:** Plan, elevation, and cross-section views of drainage facilities such as detention basins, roadway culverts, bridges

and driveway culverts.

- (m) Erosion Control: All drainage facilities must be designed and maintained in a manner which minimizes the potential for damage due to erosion. No bare earthen slopes will be allowed. Various slope treatments, including turf establishment, concrete slope paving, and rip-rap, are accepted. Flow velocities should be kept below permissible values for each type of slope treatment. Interceptor structures and backslope swale systems are required to prevent sheet flows from eroding the side slopes of open channels and detention facilities.

(D.) Review & Approval of Submittals to the Engineering Department

Upon receiving an engineering submittal, representatives of Liberty County will check it for completeness and will request additional information as needed. Upon receiving all of the information necessary to thoroughly evaluate the submittal, the County will complete the review. Written comments will be forwarded to the submitter, who will make any corrections or adjustments to the analysis and re-submit a final package. Upon determining that all necessary corrections and adjustments have been made, the County will prepare a written acceptance of the submittal.

### ***Sub-Section 2 - Public Facilities***

#### **50.2.01. Dedication to Public**

Any dedication of drainage facilities to the public shall be accomplished using one of the methods identified in Section 10.11.07. Drainage facilities to be constructed within dedicated public roadways shall not require separate dedication. In no event shall any private lot extend into a dedicated public drainage feature.

- (A) All public drainage facilities and other areas of concentrated storm water flow shall be contained within a dedicated public easement or right-of-way.

#### **50.2.02. Publicly Maintained and Dedicated Facilities**

Storm water management facilities dedicated to the public (hereafter “Public drainage facilities”) shall be required to provide proper drainage of Regulated Roadways in all developments approved under these Regulations. Constructed public drainage facilities shall be designed and constructed in accordance with Sub-section 3 of this Section. Areas occupied by existing watercourses may also be dedicated to the public as a part of a Development Authorization issued under these Regulations. In the initial submittal to the County (e.g. the preliminary plan or the Infrastructure Development Plan), the Applicant shall identify all drainage facilities for which County acceptance of maintenance will be requested. Applicants

proposing County acceptance of maintenance for drainage facilities controlling runoff rate or storm water quality from within the development shall be required to enter into a Development Agreement with the County prior to acceptance of maintenance.

#### **50.2.03. Construction of Public Storm Water Management Facilities**

Public drainage facilities shall be considered public infrastructure. Construction of public drainage facilities shall not commence until such time as an approval of a Final Plat has been issued by the County on an Application filed under these Regulations.

### ***Sub-Section 3 - Design Criteria***

#### **50.3.01. Design of Storm Water Management Facilities**

All drainage facilities and related improvements shall be designed and installed so as to provide, to the maximum extent feasible, a logical system of storm water management and to permit continuity of drainage facilities to adjacent properties. All drainage facilities shall be designed and/or evaluated by a Texas licensed professional engineer. Documentation evidencing compliance with these Regulations shall be submitted to the Department with the Application. Drainage, flood control and storm water management design methodologies shall be based upon the methods used by the Texas Department of Transportation or other commonly accepted engineering practices used within the area. All design and/or evaluation computations for flood plains and storm water management facilities shall be based on fully developed upstream conditions. For upstream areas that extend off the Subject Property, the Applicant may estimate the fully developed conditions based on information available from the Department based on regional planning efforts or other criteria adopted by the County.

#### **50.3.02. Control of Runoff Rate and Volume**

Storm water runoff from any proposed development that is discharged from the Subject Property onto adjacent property owners, into any other county drainage facility or any such drainage facility associated with an existing roadway, whether public or private, must be released at a controlled rate. For storm events including the two (2), five (5), ten (10), twenty-five (25), and one hundred (100) year frequency, storm water runoff may be discharged under the post-development conditions at a rate no greater than the pre-development condition. Post-development drainage calculations shall be based on fully developed conditions. The Department shall require the submission of materials documenting that the proposed development will be in compliance with this Section.

#### **50.3.03. Sizing of Drainage Facilities**

##### **(A) HYDROLOGY**

The purpose of this section is to provide detailed information on the hydrologic analyses

required by Liberty County. This section is divided into two main sections. Section 1 describes requirements for the hydrologic analysis of drainage areas up to 200 acres, while Section 2 describes requirements for the hydrologic analysis of drainage areas greater than 200 acres.

(1) DRAINAGE AREAS UP TO 200 ACRES

(a) Introduction

This section describes the methods to be used in hydrologic analyses of drainage areas up to 200 acres. These analyses may be completed using the Rational Method. However, a HEC-HMS hydrologic analysis can also be performed for drainage areas up to 200 acres using the methodology described in Section 50.3.03(A)(2).

(b) The Rational Method

The Rational Method relates the runoff rate from a watershed to drainage area, land use, and rainfall intensity. The basic equation used in the Rational Method to compute the runoff rate is:

$$Q = C \times C_a \times I \times A \quad \text{Equation 50-1}$$

where:

$Q$	=	the peak runoff rate (cubic feet per second);
$C$	=	a runoff coefficient dependent on land use;
$C_a$	=	a runoff coefficient adjustment factor dependent on the storm recurrence interval;
$I$	=	the rainfall intensity (inches per hour);
$A$	=	the drainage area (acres).

(c) Establishing the Drainage Area

Drainage areas for Rational Method analyses should be established using topographic maps, storm sewer layouts, and other available information. At each computation point, the drainage area is defined as the total area contributing runoff at that location.

(d) Determining Runoff Coefficients

Table 50-1 provides a summary of runoff coefficients for various land uses, overland slopes, and soil types. The appropriate runoff coefficient may be selected by establishing the land use and consulting this table. For example, an area developed as an apartment complex on land which slopes at less than one-percent would have a runoff coefficient of 0.75. Land use data may be obtained from aerial photographs, and site visits.

**TABLE 50-1: RATIONAL METHOD COEFFICIENTS  
FOR 2- TO 10-YEAR STORMS**

Description of Area	Basin Slope		
	< 1%	1% - 3.5%	> 3.5%
Single-Family Residential Districts			
<i>Lots greater than 1/2 acre</i>	0.30	0.35	0.40
<i>Lots 1/4 to 1/2 acre</i>	0.40	0.45	0.50
<i>Lots less than 1/4 acre</i>	0.50	0.55	0.60
Multi-Family Residential Districts	0.60	0.65	0.70
Apartment Dwelling Areas	0.75	0.80	0.85
Business Districts			
<i>Downtown</i>	0.85	0.87	0.90
<i>Neighborhood</i>	0.75	0.80	0.85
Industrial Districts			
<i>Light</i>	0.50	0.65	0.80
<i>Heavy</i>	0.60	0.75	0.90
<i>Railroad Yard Areas</i>	0.20	0.30	0.40
<i>Cemeteries</i>	0.10	0.18	0.25
<i>Playgrounds</i>	0.20	0.28	0.35
Streets			
<i>Asphalt</i>	0.80	0.80	0.80
<i>Concrete</i>	0.85	0.85	0.85
<i>Concrete Drives and Walks</i>	0.85	0.85	0.85
<i>Roofs</i>	0.85	0.85	0.85
Lawn Areas			
<i>Sandy Soil</i>	0.05	0.08	0.12
<i>Clay Soil</i>	0.15	0.18	0.22
Woodlands			
<i>Sandy Soil</i>	0.15	0.18	0.25
<i>Clay Soil</i>	0.18	0.20	0.30
Pasture			
<i>Sandy Soil</i>	0.25	0.35	0.40
<i>Clay Soil</i>	0.30	0.40	0.50
Cultivated			
<i>Sandy Soil</i>	0.30	0.55	0.70
<i>Clay Soil</i>	0.35	0.60	0.80

For drainage areas with multiple land uses, runoff coefficients and drainage areas associated with each land use shall be determined. The composite runoff coefficient shall then be computed using Equation 50-2:



$$C_w = \sum \frac{(C_i \times A_i)}{A_T} \quad \text{Equation 50-2}$$

where:  $C_w$  = weighted runoff coefficient;  
 $C_i$  = runoff coefficients for various land uses;  
 $A_i$  = drainage areas corresponding to values of  $C_i$  (acres);  
 $A_T$  = total drainage area (acres).

As indicated previously, a runoff coefficient adjustment factor ( $C_a$ ) shall be used to adjust peak runoff rates for various recurrence intervals. Table 50-2 lists the runoff coefficient adjustment factors for storm recurrence intervals ranging from two to 100 years.

<b>TABLE 50-2: RATIONAL METHOD RUNOFF COEFFICIENT ADJUSTMENT FACTORS</b>	
<b>Storm Recurrence Interval (years)</b>	<b>Adjustment Factor (<math>C_a</math>)</b>
2 – 10	1.00
25	1.10
50	1.20
100	1.25

(e) Establishing the Time of Concentration

The time of concentration ( $T_C$ ) is defined as the time (in minutes) required for all portions of the watershed to contribute runoff at the computation point. The  $T_C$  is normally calculated by identifying the longest flow path within the watershed and estimating the time required for runoff to travel the entire length of this path. Storm water runoff may pass through a range of flow conditions as it moves along the longest flow path. Overland sheet flow is characterized by very shallow depths of less than two inches. Within a short distance of about 100 to 300 feet, storm water runoff begins to flow at greater depths to collect in streets, swales, and small ditches or gullies, and is commonly known as concentrated overland flow. Finally, the runoff collects in storm sewers, creeks, and drainage channels in which flow depths may reach several feet.

In order to estimate  $T_C$ , the longest flow path is divided into reaches that represent the various types of flow conditions and the flow velocity for each individual reach is estimated. For example, the longest flow path may include overland sheet flow, concentrated flow in a roadside ditch, and flow in a drainage channel. Flow velocities for overland sheet flow and some concentrated flow conditions may be estimated using the Uplands Method, which relates flow velocity to overland slope and land use. This method was

developed by the U.S. Department of Agriculture Soil Conservation Service (SCS).

For storm sewers, creeks, and channels, flow velocities may be estimated using Manning's equation or a HEC-RAS model (see Section 50-5). The length of each individual reach is divided by the flow velocity to obtain the time of travel required for water to pass through the reach, and  $T_C$  is calculated as the sum of the individual travel times.

(f) Computation of Rainfall Intensity

The rainfall intensity ( $I$ ) for a particular frequency used in the Rational Method may be determined from Equation 50-3, which was developed by the Texas Department of Transportation (TxDOT) from the U.S. Weather Bureau publications *Technical Paper No. 40* and *Hydrometeorological Report No. 35*.

$$I = \frac{b}{(T_c + d)^e} \quad \text{Equation 50-3}$$

where:  $I$  = rainfall intensity (inches per hour);  
 $T_C$  = time of concentration (minutes);  
 $b, d, e$  = rainfall intensity parameters from Table 4-3.

If the calculated  $T_C$  is less than 10 minutes, then a  $T_C$  of 10 minutes should be used in Equation 3.

TABLE 50-3: RAINFALL INTENSITY PARAMETERS FOR LIBERTY COUNTY			
CONSTANTS FOR ORANGE COUNTY			
Storm Frequency	$e$	$b$	$D$
2-Year	0.789	69	8.2
5-Year	0.753	66	7.4
10-Year	0.742	76	7.4
25-Year	0.727	83	7.4
50-Year	0.711	87	7.4
100-Year	0.690	85	8.2

- (i) Analyzing a Watershed with Multiple Sub-Areas or Computation Points When analyzing a watershed with multiple sub-areas or computation points, the peak flow rate at the computation point located furthest upstream is computed first. Peak flow rates are computed at subsequent points, while moving in the downstream direction. At each point, the total drainage area is determined and  $T_C$  is computed for the longest flow path from the most remote point in the entire

watershed to the current computation point. The rainfall intensity for the peak flow rate computation is calculated using this  $T_c$ . As discussed in Section 50.4, a weighted runoff coefficient shall be computed using the coefficients for individual sub-areas upstream of the computation point.

(2) Drainage Areas Greater Than 200 Acres

This section describes the methods to be used in hydrologic analyses of drainage areas greater than 200 acres. These analyses shall be completed using the HEC-HMS computer program developed at the Hydrologic Engineering Center of the U.S. Army Corps of Engineers (USACE). This software program can be downloaded from the USACE's website <http://www.hec.usace.army.mil/software/hec-hms/downloads.aspx>) at no charge. The *Hydrologic Modeling System HEC-HMS User's Manual*, the *Hydrologic Modeling System HEC-HMS Applications Guide*, and the *Hydrologic Modeling System HEC-HMS Technical Reference Manual* developed by the USACE can be used for further reference. These manuals can also be downloaded from the USACE's website (<http://www.hec.usace.army.mil/software/hec-hms/downloads.aspx>) at no charge. The hydrologic parameters discussed in this Section are the basis for developing HEC-HMS models.

(a) Watershed Boundaries

Topographic information, storm sewer layouts, and other available information shall be used to provide the level of detail necessary to delineate additional sub-area boundaries as needed. These boundaries may be delineated by hand or with HEC-GeoHMS, which is a *Geographic Information Systems (GIS)* program that works in conjunction with ArcView to compute hydrologic parameters. However, HEC-GeoHMS sub-area boundaries should be closely reviewed by an engineer familiar with the topography of the drainage area. The number of sub-areas required for the HEC-HMS analysis is a function of the number of computation points, which are typically established at confluences with tributaries, roadway crossings, or other points of interest (lakes and reservoirs, etc). Normally, there is one sub-area above the first analysis point and one or more between each pair of successive analysis points. In addition, there is at least one sub-area for each tributary.

(b) Rainfall Data

The rainfall depth-duration-frequency data for the Liberty County listed in Table 50-4, which was developed by modifying data contained in the *USGS Water Resources Investigative Report (WRIR) 98-4044*, shall be used in HEC-HMS hydrologic analyses. The rainfall depth data and exceedance probability associated with the design storm event shall be entered in the meteorological model of HEC-HMS. A one-percent exceedance probability would be entered for a 100-year storm event, four-percent would be entered for a 25-year event, and twenty-percent would be entered for a 5-year event.

A maximum intensity-duration of five minutes shall be used for the analysis regardless of the design storm event. A value of 67-percent is used as the peak center and the HEC-HMS program automatically distributes the rainfall over a 24-hour

period in such a manner that the maximum rainfall intensity occurs at approximately two-thirds of storm event. Rainfall leading up to and following the period of maximum intensity is distributed in a manner which produces a balanced rainfall distribution. Since the use of the total area option in HEC-HMS is problematic for many types of hydrologic analysis, point rainfall data is used in Liberty County and a total storm area of 0.01 square miles, or other approved area, is used to compute runoff hydrographs. A baseflow of zero shall be used unless project-specific considerations warrant the use of this parameter.

**TABLE 50-4: RAINFALL DATA FOR LIBERTY COUNTY**

Recurrence Interval (years)	Rainfall Depth (inches) for Given Duration								
	5 min	15 min	30 min	60 min	2 hour	3 hour	6 hour	12 hour	24 hour
2	0.7	1.1	1.5	2.0	2.6	2.8	3.4	4.1	4.8
5	0.8	1.4	1.9	2.6	3.4	3.8	4.6	5.6	6.8
10	0.9	1.5	2.1	3.0	4.1	4.5	5.6	6.8	8.2
25	1.0	1.8	2.4	3.5	4.9	5.5	7.0	8.8	10.5
50	1.1	2.0	2.7	3.9	5.7	6.4	8.8	10.5	12.0
100	1.2	2.1	2.9	4.4	6.5	7.3	10.0	11.8	13.5
500	1.4	2.6	3.5	5.7	8.7	10.0	14.5	18.5	19.0

(c) Infiltration Losses

Infiltration losses shall be accounted for using the Green & Ampt method, which is a conceptual representation of the infiltration process, was developed in 1911 by Green & Ampt. This method estimates infiltration losses based on a function of soil texture and the capacity of the given soil type to convey water. The advantage of this method is that the parameters can be estimated based on soil type. The parameters should be applied on a watershed-wide basis, similar to the exponential and initial/uniform loss methods from the original Flood Hazard Study.

Table 50-5 shows the volume moisture deficit, wetting front suction, and hydraulic conductivity parameters for various soil textures and types. The hydrologic soil group to which a particular soil belongs may be determined by consulting the Soil Survey or the Soil Survey Geographic Database (SSURGO) for Liberty County, Texas.

TABLE 50-5: GREEN & AMPT LOSS PARAMETERS			
Soil Classification	Volume Moisture Deficit	Wetting Front Suction (inches)	Hydraulic Conductivity (inches/hour)
<b>Soil Texture</b>			
Sand	0.417	1.95	9.276
Loamy Sand	0.402	2.41	2.354
Sandy Loam	0.412	4.33	0.858
Loam	0.436	3.50	0.520
Silt Loam	0.486	6.57	0.268
Sandy Clay Loam	0.330	8.60	0.118
Clay Loam	0.389	8.22	0.079
Silty Clay Loam	0.431	10.75	0.079
Sandy Clay	0.321	9.41	0.047
Silty Clay	0.423	11.50	0.039
Clay	0.385	12.45	0.024
<b>Soil Group</b>			
A (freely draining)	0.417	1.95	9.276
B (intermediate)	0.436	3.50	0.520
C (intermediate)	0.389	8.22	0.079
D (poorly draining)	0.385	12.45	0.024

(d) Initial Abstraction

Initial abstraction losses shall be accounted for using the Soil Conservation Service (SCS) Curve Number method, which is an empirical method developed by the U.S. Department of Agriculture. Equation 50-4 can be used to compute the initial abstraction for specific soil types.

$$I_a = 0.2S \quad \text{Equation 50-4}$$

where:  $I_a$  = the initial abstraction depth (inches);  
 $S$  = initial retention =  $\frac{1000}{CN} - 10$ ;  
 $CN$  = SCS Curve Number, from Table 50-6.

The Curve Number is a function of soil structure, antecedent watershed moisture, and land use. Soil structure is defined by assigning individual soils to one of four hydrologic soil groups (A through D) that represent a wide range of soil porosities. Soils belonging to hydrologic soil group A are the most porous, while soils in group D are the least porous. The hydrologic soil group may be determined from the Soil Survey for Orange County, Texas or the Soil Survey Geographic Database (SSURGO) for Orange County. Table 50-6 provides a summary of SCS Curve Numbers for various land uses, taken from the *SCS National Engineering Handbook*.

TABLE 50-6: SCS CURVE NUMBERS				
Land Use Description	Hydrologic Soil Group			
	A	B	C	D
Cultivated Land				
<i>Without Conservation Treatment</i>	72	81	88	91
<i>With Conservation Treatment</i>	62	71	78	81
Pasture or Range Land				
<i>Poor Condition</i>	68	79	86	89
<i>Good Condition</i>	39	61	74	80
Meadow: Good Condition	30	58	71	78
Wood or Forest Land				
<i>Thin Stand, Poor Cover, No Mulch</i>	45	66	77	83
<i>Good Cover</i>	25	55	70	77
Open Spaces, Lawns, Parks, Cemeteries				
<i>Good Condition, 75% Grass Cover</i>	39	61	74	80
<i>Poor Condition, 50-75% Grass Cover</i>	49	69	79	84
Commercial and Business Areas (85% Impervious)	89	92	94	95
Industrial Districts (72% Impervious)	81	88	91	93
Residential				
<i>Average Lot Size          Average % Impervious</i>				
<i>1/8 acre or less          65</i>	77	85	90	92
<i>1/4 acre          38</i>	61	75	83	87
<i>1/3 acre          30</i>	57	72	81	86
<i>1/2 acre          25</i>	54	70	80	85
<i>1 acre          20</i>	51	68	79	84
Paved Parking Lots, Roofs, Driveways, Etc.	98	98	98	98
Streets and Roads				
<i>Paved with Curbs and Storm Sewers</i>	98	98	98	98
<i>Gravel</i>	76	85	89	91
<i>Dirt</i>	72	82	87	89

Source: SCS National Engineering Handbook

For watersheds with varying land uses and soil types, composite Curve Numbers may be computed by determining the Curve Number and drainage area associated with each land use and/or soil category. The composite Curve Number may then be computed using the following equation:

$$CN_w = \sum \frac{(CN_i \times A_i)}{A_T} \quad \text{Equation 50-5}$$

$CN_w$  = weighted Curve Number;  
 $CN_i$  = Curve Number for various land uses and soil types;

- $A_i$  = drainage areas corresponding to values of  $CN_i$  (acres);  
 $A_T$  = total drainage area (acres).

In HEC-HMS applications, cumulative totals for rainfall and infiltration are maintained. The total runoff is re-computed for every time step.

- (e) **Percent Impervious Cover**  
 Percent impervious cover is a function of land urbanization and can be estimated from field observations, aerial photographs, and other supporting information on the drainage area. Table 50-7 provides a summary of percent impervious cover values for different land use categories:

<b>TABLE 50-7: PERCENT IMPERVIOUS COVER VALUES FOR LIBERTY COUNTY</b>		
<b>Land Use Categories</b>	<b>Land Use Descriptions</b>	<b>% Impervious</b>
Undeveloped	Unimproved, natural, or agricultural	0
Residential – Rural Lot	≥ 5-acre ranch or farm	5
Residential	Average Lot Size	
	1 acre	20
	½ acre	25
	⅓ acre	30
	¼ acre	38
	⅛ acre or less	65
Developed Green Areas	Parks or golf courses	15
Light Industrial/ Commercial	Office parks, nurseries, airports, warehouses, or manufacturing with non-paved areas	60
High Density	Commercial, business, industrial, or apartments	85
Transportation	Highway or major thoroughfare corridors	90
Water	Detention basins, lakes, channels, roadside ditches	100

- (f) **Loss Rate Computations in HEC-HMS**  
 The Green & Ampt loss rate parameters and percent impervious cover values discussed in Sections (c) to Section (e) are entered into the loss rate option of the HEC-HMS Subbasin Model Editor window.
- (g) **Unit Hydrograph Methodology**  
 Unit hydrographs shall be computed based on the Clark Unit Hydrograph

method, which is one of the unit hydrograph methods available in HEC-HMS. The Clark Unit Hydrograph method uses three parameters to define a unit hydrograph for a watershed: the  $T_C$ , a storage coefficient, and a time-area curve. The  $T_C$  is defined as the time required for all portions of the watershed to contribute runoff at the computation point. The storage coefficient ( $R$ ) is an indicator of the available storm water storage volume within a watershed within depressions, ponds, channels and flood plains. The value of  $R$  varies directly with the relative amount of storage volume within a watershed (i.e., the greater the storage volume, the higher the storage coefficient). For Liberty County,  $R$  should be estimated from Equation 50-6 or any other methodology approved by Liberty County.

$$R = 3 \times T_C \quad \text{Equation 50-6}$$

The time-area curve relates the percentage of the watershed contributing runoff at the analysis point to the fraction of the  $T_C$ , which has elapsed since the beginning of runoff. The entire watershed is considered to be contributing runoff at the outlet when the elapsed time is equal to or greater than the  $T_C$ . This standard curve is applicable as long as extremes in watershed shapes (i.e., very large or very small ratios of watershed length to width) are avoided. Calculation of the time-area curve is handled internally by HEC-HMS with a standard time-area curve based on assumed watershed shape.

Runoff hydrographs can be computed in HEC-HMS by selecting the Clark Unit Hydrograph method from the Transform option of HEC-HMS Subbasin Editor Window. In addition, the  $T_C$  and  $R$  parameters should be entered for each subbasin. The meteorological model data works in conjunction with the subbasin editor data to calculate a hydrograph for each subbasin.

(h) **Streamflow Routing**

Streamflow routing is the process by which the lagging and attenuating effects of travel time and storage on runoff hydrographs are taken into account as flood flows move from one analysis point to another. Although the HEC-HMS program offers a number of streamflow routing methods, Liberty County requires the use of the Modified Puls method where channel cross-sections and a HEC-RAS hydraulic model of the channel are available. For streamflow routing along channels without a HEC-RAS model, the Muskingum-Cunge Standard, Muskingum-Cunge 8-Point, or Muskingum methods should be used depending on which method is best suited to the specific application. However, if backwater conditions and/or overland flooding are anticipated, it is recommended that a HEC-RAS model of the channel be developed and the Modified Puls method be used.



The Modified Puls Method explicitly accounts for the effects of storage volume within the flood plain and is based on a simple continuity equation:

$$\Delta S = I - O \quad \text{Equation 50-7}$$

where:  $\Delta S$  = change in storage volume within the routing reach;  
 $I$  = inflow to the routing reach;  
 $O$  = outflow from the routing reach.

For the Modified Puls method, input to the HEC-HMS program consists of a set of flow rates and corresponding storage volumes, which are input in the basin model routing reach window. Additionally, the number of sub-reaches and initial flow condition are selected in the same window. The Muskingum method is an approximation of the continuity equation (Equation 50-7) where storage is modeled as the sum of prism and wedge storage. Required input parameters for this method include: the Muskingum K, Muskingum X (ranges from 0.0 to 0.5), and the number of sub-reaches.

HEC-HMS modeling input for the Muskingum-Cunge Standard method consists of the following physical parameters: the length and slope of the routing reach, the Manning's roughness coefficient (n value), the shape of the channel (circular or prismatic), the bottom width or diameter, and the side slope ratio. This mathematical routing method provides an implicit accounting of storage within the channel. However, storage within the flood plain outside the defined channel is not considered. Although the same equations and solution techniques are used for the Muskingum-Cunge 8-Point method, the channel is described with eight station-elevation coordinates instead of a standard cross-section shape. Other required input items for this method are the reach length, energy slope, and n values for the channel and overbanks.

(i) Combining Hydrographs

When analyzing Basins or subbasins that have been divided into two or more sub-areas, it is necessary to combine runoff hydrographs from the individual sub-areas. Combining the hydrographs yields a single hydrograph, which accounts for all the runoff from the individual sub-areas. This is accomplished by inserting a junction in the HEC-HMS Basin Model. Connect the two sub- areas to the junction to obtain a combined hydrograph. HEC-HMS will compute individual hydrographs for Subbasin-1 and Subbasin-2 and combine them at Junction-1.

(B) HYDRAULICS OF PRIMARY DRAINAGE FACILITIES

The purpose of this chapter is to provide detailed information on the hydraulic analysis and design of primary drainage facilities within Liberty County. The primary drainage facilities include open channels, bridges, culverts, and enclosed drainage systems (i.e., open channels that have been enclosed).

(1) General Design Requirements For Primary Drainage Facilities

The following design requirements are discussed in this section: design storm frequencies; design requirements for earthen channels; design requirements for concrete-lined channels; design requirements for rectangular concrete low-flow sections; transitions, bends, and confluences; design requirements for culverts; structural requirements for culverts; design requirements for bridges; design requirements for enclosed systems; and maximum allowable velocities.

(a) Design Storm Frequencies

The following design storm frequencies shall be used for analysis and design of open channels, bridges, culverts, and enclosed systems:

- (i) Channels draining up to 100 acres shall be designed to convey 25-year peak discharges with a minimum freeboard of one foot.
- (ii) Channels draining between 100 acres and 200 acres shall be designed to convey 50-year peak flow rates a minimum freeboard of one foot.
- (iii) Channels draining greater than 200 acres shall be designed to convey 100-year peak flow rates a minimum freeboard of one foot. These channels shall also be analyzed using a 10-year design storm event.
- (iv) For open channel studies involving *Federal Emergency Management Agency (FEMA)* submittals, the 10-year, 50-year, 100-year, and 500- year storm frequencies must be analyzed.

(b) Design Requirements for Earthen Channels

The following minimum requirements shall be incorporated into designs of earthen channels that are to be maintained by a public agency such as the County, a Drainage District, or a Municipal Utility District:

- (i) Channel side slopes shall be no steeper than 3 horizontal to 1 vertical (3:1). Flatter slopes may be required when soil conditions are conducive to slope instability.
- (ii) The minimum channel bottom width shall be six feet.
- (iii) A 20 foot maintenance berm is required on one side of the channel.
- (iv) Backslope drain swales and interceptor structures are required to prevent flow down the ditch side slopes. The maximum spacing for interceptor structures is 600 feet.

- (v) Channels, channel rights-of-way (ROWs) and side slopes must be vegetated immediately after construction to minimize erosion in accordance with the erosion control requirements.
  - (vi) Flow from roadside ditches must be conveyed into open channels through standard roadside ditch interceptor structures.
- (c) Minimum Design Requirements for Trapezoidal Concrete-Lined Channels Concrete-lined channels shall be designed to meet the following minimum requirements that are to be maintained by a public agency such as the County, a Drainage District, or a Municipal Utility District::
- (i) All concrete slope paving shall consist of Class A concrete.
  - (ii) The minimum bottom width shall be eight feet.
  - (iii) The side slopes of the channel shall be no steeper than 1.5 horizontal to 1 vertical (1.5:1).
  - (iv) A maintenance berm is required on both sides of the channel. The berm width shall be at least 20 feet on one side of the channel and at least 10 feet on the other side.
  - (v) All slope paving shall include a toe wall at the top and sides with a minimum depth of 18 inches. Toe walls shall also be included along the bottom of the channel with a minimum depth of 24 inches for clay soils and 36 inches for sandy soils.
  - (vi) Backslope drain swales and interceptor structures are required in the channel maintenance berm to prevent overland flow down the bank of partially-lined channels. These items shall be designed in accordance with the minimum requirements. However, backslope drain swales and interceptor structures are not required on fully lined channels.
  - (vii) Channel maintenance berms must be vegetated immediately after construction in accordance with erosion control requirements.
  - (viii) Weep holes shall be used to relieve hydrostatic pressure behind lined channel sections. The specific type, size, and placement of the weep holes shall be based on the recommendations of the geotechnical report.
  - (ix) Where construction is to take place under muddy conditions or where standing water is present, a seal slab of Class C concrete shall be placed in the channel bottom prior to placement of the concrete slope paving.
  - (x) Control joints shall be provided at a maximum spacing of approximately 25 feet. A sealing agent shall be utilized to prevent moisture infiltration at control joints.
  - (xi) Concrete slope protection shall have the minimum thickness and reinforcement indicated in Table 50-8.
  - (xii) A geotechnical investigation and report on local soil conditions is required for all channel construction and improvement projects.

<b>TABLE 50-8: MINIMUM THICKNESS AND REINFORCEMENT FOR CONCRETE SLOPE PAVING</b>			
<b>Channel Side Slope (H:V)</b>	<b>Minimum Thickness (inches)</b>	<b>Minimum Reinforcement</b>	
		<b>Material</b>	<b>Dimensions</b>
3:1	4 inches	welded wire fabric	6 x 6 x W2.9 x W2.9
2:1	5 inches	welded wire fabric	6 x 6 x W4.0 x W4.0
1.5:1	6 inches	reinforcement	4 x 4 x W4.0 x W4.0

(d) Design Requirements for Rectangular Concrete Low-Flow Sections

Rectangular concrete low-flow sections can be incorporated into designs for earthen and concrete-lined channels to provide additional capacity or depth in areas where channel ROW is limited. The following criteria shall be used for concrete low-flow sections that are to be maintained by a public agency such as the County, a Drainage District, or a Municipal Utility District::

- (i) All concrete slope paving shall consist of Class A concrete.
- (ii) The structural steel design should be based on the use of ASTM A- 615, Grade 60 steel.
- (iii) The minimum bottom width of the low-flow section shall be eight feet.
- (iv) For bottom widths of 12 feet or more, the channel bottom shall be graded toward the centerline at a slope of 1/2 inch per foot (4.15- percent).
- (v) The maximum height of vertical concrete walls shall be three (3) feet.
- (vi) Escape stairways shall be located at the upstream side of all roadway crossings. Additional escape stairways shall be located along the channel to keep the maximum distance between stairways below 1,400 feet between stairways.
- (vii) For channels with concrete low-flow sections, the top of the vertical concrete wall shall be constructed in such a way as to provide for the possible future placement of concrete slope paving.
- (viii) Weep holes shall be used to relieve hydrostatic pressure behind lined channel sections. The specific type, size, and placement of the weep holes shall be based on the recommendations of the geotechnical report.
- (ix) Where construction is to take place under muddy conditions or where standing water is present, a seal slab of Class C concrete shall be placed in the channel bottom prior to placement of the

concrete slope paving.

- (x) Control joints shall be provided at a maximum spacing of approximately 25 feet. A sealing agent shall be utilized to prevent moisture infiltration at control joints. Concrete low-flow channels may be used in combination with a maintenance shelf on one or both sides of the channel. The minimum width of the shelf shall be fourteen 14 feet. Pavement used on the shelf shall be capable of supporting maintenance equipment having a concentrated wheel load of at least 1,350 pounds.
  - (xi) All designs of concrete low-flow sections shall be supported by structural computations.
  - (xii) A geotechnical investigation and report on local soil conditions is required for all channel construction and improvement projects.
- (e) Design Requirements for Transitions, Bends, and Confluences
- Transitions, bends, and confluences shall be designed to meet the following minimum requirements that are to be maintained by a public agency such as the County, a Drainage District, or a Municipal Utility District::
- (i) Transitions in channel bottom widths or side slopes shall be designed to create minimal flow disturbance and thus minimal energy loss. Transition angles should be less than 12 degrees.
  - (ii) A warped or wedge-type transition is recommended for connecting rectangular and trapezoidal channel sections.
  - (iii) Channel bends shall be made as gradually as possible. The minimum bend radius along the centerline of the channel is three times the top width of the channel at the maximum design water surface elevation (WSEL). Where smaller radii are required, erosion protection (i.e., concrete slope paving, riprap, interlocking blocks, etc.) is required. In no case shall the bend radius be less than 100 feet.
  - (iv) The maximum allowable deflection angle for any bend in an improved channel is 90 degrees.
  - (v) Erosion protection shall be provided at channel confluences in accordance with the erosion protection requirements.
- (f) Design Requirements for Culverts
- (i) Culverts shall be designed to convey the fully developed peak discharge rates associated with the design storm frequency requirements provided in Section 50.1 while maintaining a minimum freeboard of one-foot in the channel upstream of the culvert. In addition, the maximum allowable velocities discussed in Section 50.1 must not be exceeded.

- (ii) Culverts shall be aligned parallel to the longitudinal axis of the channel to maximize hydraulic efficiency and minimize turbulence and erosion. At locations where a difference between the alignment of the channel and the culvert is necessary, the change in alignment shall be accomplished upstream of the culvert so that the culvert is aligned with the downstream channel.
- (iii) The minimum allowable diameter for circular culverts is 18 inches.
- (iv) The minimum allowable size of box culverts is two feet x two feet.
- (v) Concrete slope paving or riprap shall be used upstream and downstream of the culvert to protect earthen channels from erosion. The need for slope paving should be given in the geotechnical report.
- (vi) Culverts shall extend completely across railroad ROWs at crossing locations.
- (vii) Where hydraulic jumps are anticipated around culverts, the channel geometry shall be modified to force the hydraulic jump to occur in a portion of the channel protected with concrete slope paving. Hydraulic jumps are characterized by a rapid change in the depth of flow from a low stage to a high stage, which results in an abrupt rise in the WSEL.

(g) Structural Requirements for Culverts

Unless otherwise approved, all pipe and box culverts shall satisfy the following minimum structural design requirements:

- (i) All pre-cast reinforced concrete pipe shall be ASTM C-76.
- (ii) All high density polyethylene (HDPE) pipe culverts shall conform to the AASHTO M294 specifications. Bedding for HDPE culverts shall be designed and constructed in accordance with the manufacturer's recommendations.
- (iii) All pre-cast reinforced concrete box culverts with more than two feet of earthen cover shall be ASTM C789-79. All pre-cast reinforced box culverts with less than two feet of earthen cover shall be ASTM 850- 79.
- (iv) All corrugated steel pipes shall be aluminized in accordance with AASHTO M-36.
- (v) AASHTO HS20-44 loading shall be used for all culverts.
- (vi) Joint sealing materials for pre-cast concrete culverts shall comply with the "AASHTO Designation M-198 74 I, Type B, Flexible Plastic Gasket (Bitumen)" specification.
- (vii) Two-sack-per-ton cement-stabilized sand shall be used for backfill around culverts.
- (viii) A six-inch bedding of two-sack-per-ton cement-stabilized sand is

required for all pre-cast concrete box culverts.

(h) Design Requirements for Bridges

Bridges shall be designed to meet the following requirements:

- (i) Bridges shall be designed to convey the fully developed peak discharge rates associated with the design storm frequency requirements while maintaining a minimum freeboard of one-foot in the channel upstream of the bridge. In addition, the maximum allowable velocities discussed in Section (j) must not be exceeded.
- (ii) New bridges shall be designed to completely span the existing or proposed channel so that the channel will pass under the bridge without significant contractions or changes in the channel shape. Bridges constructed on existing or interim channels shall be designed to accommodate the ultimate channel section with minimum structural modifications.
- (iii) Bridges shall be designed to intersect the channel at an angle of 90 degrees, if possible.
- (iv) Pier bents and abutments shall be aligned parallel to the direction of flow in the channel. Pier bents shall be placed as far from the center of the channel as possible and wherever possible shall be placed within the channel side slopes instead of the channel bottom.
- (v) Concrete slope paving or riprap shall be used to protect earthen channels from erosion underneath, upstream and downstream of bridges.
- (vi) Where hydraulic jumps are anticipated around bridges, the channel geometry shall be modified to force the hydraulic jump to occur in a portion of the channel protected with concrete slope paving.

(i) Enclosed Drainage Systems

Enclosed drainage systems include pipe and box culverts used to replace segments of open channel longer than the typical width of a road or railroad ROW.

- (i) Enclosed drainage systems shall be designed to accommodate fully developed design peak runoff rates discussed in Section (a) while maintaining the hydraulic grade line elevations below adjacent natural ground elevations or street gutter elevations, whichever are lower for fully-developed watershed conditions.
- (ii) The minimum inside pipe dimension shall be two feet.
- (iii) The minimum and maximum allowable velocities for design peak runoff rates shall be two feet per second and eight feet per second, respectively, assuming full pipe flow.

- (iv) Structural requirements for enclosed systems are identical to those specified for pipe and box culverts in Section (g).
  - (v) Manholes or junction boxes shall be located no more than 600 feet apart along the entire length of the system and at all locations where changes in culvert size and shape occur.
  - (vi) Outfall structures shall conform to the requirements set forth for storm sewer outfalls in this manual.
  - (vii) The ROW width required for enclosed systems will be set equal to the maximum pipe or box width plus two times the depth to the culvert invert or 30 feet, whichever is smaller.
- (j) **Maximum Flow Velocities**  
The maximum allowable velocity in open channels and at bridges or culverts shall be analyzed for the design storm event. As shown in Table 50-9, the maximum allowable velocity is related to the type of channel, the slope treatment, and the soil structure throughout the open channel section. If the maximum velocities listed in this table are exceeded during the design storm event, then the channel design shall be modified until acceptable velocities are attained. Alternatively, erosion protection (i.e., riprap, concrete slope paving, or interlocking blocks) could be provided to increase the maximum allowable velocity in that portion of the channel. However, the erosion protection must extend upstream and downstream a sufficient distance to a location where the design storm velocity in the channel is below the maximum allowable levels for earthen channels without slope protection. Engineer may use a geotechnical report to verify maximum allowable velocities.

<b>TABLE 50-9: MAXIMUM ALLOWABLE VELOCITIES IN OPEN CHANNELS</b>		
<b>Soil Description</b>	<b>Slope Treatment</b>	<b>Maximum Velocity (feet per second)</b>
Fine Sand	None	1.50
Sandy Loam	None	1.75
Silt Loam	None	2.00
Clay Loam	None	2.50
Stiff Clay	None	3.75
Sandy Soils (Easily Eroded)	Grass	4.00
Clay Soils (Erosion-Resistant)	Grass	5.00
Sandy Soils (Easily Eroded)	Rip-Rap	6.00
Clay Soils (Erosion Resistant)	Rip-Rap	8.00
Sandy Soils (Easily Eroded)	Concrete	8.00
Clay Soils (Erosion Resistant)	Concrete	10.00
Bridges & Culverts		8.00



- (k) Maintenance  
Provisions for adequate maintenance must be made in the design of all drainage facilities. Sufficient ROW must be set aside, slopes must be kept at or below maximum values, and slope treatments must be properly completed. Access to drainage facilities must not be impeded.

## 2. Hydraulic Analysis of Primary Drainage Facilities

This section describes the methods to be used in the hydraulic analysis of open channels as well as associated bridge and culvert structures.

- (a) Acceptable Open Channel Design Methodologies  
The final open channel dimensions shall be determined by using the *HEC- RAS* computer program developed at the Hydrologic Engineering Center of the U.S. Army Corps of Engineers (USACE). The latest version of this software program can be downloaded from the USACE's website  
(<http://www.hec.usace.army.mil/software/hec-ras/downloads.aspx>)  
at no charge. The HEC-RAS program has the capability to analyze unsteady flow conditions, transitions from subcritical to supercritical flow, and other complex hydraulic conditions.  
The hydraulic data discussed in Sections 50.3.03B(2)d. to 50.3.03(2)i should be compiled to facilitate development of HEC-RAS models. Additional information on HEC-RAS can be obtained from the *HEC-RAS River Analysis System User's Manual*, the *HEC-RAS River Analysis System Application's Guide*, and the *HEC-RAS River Analysis System Hydraulic Reference Manual* developed by the USACE. All of these manuals can be downloaded free of cost from the USACE's website at <http://www.hec.usace.army.mil/software/hec-ras/downloads.aspx>
- (b) Acceptable Bridge and Culvert Design Methodologies  
Hydraulic analysis of bridges and culverts may be performed using the HEC- RAS computer program. However, the nomographs developed by the Federal Highway Administration (FHWA) published in *Hydraulic Design of Highway Culverts* may be used for initial estimates of culvert size or to verify that the results obtained from HEC-RAS are reasonable. These nomographs can also be used to size culverts associated with roadside ditches. In addition, any other software programs which meet industry standards can be used, if prior approval is obtained from the County.
- (c) Acceptable Enclosed Drainage System Design Methodologies  
Hydraulic analysis of enclosed drainage systems that are part of an open channel system may be analyzed using HEC-RAS. In addition, any other software programs which meet industry standards can be used, if prior

approval is obtained from the County. For stand-alone enclosed systems, the methodology described in Section 50.3.03B(1)i for storm sewer systems shall be used. For these calculations, full pipe flow may be assumed. Both friction losses and minor losses (i.e., losses due to transitions, bends, junctions, manholes, etc.) should be accounted for.

(d) Flow Data

The Rational Method may be used to compute the peak flow rates for drainage areas up to 200 acres. However, a HEC-HMS hydrologic analysis can also be performed for drainage areas up to 200 acres. For drainage areas greater than 200 acres, the HEC-HMS methodology discussed in Section 50.3.03A(2) shall be used to compute peak discharge rates for the design storm frequencies specified in Section 50.3.03B(1)a. These peak flow rates shall be used to develop the flow data in HEC-RAS.

For an unsteady flow analysis, the inflow hydrographs computed in HEC-HMS are used instead of peak discharge rates. These hydrographs should be entered into the Unsteady Flow Data editor of HEC-RAS for unsteady flow detention analyses or the applicable portion of other approved software programs.

(e) Boundary Conditions

In order for HEC-RAS to perform computations, boundary conditions or starting WSELs must be defined. Boundary conditions are required at the downstream and upstream ends of the river system for subcritical and supercritical flow regimes, respectively. For mixed flow regimes, boundary conditions are required at both the upstream and downstream ends of the system. Subcritical flow typically occurs in the Liberty County area. This flow regime has a low velocity and appears tranquil, whereas the supercritical flow regime is characterized by shooting and rapid flows.

For unsteady flow detention analyses, a variety of boundary conditions are available within the Unsteady Flow Data editor. Refer to the *HEC-RAS River Analysis System User's Manual* for additional information on the available unsteady flow boundary conditions. For open channel analyses, the downstream boundary conditions should be entered into the Steady Flow Data editor. If a HEC-RAS model of the receiving channel is not available, then normal depth should be used as the downstream boundary condition and the energy slope should be entered. The energy slope can be approximated as the slope of the bottom of the channel. If a HEC-RAS model of the receiving channel is available and the tailwater in this channel can be determined, then the known WSEL downstream boundary condition should be selected.

In order to determine the tailwater *elevation* in the receiving channel, the Frequencies of Coincidental Occurrence methodology described in the

Texas Department of Transportation's (TxDOT's) *Hydraulic Design Manual* shall be used. This methodology is based on the assumption that the rainfall events within the drainage system being analyzed and the receiving channel are neither completely dependent nor completely independent. As shown in Table 50-10, this method provides a basis for selecting an appropriate frequency for the tailwater elevation of the receiving channel versus the frequency for the tributary channel, storm sewer system, or *detention basin*. For example, a 100-year analysis of a tributary channel with a drainage area of 200 acres that discharges to an open channel with an associated drainage area of 2,000 acres would have a ratio of receiving channel to tributary of 10:1. Therefore, the required tailwater elevation for the 100-year analysis of the tributary channel would be the 50-year WSEL in the receiving channel.

**TABLE 50-10: FREQUENCIES OF COINCIDENTAL OCCURRENCE FOR DETERMINING TAIL WATER ELEVATIONS IN RECEIVING CHANNELS**

Area Ratio	Design Storm Event for the Hydraulic Analysis of Tributary Channels, Storm Sewer Systems, or Detention Basins					
	2-year	5-year	10-year	25-year	50-year	100-year
10,000:1	2	2	2	2	2	2
1,000:1	2	2	2	5	5	10
100:1	2	2	5	10	10	25
10:1	2	5	10	10	25	50
1:1	2	5	10	25	50	100

(f) Cross-Section Data

The cross-section data required by HEC-RAS includes: elevation-station data; Manning's roughness coefficients (*n* values), which are described in Section 50.3.03B(2)g; channel and overbank reach lengths; top of bank (TOB) locations; and expansion and contraction coefficients. If ineffective flow areas (IFAs), levees, or blocked obstructions exist, then geometric information regarding these items would also be entered in the Cross-Section Data Editor.

The elevation-station data shall be obtained from recent field survey data and the cross-sections shall be extended far enough into the left and right overbanks so that all of the flow is contained within the defined cross-section, if possible. Although LIDAR data may be used to supplement field survey data and define the overbank areas of the cross-sections, field survey data is required to accurately define the channel because LIDAR does not penetrate water. Cross-sections shall be taken approximately every 500 feet along the channel, unless project-specific considerations warrant otherwise. In the vicinity of bridges and culverts, cross-section spacing shall adhere to recommendations in the HEC-RAS

program documentation referenced in Section 50.3.03B(2)a. If necessary, additional cross-sections can be interpolated by HEC-RAS or field surveyed cross-sections can be copied to achieve the required cross-section spacing around bridges and culverts.

Channel reach lengths between cross-sections shall be measured along the centerline of the channel. As indicated in the *HEC-RAS River Analysis System Hydraulic Reference Manual*, left and right overbank lengths should be determined as the length along the anticipated path of the center of mass of overbank flow. In many instances, all three reach length values will be similar. However, they may differ significantly at channel bends and locations where the channel meanders while the overbanks remain straight.

For the Liberty County area, the typical expansion and contraction coefficients for open channels are 0.1 and 0.3, respectively. However, higher coefficients of 0.3 and 0.5 should be used at cross-sections two, three, and four around bridges and culverts to simulate expansion and contraction conditions around these structures. Refer to the *HEC-RAS River Analysis System User's Manual* for information on the location of cross-sections two through four around bridges and culverts. IFAs should also be included around bridges and culverts using the recommendations outlined in the *HEC-RAS River Analysis System Hydraulic Reference Manual*.

HEC-GeoRAS can be used to automate the development of HEC-RAS models by importing channel geometric data directly into HEC-RAS. The channel centerline location, cross-section data, reach lengths, assumed TOB locations,  $n$  values, and expansion/contraction coefficients can be defined within HEC-GeoRAS and imported directly into HEC-RAS. However, this program requires input from an engineer or hydrologist experienced with hydraulic modeling. In addition, TOB locations and overbank reach lengths may need to be modified within HEC-RAS. IFAs, levees, and blocked obstructions would also need to be entered directly into HEC-RAS.

(g) Manning's Roughness Coefficient

The HEC-RAS software program utilizes Manning's Equation to compute conveyance and flows in open channels. The  $n$  value used in this equation varies inversely with conveyance and is a measure of the roughness of the surfaces with which storm water comes into contact. For example, a forested area would have a higher  $n$  value and a lower conveyance than a pasture or open field. Recent aerial photographs as well as field reconnaissance can be used in conjunction with Table 50-4 to determine  $n$  values for channels and flood plains, or overbank areas. Although Table 50-4 is generally adequate for selecting  $n$  values corresponding to existing field conditions, project-specific considerations may warrant the use of Equation 50-1 for a more detailed determination of  $n$  values associated with the channel and flood plains

(overbanks). For most applications, it is acceptable to round  $n$  values to the nearest 0.005 (i.e., an  $n$  value of 0.033 would be entered into HEC-RAS as 0.035).

#### Equation 50-8

$$(n_0 + n_1 + n_2 + n_3 + n_4)m$$

where:	$n$	=	composite Manning's roughness coefficient;
	$n_0$	=	base value for the bare soil surface material of the channel or flood plain;
	$n_1$	=	value to correct for the irregularity of the channel or flood plain;
	$n_2$	=	value to account for variations in the shape and size of the channel or flood plain cross-section;
	$n_3$	=	value to account for obstructions in the channel or flood plain;
	$n_4$	=	value to account for the effects of vegetation;
	$m$	=	correction factor for the sinuosity of the channel or flood plain.

Tables 50-12 and 50-13 provide a summary of parameters used in Equation 50-8 to compute  $n$  values for channels and flood plains, respectively.

**TABLE 50-11: MANNING’S ROUGHNESS COEFFICIENTS**

<b>Type of Channel and Description</b>	<b>Minimum</b>	<b>Normal</b>	<b>Maximum</b>
<b><i>Excavated or Dredged Channels</i></b>			
Concrete Lined Channels	0.011	0.013	0.015
Earthen Channels, Straight and Uniform			
<i>Clean, After Weathering</i>	0.016	0.018	0.020
<i>With Short Grass, Few Weeds</i>	0.022	0.027	0.033
Earthen Channels, Winding and Sluggish			
<i>No Vegetation</i>	0.023	0.025	0.030
<i>Grass, Some Weeds</i>	0.025	0.030	0.033
<i>Dense Weeds or Plants in Deep Channels</i>	0.030	0.035	0.040
<i>Earth Bottom and Rubble Sides</i>	0.028	0.030	0.035
<i>Stony Bottom and Weedy Banks</i>	0.025	0.035	0.040
<i>Cobble Bottom and Clean Sides</i>	0.030	0.040	0.050
Channel Not Maintained, Weeds & Brush Uncut			
<i>Dense Weeds, High as Flow Depth</i>	0.050	0.080	0.120
<i>Clean Bottom, Brush on Sides</i>	0.040	0.050	0.080
<i>Same, Highest Stage of Flow</i>	0.045	0.070	0.110
<i>Dense Brush, High Stage</i>	0.080	0.100	0.140
<b><i>Natural Streams</i></b>			
Clean, Straight, Full Stage, No Rifts or Deep Pools	0.025	0.030	0.033
Same as Above, But Some Stones and Weeds	0.030	0.035	0.040
Clean, Winding, Some Pools and Shoals	0.033	0.040	0.045
Same as Above, But Some Weeds and Stones	0.035	0.045	0.050
Same as Above, Lower Stages, More Ineffective Areas	0.040	0.048	0.055
Sluggish Reaches, Weedy, Deep Pools	0.050	0.070	0.080
<b><i>Flood Plains</i></b>			
Pasture, No Brush			
<i>Short Grass</i>	0.025	0.030	0.035
<i>High Grass</i>	0.030	0.035	0.050
Cultivated Areas			
<i>No Crop</i>	0.020	0.030	0.040
<i>Mature Row Crops</i>	0.025	0.035	0.045
<i>Mature Field Crops</i>	0.030	0.040	0.050
Brush			
<i>Scattered Brush, Heavy Weeds</i>	0.035	0.050	0.070
<i>Light Brush and Trees, in Winter</i>	0.035	0.050	0.060
<i>Light Brush and Trees, in Summer</i>	0.040	0.060	0.080
<i>Medium to Dense Brush, in Winter</i>	0.045	0.070	0.110
<i>Medium to Dense Brush, in Summer</i>	0.070	0.100	0.160
Trees			
<i>Dense Willows, Summer, Straight</i>	0.110	0.150	0.200
<i>Cleared Land with Stumps, No Sprouts</i>	0.030	0.040	0.050
<i>Same as Above with Heavy Growth of Sprouts</i>	0.050	0.060	0.080
<i>Heavy Stand of Timber, a Few Down Trees, Little Undergrowth, Flood Stage Below Branches</i>	0.080	0.100	0.120
<i>Same as Above, but with Flood Stage Reaching Branches</i>	0.100	0.120	0.160

<b>TABLE 50-12: PARAMETERS USED IN COMPUTING CHANNEL ROUGHNESS COEFFICIENTS</b>		
<b>Parameter</b>	<b>Accounts For</b>	<b>Representative Roughness Values</b>
n <sub>0</sub>	Channel Material	0.011 for Concrete 0.020 for Earth 0.025 for Rock Cut 0.024 for Fine Gravel 0.028 for Coarse Gravel
n <sub>1</sub>	Degree of Irregularity	0.000 for Smooth 0.005 for Minor Irregularities 0.010 for Moderate Irregularities 0.020 for Severe Irregularities
n <sub>2</sub>	Variation of Channel Cross-Section	0.000 for Gradual Variations 0.005 for Alternating Occasionally 0.010 to 0.015 for Alternating Frequently
n <sub>3</sub>	Relative Effect of Obstructions	0.000 for Negligible Obstructions 0.010 to 0.015 for Minor Obstructions 0.020 to 0.030 for Appreciable Obstructions 0.040 to 0.060 for Severe Obstructions
n <sub>4</sub>	Vegetation	0.005 to 0.010 for Low Vegetation 0.010 to 0.025 for Medium Vegetation 0.025 to 0.050 for High Vegetation 0.050 to 0.100 for Very High Vegetation
m	Degree of Meandering	1.000 for Minor Meandering 1.150 for Appreciable Meandering 1.300 for Severe Meandering

**TABLE 50-13: PARAMETERS USED IN COMPUTING FLOOD PLAIN  
ROUGHNESS COEFFICIENTS**

<b>Parameter</b>	<b>Accounts For</b>	<b>Representative Values</b>
$n_0$	Base Material	0.010 for Concrete 0.020 for Earth 0.025 for Rock Cut 0.024 for Fine Gravel 0.028 for Coarse Gravel
$n_1$	Degree of Irregularity	0.0 for Smooth 0.1 to 0.005 for Minor Irregularities 0.006 to 0.010 for Moderate Irregularities 0.011 to 0.020 for Severe Irregularities
$n_2$	Variation in Cross-Section	0.000 Not Applicable
$n_3$	Effect of Obstructions	0.000 to 0.004 for Negligible Obstructions 0.005 to 0.019 for Minor Obstructions 0.020 to 0.030 for Appreciable Obstructions
$n_4$	Amount of Vegetation	0.001 to 0.010 for Small Amounts 0.011 to 0.025 for Medium Amounts 0.026 to 0.050 for Large Amounts 0.051 to 0.100 for Very Large Amounts 0.100 to 0.200 for Extreme Amounts
$m$	Degree of Meander	1.00 Not Applicable

(h) Bridge & Culvert Data

HEC-RAS requires the following data for bridge and culvert computations: deck/roadway data, geometric data for culverts, sloping abutments and pier data for bridges, and the bridge or culvert modeling approach. Detailed information on all of the HEC-RAS data entry requirements is included in the HEC-RAS program documentation. The following data is required to define the deck/roadway within the Deck/Roadway Data Editor: the distance between the upstream side of the bridge/culvert and the cross-section immediately upstream of the structure; the width of the bridge deck/culvert; upstream and downstream bridge deck/culvert station-elevation data; a weir coefficient, which ranges from 2.6 for flow over a bridge deck to 3.0 for flow over elevated roadway approach embankments; upstream and downstream embankment side slopes; the maximum allowable submergence before the program switches to energy based calculations rather than pressure and weir flow; the minimum weir flow elevation; and the weir crest shape.

The following culvert geometric data is entered into the Culvert Data Editor of HEC-RAS: solution criteria, culvert shape and size, culvert chart and scale numbers, distance to upstream cross-section, culvert length, entrance and exit loss coefficients, Manning's  $n$  values, upstream and downstream invert elevations, number of identical barrels, and centerline stations for each barrel. The highest upstream energy grade option should be selected for the culvert solution criteria. The Manning's  $n$  value and entrance loss coefficients for the



culvert(s) should be determined from Tables 50-7 and 50-8, respectively, and entered into the Culvert Data Editor. Typical exit loss coefficients for culverts range from 0.3 to 1.0, but are normally set at 1.0. Additional information on exit loss coefficients can be found in the *HEC-RAS River Analysis System Hydraulic Reference Manual*. A summary of the chart and scale numbers used by HEC-RAS for the FHWA culvert performance nomographs described in Section 50.3.03(B)2(b) is provided in Table 50-9. These FHWA nomographs are used as the basis for inlet control headwater computations in HEC-RAS. Field survey data and construction drawings should be used to determine the remaining culvert geometric data required by HEC-RAS.

<b>TABLE 50-14: MANNING’S ROUGHNESS COEFFICIENTS FOR CULVERTS</b>	
<b>Description of Pipe</b>	<b>Roughness Coefficient (<i>n</i>)</b>
Reinforced Concrete Pipe and Box Culverts	0.013
HDPE Plastic Pipe	0.012
Corrugated Steel Pipe With 2-2/3” x 1/2” Corrugations	0.024
Corrugated Steel Pipe With 3” x 1” Corrugations	0.027
Corrugated Steel Pipe With 6” x 2” Corrugations	0.030

<b>TABLE 50-15: ENTRANCE LOSS COEFFICIENTS FOR CULVERTS</b>	
<b>Type of Structure and Configuration of Entrance</b>	<b>Coefficient (<math>K_e</math>)</b>
<i>Concrete Pipe Culverts</i>	
Projecting from Fill	
<i>Socket End (Groove End) of Pipe</i>	0.2
<i>Square-Cut End of Pipe</i>	0.5
Headwall or Headwall & Wingwalls	
<i>Socket End of Pipe (Groove End)</i>	0.2
<i>Square Edge</i>	0.5
Mitered to Conform to Fill Slope	0.7
End Section Conforming to Fill Slope	0.5
<i>Corrugated Steel Culverts</i>	
Projecting From Fill	0.9
Headwall or Headwall & Wingwalls	0.5
Mitered to Conform to Fill Slope	0.2
End Section Conforming to Fill Slope	0.5
<i>Concrete Box Culverts</i>	
Headwall Parallel to Embankment (No Wingwalls)	0.5
Wingwalls at 30 Degrees to 75 Degrees to Barrel	0.4
Wingwalls at 10 Degrees to 25 Degrees to Barrel	0.5
Wingwalls Parallel (Extensions of Sides)	0.7

<b>TABLE 50-16: FHWA CHART AND SCALE NUMBERS FOR CULVERTS</b>		
<b>Chart No.</b>	<b>Scale No.</b>	<b>Description of Culvert and Entrance Configuration</b>
<i>Box Culverts with Flared Wingwalls</i>		
8	1	Wingwalls Flared 30 to 75 Degrees
	2	Wingwalls Flared 90 or 15 Degrees
	3	Wingwalls Flared 0 Degrees (Sides Extended Straight)
<i>Concrete Pipe Culverts</i>		
1	1	Square Edge Entrance with Headwall
	2	Groove End Entrance with Headwall
	3	Groove End Entrance, Pipe Projecting from Fill
<i>Corrugated Steel Culverts</i>		
2	1	Headwall
	2	Mitered to Conform to Fill Slope
	3	Pipe Projecting from Fill

Sloping abutment and pier data for bridges can be entered into the Sloping Abutment Data Editor and Pier Data Editor, respectively. The sloping abutment data requirements consist of station-elevation data, while the pier data requirements consist of elevation-width data as well as upstream and downstream centerline stations. The floating debris around a pier or piers can also be entered into the Pier Data Editor. In

addition, the Bridge Design Editor within HEC-RAS can be used to facilitate the design of new bridges.

The Bridge Modeling Approach Editor requires the selection of low flow and high flow (pressure and/or weir) computation methods. Low flow occurs when water passes under a bridge or through a culvert without submerging the low chord of the bridge structure or the top of the culvert. Pressure flow occurs whenever the low chord of the bridge or the entire culvert is submerged and weir flow occurs when water overtops the roadway. Available low flow methods include: Energy (Standard Step), Momentum, Yarnell, and WSPRO. The Energy method should be selected for culvert analyses. Although a single low flow method may be selected for bridges, it is recommended that the Energy method as well as one or more other applicable methods be selected and that the highest energy answer be used. If the Momentum or Yarnell methods are selected for bridges, the user must enter a value for the pier loss coefficient that corresponds to that method. A list of representative coefficients can be obtained within the Bridge Modeling Approach Editor. If the WSPRO method is selected, the user must press the WSPRO Variables button and enter additional information that is required for that method. The available high flow methods are Energy (Standard Step) and Pressure and/or Weir. It is recommended that both of these methods be selected and that the highest energy answer be used.

(i) Floodway Analysis

A floodway analysis is required if modifications are made to HEC-RAS models of streams that were studied by the Federal Emergency Management Agency (FEMA). The floodway is a corridor of effective flow that includes the channel and any adjacent land areas required to pass the 100-year peak discharge rates without increasing the WSEL at any point along the channel more than one-foot above the 100-year base flood elevations (BFE). The floodway is a regulatory concept that is intended to prevent encroachments (i.e., fill, structures, or other obstructions) from being placed too close to the channel without extensive analysis and mitigation measures. Additional information on FEMA requirements for floodway analysis can be obtained from FEMA's website (<http://www.fema.gov>), the HEC-RAS program documentation.

(C) HYDRAULICS OF SECONDARY DRAINAGE FACILITIES

The purpose of this chapter is to provide detailed information on the hydraulic analysis and design of secondary drainage facilities within Liberty County. The secondary drainage facilities include storm sewers, sheet flow swales, and other facilities which typically serve relatively small drainage areas as well as lot grading and drainage requirements.

(1) General Design Requirements For Storm Sewers

This section describes the general design requirements for storm sewers, which include all conduit systems and may consist of either storm sewer pipes or box culverts. However, culverts and bridges within open channels shall be designed and analyzed using the criteria contained in Sections 50.3.03(B)(1)

(a) Design Storm Frequencies

The following design storm frequencies shall be used for analysis and design of storm sewers:

- (i) Street gutters along residential streets should carry peak runoff rates from a five-year storm event without overtopping curbs while maintaining the hydraulic grade line (HGL) at an elevation below the gutter line at inlets and below the rim elevation at manholes. Major thoroughfares should accommodate five-year peak runoff rates with a minimum ten-foot dry travel lane and 25-year peak runoff rates without overtopping curbs.
- (ii) For systems draining less than 100 acres, storm sewers should be designed to convey five-year peak runoff rates while maintaining the HGL at an elevation below the gutter line at inlets and below the rim elevation at manholes. Peak 25-year runoff rates shall be accommodated with a maximum of six inches of flow depth above the crown of the roadway.
- (iii) For systems draining more than 100 acres but less than 200 acres, storm sewers should be designed to convey ten-year peak runoff rates while maintaining the HGL at an elevation below the gutter line at inlets and below the rim elevation at manholes. Peak 50-year runoff rates shall be accommodated with a maximum of six inches of flow depth above the crown of the roadway.
- (iv) For systems draining more than 200 acres, storm sewers should be designed to convey 25-year peak runoff rates while maintaining the HGL at an elevation below the gutter line at inlets and below the rim elevation at manholes. Peak 100-year runoff rates shall be accommodated with a maximum of six inches of flow depth above the crown of the roadway.

(b) General Design Requirements

- (i) Storm sewer systems shall be designed to accommodate fully developed peak runoff rates associated with the design storm frequency requirements specified in Section 50.3.03(B(2)) while maintaining the HGL at an elevation below the gutter line at inlets and below the rim elevation at manholes.
- (ii) The minimum and maximum allowable velocities for the design peak runoff rates are two feet per second and eight feet per second, respectively, assuming full pipe flow.
- (iii) The minimum allowable storm sewer pipe size is 18 inches.
- (iv) Manholes or junction boxes shall be placed where changes in pipe size, shape, and slope occur; at storm sewer junctions; and at intervals in long storm sewer segments where the size or direction has not changed.
- (v) All storm sewers located within the public right-of-way (ROW) and/or easements should be constructed of reinforced concrete pipe (RCP).

Other pipe materials in compliance with the County adopted building codes may be used for storm sewer systems.

- (vi) Structural requirements for storm sewer systems shall adhere to those specified for culverts in Section 50.3.03B(1)i.

(c) Extreme Event Design

The capacity of the storm sewer system may be exceeded during rainfall events that are more intense than the design storm. For example, a storm sewer system designed to convey the five-year peak runoff rates from a drainage area will not have adequate capacity to convey the 100-year peak runoff rates from that area. Ponding may occur in streets, roadside ditches, and adjacent low-lying areas when the capacity of the storm sewer system is exceeded. In order to eliminate or reduce potential flooding on adjacent properties, street layout and pavement grades shall be designed to direct storm water runoff into channels or drainage systems without flowing through private property. The street grading plan shall be developed to prevent 100-year ponding levels in the streets from exceeding the lowest of the following:

- (i) one-foot above natural ground;
- (ii) one-foot over the top of curb;
- (iii) the lowest finished floor elevation of adjacent habitable structures and critical facilities.

In areas where streets cannot be graded to carry sheet flows directly to an open channel, an extreme event overflow structure must be provided to collect sheet flow and convey it to a channel. This structure should consist of storm sewer and inlets designed to convey the 100-year peak runoff rate from the developed drainage area plus a grass- or concrete-lined emergency overflow swale located within a drainage easement between two residential lots.

(2) Hydraulic Analysis of Storm Sewers

This section describes the requirements for the hydraulic analysis of storm sewer systems.

(a) Acceptable Storm Sewer Design Methods

Hydraulic analysis of storm sewers may be performed using manual calculations, a spreadsheet, *TxDOT's WinStorm* software program, or other storm sewer design methods approved by the County. If WinStorm is used for the storm sewer design, the peak runoff rates for drainage areas up to 200 acres may be calculated within this program by selecting the Rational Method and the Liberty County *rainfall intensity* parameters. Additional information on the use of WinStorm can be obtained from the *WinStorm 3.5 Storm Drain Design User's Manual*, which is available from TxDOT's website free of charge (<http://www.dot.state.tx.us/isd/software/software.htm>).

(b) Peak Runoff Rates

The following methods shall be used to determine the peak runoff rates from the drainage area served by the storm sewer system:

- (i) The Rational Method discussed in Section 50.3.03 may be used to determine peak runoff rates for storm sewer systems serving drainage areas up to 200 acres.
  - (ii) The HEC-HMS methodology discussed in Section 50.3.03A(2) shall be used to compute peak discharge rates for storm sewer systems serving drainage areas greater than 200 acres.
- (c) **Storm Sewer Slopes**  
The minimum allowable velocity for storm sewers flowing full is two feet per second and the maximum allowable velocity for storm sewers flowing full is eight feet per second. Manning's equation (Equation 9) can be rearranged as indicated below to solve for the maximum and minimum pipe slopes required to maintain flow velocities within the acceptable range.

$$Q = \left( \frac{1.49}{n} \right) A R^{2/3} S^{1/2} \quad \text{Equation 50-9}$$

where:  $Q$  = flow rate (cubic feet per second);  
 $n$  = Manning's roughness coefficient from Table 11;  
 $A$  = cross-sectional area of flow, assuming full flow in pipe or box (square feet);  
 $R$  = hydraulic radius, cross-sectional area divided by wetted perimeter (feet);  
 $S$  = slope of the pipe or box (feet per foot).

As indicated in the Continuity Equation (Equation 6-2), the flow rate can be expressed as a function of velocity and area

$$Q = V \times A \quad \text{Equation 50-10}$$

where:  $V$  = velocity (feet per second).

Incorporating the Continuity Equation into Manning's Equation yields Equation 6-3:

$$V = \left( \frac{1.49}{n} \right) R^{2/3} S^{1/2} \quad \text{Equation 50-11}$$

The hydraulic radius can be expressed as a function of the diameter for circular pipes flowing full:

$$R = \frac{D}{4} \quad \text{Equation 50-12}$$

where:  $D$  = pipe diameter (feet).

Substituting Equation 6-4 into Equation 6-3 and rearranging to solve for slope of the pipe yields Equation 6-5:

$$S = \left[ \frac{Vn}{1.49 \left( \frac{D}{4} \right)^{2/3}} \right]^2 \quad \text{Equation 50-13}$$

The  $n$  values used to obtain these slopes were obtained from Table 50-17. Equation 6-5 should be used to determine the range of acceptable slopes for other pipe materials, sizes,  $n$  values, and shapes.

<b>TABLE 50-17: MINIMUM AND MAXIMUM ALLOWABLE SLOPES FOR STORM SEWERS</b>						
<b>Pipe Diameter (inches)</b>	<b>Pipe Slopes (%)</b>					
	<b>RCP (n = 0.013)</b>		<b>HDPE (n = 0.012)</b>		<b>CMP (n = 0.027)</b>	
	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Minimum</b>	<b>Maximum</b>
18	0.11	1.802	0.096	1.535	0.486	7.771
21	0.092	1.467	0.078	1.250	0.395	6.327
24	0.077	1.228	0.065	1.046	0.331	5.296
27	0.066	1.049	0.056	0.894	---	---
30	0.057	0.912	0.049	0.777	0.246	3.933
36	0.045	0.715	0.038	0.609	0.193	3.084
42	0.036	0.582	0.031%	0.496	0.157	2.511
48	0.030	0.487	0.026	0.415	0.131	2.102
54	0.026	0.416	0.022	0.355	0.112	1.796
60	0.023	0.362	0.019	0.308	0.098	1.561
66	0.020	0.319	0.017	0.271	0.086	1.374
72	0.018	0.284	0.015	0.242	0.076	1.224
78	0.016	0.255	0.014%	0.217	0.069	1.100
84	0.014	0.231	0.012	0.197	0.062	0.997
90	0.013	0.211	0.011	0.180	0.057	0.909

96	0.012	0.193	0.010	0.165	0.052	0.834
102	0.011	0.178	0.009	0.152	0.048	0.769
108	0.010	0.165	0.009	0.141	0.045	0.713
120	0.009	0.144	0.008	0.122	---	---

(d) Friction Losses

Friction losses in storm sewer systems may be computed using the following form of the Manning's Equation:

$$H_F = \frac{(n^2 Q^2 L)}{(2.22 A^2 R^{4/3})} \quad \text{Equation 50-14}$$

where:  $H_F$  = friction loss (feet);

(e) Minor Losses

Minor losses are those losses that result from changes in velocity or direction of flow. Although, minor losses in storm sewer systems are usually insignificant, they may exceed the  $H_F$  in relatively short storm sewer segments. In addition, the cumulative effect of minor losses may be significant in relatively flat areas like parts of Liberty County. Minor losses include those associated with: pipe entrances, pipe exits, pipe bends, pipe elbows, junctions, manholes, expansions, contractions, and appurtenances such as valves and meters. It is important to note that minor losses can be minimized by careful design. For example, severe pipe bends can be replaced by gradual curves if sufficient right-of-way is available and costs are manageable. Furthermore, well designed manholes and inlets without sharp or sudden transitions or flow impediments do not cause significant minor losses.

Minor losses are typically computed using a loss coefficient and flow velocities in upstream and downstream pipe segments. Although entrance losses, exit losses, and losses at inlets and manholes are discussed in detail in this section, it may be necessary to account for other minor losses depending on project specific considerations. For additional information on minor losses refer to TxDOT's *Hydraulic Design Manual* or other hydraulic reference manuals. Equation 50-15 can be used to compute entrance losses:

$$H_E = K_e \frac{V^2}{2g} \quad \text{Equation 50-15}$$

where:  $H_E$  = entrance loss (feet);  
 $K_e$  = the entrance loss coefficient, from Table 50-15, or 1.25 for inlets or manholes at the beginning of a storm sewer segment;  
 $V$  = velocity in the pipe (feet per second);  
 $g$  = the acceleration of gravity (32.2 feet per second<sup>2</sup>).



For this calculation, the velocity upstream of the pipe entrance is assumed to be zero. Table 50-15 provides a summary of entrance loss coefficients for a number of culvert entrance configurations. Equation 50-15 can also be used to compute exit losses and the exit loss coefficient may be assumed to be equal to 1.0 for most applications. Minor losses at inlets and manholes can be computed with Equation 50-16. Table 50-18 lists typical Minor loss coefficients for various inlet and manhole configurations.

$$H_{I/M} = \frac{(V_2^2 - KV_2^2)}{2g} \quad \text{Equation 50-16}$$

where:  $H_{I/M}$  = loss at inlet or manhole (feet);  
 $K$  = the minor loss coefficient, from Table 50-18;  
 $V_1$  = velocity in the upstream pipe (feet per second);  
 $V_2$  = velocity in the downstream pipe (feet per second);  
 $g$  = the acceleration of gravity (32.2 feet per second<sup>2</sup>).

TABLE 50-18: MINOR LOSS COEFFICIENTS FOR INLETS AND MANHOLES	
Type of Structure	Coefficient (K)
Inlet on Main Line	0.50
Inlet on Main Line with Branch Lateral	0.25
Manhole on Main Line with 22.5-Degree Lateral	0.75
Manhole on Main Line with 45-Degree Lateral	0.50
Manhole on Main Line with 60-Degree Lateral	0.35
Manhole on Main Line with 90-Degree Lateral	0.25

(f) Hydraulic Grade Line

As indicated previously, the HGL shall be maintained at an elevation below the gutter line at inlets and below the rim elevation at manholes during the design storm frequency determined from Section 50.3.03C(2)

The tailwater elevation in the receiving channel or storm sewer system shall be determined using the Frequencies of Coincidental Occurrence methodology described in Section 50.3.03B(2)e and Table 50-10. This value will be the starting WSEL or HGL at the downstream end of the storm sewer system (outfall node). The HGL elevation at the upstream end (node) of each storm sewer segment can be estimated using Equation 6-9.

$$HGL_u = HGL_d + h_f + h_m \quad \text{Equation 50-17}$$

where:  $HGL_u$  = HGL at upstream end (node) of storm sewer segment (feet);  
 $HGL_d$  = HGL at downstream end (node) of storm sewer segment (feet);  
 $h_f$  = headloss due to friction (feet);  
 $h_m$  = sum of Minor losses (feet).

The HGL at the downstream end (node) of the next storm sewer segment upstream can be estimated as the upstream HGL calculated for the downstream segment of storm sewer from this node or the top of the upstream pipe, whichever is greater.

The HGL computations should proceed in an upstream direction into all branches of the storm sewer system. If the HGL elevation is above the gutter line at any inlets or the rim elevation at any manholes, the storm sewer system must be adjusted so that the HGL does not exceed these elevations. This can typically be accomplished by increasing the capacity of the storm sewer segments with the most significant losses. However, adjustments to storm sewer flowline elevations may also be required.

(3) Design of Roadside Ditches

This section describes the general design requirements, design storm frequencies, and peak runoff rates for storm sewers.

(a) Design Storm Frequencies

The following guidelines must be followed in the design of roadside ditches and associated culverts to be placed in roadside ditches.

(b) For drainage areas up to 50 acres, roadside ditches and culverts in those ditches should be designed to convey five-year peak runoff rates at maximum water levels not exceeding top of bank elevations. Peak 25-year runoff rates shall be accommodated with a maximum flow depth of six inches above the crown of the roadway.

(i) For drainage areas between 50 acres and 100 acres, roadside ditches and culverts in those ditches should be designed to convey ten-year peak runoff rates at maximum water levels not exceeding bank elevations. Peak 50-year runoff rates shall be accommodated with a maximum flow depth of six inches above the crown of the roadway.

(ii) For drainage areas greater than 100 acres, roadside ditches will be considered as open channels. Refer to Section 50.3.03B(1)b for open channel design requirements.

(c) General Design Requirements for Roadside Ditches

The following general requirements shall be applied to the designs of all roadside ditches.

(iii) Roadside ditches shall be designed with side slopes no steeper than 3 horizontal to 1 vertical (3:1).

(iv) The minimum Manning's roughness coefficient for roadside ditch design shall be 0.04.

(v) The minimum grade for roadside ditches shall be 0.1-percent.

(vi) Hydraulic computations which demonstrate that the ditch design is sufficient to carry design flow rates for the frequencies specified in Section 50.3.03C(3)a will be required.

- (vii) The ditch must be vegetated immediately after construction or repair to minimize erosion.
- (viii) Flow velocities are to be maintained at non-erosive levels. In areas where erosive velocities are anticipated, slope protection measures will be employed (see Section 50.3.03E).
- (ix) The depth of roadside ditches shall be maintained between 1.5 feet and four feet. Roadside ditches greater than four feet in depth will be subject to the design requirements for open channels.
- (x) The minimum culvert size for roadside ditches shall be 18 inches.
- (xi) The maximum head loss for a driveway culvert shall be limited to 0.1 feet.

(d) Peak Runoff Rates

Design peak flow rates may be computed using the Rational Method.

(4) Design of Other Secondary Drainage Facilities

(a) Types of Facilities

Other than storm sewers and roadside ditches, secondary drainage facilities may include sheet flow swales, small culverts, and other structures which are intended to handle relatively small volumes of storm runoff.

(b) General Design Requirements

Secondary drainage facilities shall be designed to accommodate peak flow rates from a five-year design storm event without creating flooding problems or erosion hazards. Maximum five-year design water levels shall generally be kept below natural ground. Design methods for secondary drainage facilities must be based on sound engineering practice and widely-accepted methodologies. Examples include the Rational Method, Manning's Equation, standard orifice and weir flow equations, and Federal Highway Administration (FHWA) culvert design methods.

(c) Peak Flow Rates

Peak design flow rates for secondary drainage facilities shall be computed using the Rational Method for drainage areas up to 200 acres. HEC-HMS shall be used to compute the peak flow rates for drainage areas greater than 200 acres. Complete peak flow calculations must be submitted in support of all proposed structure designs.

(5) Lot Grading and Drainage

Individual lots should be graded by Developer shall be in accordance with the following guidelines: Lots should be graded to drain to a street, swale, or ditch at a minimum slope of one tenth of one-percent.

- (a) Wherever possible, sheet flow from individual lots should not cross adjacent lots before entering a street, swale, ditch, or other drainage facility.

- (b) All finished floor elevations should be at least 12 inches above the highest finished ground elevation immediately adjacent to the slab.
- (c) For lots draining to a street, the finished floor elevation should be at least 12 inches above the highest point along the top of the curb immediately adjacent to the building.
- (d) All finished floor elevations should be at least two feet above the design water surface elevation or computed base flood elevation in any adjacent drainage facility.

#### D. Detention Analysis

The purpose of this chapter is to provide criteria and guidelines to be used in the analysis of detention facilities. Detention facilities are intended to mitigate increases in peak flows and changes in the timing of runoff associated with urbanization so that surrounding properties and the receiving body of water are not adversely impacted by increases in peak flows or water surface elevations (WSELs).

It is important to note that detention will be required for the following types of improvements: new development; redevelopment; roadway expansion; drainage system improvements, and any other improvements that increase the impervious cover, decrease the time of concentration ( $T_C$ ), or increase the peak flows from a drainage area. Additional information on impervious cover,  $T_C$  values, and peak flows is provided in Section 50.3.03A.

The civil engineering industry's standard of care for detention analysis is the 100-year event, which is typically used by public entities requiring detention. In addition, the 100-year rainfall event is used by the Federal Emergency Management Agency (FEMA) to define the level of flooding risk within communities that participate in the National Flood Insurance Program (NFIP). Therefore, the 100-year design storm event will be used as the basis for detention analysis in Liberty County. In some instances, five-year and 25-year design storm events will also need to be analyzed to ensure that the proposed detention facility does not cause adverse impacts during more frequent rainfall events.

##### 1. General Design Requirements

The following design requirements are discussed in this section: design storm frequencies, detention basin location and geometry, maintenance berms, maintenance, pumped detention facilities, multi-purpose design, and extreme event overflow structures.

##### a. Design Storm Frequencies

The following design storm frequencies should be used for detention analysis and design.

- (i) The required storage volume for detention basins serving up to 200 acres (that are analyzed using the simplified methodology described in Section 50.3.03D(3)) shall be designed for a 100-year design storm event.

- (ii) Detention basins serving drainage areas greater than 200 acres and areas up to 200 acres that are analyzed using the methodology described in Section 50.3.03D(4) shall be analyzed for the 10- and 100-year design storm events.

b. Detention Basin Location and Geometry

In order to facilitate pavement and storm sewer drainage, detention basins should typically be located in the lowest portion of the drainage area contributing to the basin. In addition, detention basins should be located immediately adjacent to the receiving drainage system where feasible. This will minimize the required length of outfall pipe and decrease maintenance strip requirements (see Section 50.3.03D(1)c), which may decrease overall drainage system costs. The following criteria shall be used in detention basin design that are to be maintained by a public agency such as the County, a Drainage District, or a Municipal Utility District::

- (i) Side slopes of detention basins shall be no steeper than three horizontal to one vertical (3:1). However, the use of these side slopes should be verified by a geotechnical report. If soil conditions are conducive to slope instability, flatter side slopes may be required.
- (ii) A minimum transverse slope of 0.50-percent shall be used on the bottom of the detention basin.
- (iii) A minimum of one-foot of freeboard shall be provided in the detention basin.
- (iv) A six-foot wide concrete pilot channel with a depth of four inches shall be provided in the bottom of the basin to facilitate drainage and avoid erosion problems. A minimum slope of 0.10-percent shall be used for concrete pilot channels.
- (v) Earthen pilot channels with a minimum depth of two feet may be substituted for concrete pilot channels for aesthetic reasons or to facilitate multi-purpose use of a detention facility. The minimum slope for earthen pilot channels is 0.20-percent and the side slopes of earthen pilot channels shall be no steeper than three horizontal to one vertical (3:1).
- (vi) The minimum allowable outfall pipe size is 18 inches. If the detention analysis shows that a smaller pipe is required to restrict discharges, then a restrictor shall be placed inside an 18-inch diameter pipe.
- (vii) The use of parking lot detention storage is acceptable provided that the maximum ponding depth does not exceed six inches. However, it is recommended that preliminary approval be obtained from County Staff prior to beginning a detailed design of any parking lot detention facility.

c. Maintenance Berms

For detention basins proposed to be maintained by the County, a minimum 30-foot maintenance strip shall be provided around the entire detention basin. Detention basins located immediately adjacent to a drainage channel with a dedicated right-of-way (ROW) and a maintenance strip wide enough to

satisfy channel design criteria may share the adjacent channel maintenance strip. However, the combined total width of the channel and detention basin maintenance strips shall not be less than 30 feet under any circumstances.

(c) Maintenance

All detention facilities shall be located in readily accessible areas and two access routes should be provided where possible. The following maintenance activities should be performed on a regular basis: mowing, slope repairs, removal of accumulated sediments, and repairs to discharge structures. In addition, a maintenance schedule should be prepared in conjunction with the detention design and periodically updated by the agency or entity responsible for maintenance of the detention facility. Liberty County will not be responsible for the maintenance of detention facilities designed to mitigate the development of individual private projects or the construction of infrastructure improvements projects intended to serve private developments.

(d) Pumped Detention Facilities

Detention facilities which rely on pumps to discharge all or part of the storm water which flows into them are generally not recommended. For facilities where pumps are required, the pump facilities should possess sufficient discharge capacity to accommodate the design 100-year peak discharge rate with the largest pump out of service or an emergency spillway shall be provided from this detention facility to the nearest outfall channel. However, these facilities will require approval by the County.

(e) Multi-Purpose Design

Liberty County encourages multi-purpose features in detention facilities provided that the storm water management function of the facility is not compromised. In addition, the multi-purpose detention facilities must be designed to accommodate the maintenance activities discussed in Section 50.3.03D(1)d and to provide safety features. Recommended multi-purpose features include permanent ponds, wetlands, playgrounds, soccer fields, and hiking or biking trails.

(f) Extreme Event Overflow Structures

All detention basins shall be designed so that storm water runoff in excess of the 100-year rainfall event is conveyed to the nearest drainage channel without flooding structures. Overflow depths up to one-foot above basin top of bank elevations should be considered. Grass-lined earthen swales, weirs, concrete-lined overflow sections, and other structures may be utilized to convey these overflows.

2. Peak Discharge Rates

The following items related to peak discharge rates are discussed in this section: methodology, allowable peak discharge rates, and off-site flows.

- (a) **Methodology**  
As described in Section 50.3.03A(1), the Rational Method may be used for drainage areas up to 200 acres, and HEC-HMS shall be used for drainage areas greater than 200 acres to determine peak discharge rates consistent with the aforementioned criteria. For drainage areas greater than 200 acres or for smaller drainage areas being analyzed with the detention routing methodology described in Section 50.3.03A(2), inflow hydrographs shall be computed by HEC-HMS.

- (b) **Allowable Peak Discharge Rates**

- (i) For detention facilities serving drainage areas up to 200 acres, the maximum allowable peak discharge rate shall be limited to the existing conditions 10- and 100-year peak discharge rates for the 10- and 100-year design storm events, respectively.
  - (ii) For detention basins with drainage areas greater than 200 acres, the peak discharge shall also be restricted to the existing conditions 10- and 100-year peak discharge rates for the 10- and 100-year design storm events, respectively.  
It is important to note that limiting discharges during the two rainfall events may require multiple outfall structures (i.e., a low-flow pipe with a larger diameter pipe or weir stacked above).

- (c) **Off-Site Flows**

An investigation of off-site flows shall be completed as part of every drainage study or detention analysis. Off-site flows that drain through a project must be accommodated by the proposed drainage plan. When off-site (run-on) flows are routed through a detention basin, the allowable peak discharge rates shall be based on the entire contributing (project and off-site) drainage area. For this case, regardless of acreage, the detailed detention analysis methodology described in Section 50.3.03A(2), must be used.

A downstream off-site drainage facility may be required to convey the storm water from the project site to the receiving system, with sufficient 100-year capacity based upon contributing upstream acreage under existing conditions. This offsite drainage facility shall have sufficient drainage easement for conveyance and maintenance purposes. For the width of the ROW required for channels, see Section 50.3.03B(1)b for earthen channels and Section B(1)c for concrete-lined channels. For enclosed systems, the minimum ROW width is equal to the widest dimension of the underground conduit plus two times the maximum depth from finished ground to the invert of the conduit, or 30 feet, whichever is greatest.

- (2) **Detention Analysis for Drainage Areas Up To 200 Acres**

This section describes the methodology to be used in determining the required detention storage volume and outfall structure size for drainage areas up to 200 acres.

(a) Detention Analysis for Drainage Areas Up to 200 Acres

The simplified detention analysis methodology developed for drainage areas up to 200 acres is based on the triangular hydrograph method. Equations 50-18 through 50-20 can be used to compute the required detention storage volume as the area between triangular inflow and outflow hydrographs for the basin. In this method, the outflow hydrograph is assumed to intersect the receding limb of the inflow hydrograph at a flow rate equal to the maximum allowable peak discharge rate from the detention facility. Equation 50-18 can be used to calculate the time base of the triangular inflow hydrograph (B):

$$B = \frac{43,560V_R}{0.5Q_I} \quad \text{Equation 50-18}$$

where:  $B$  = time base of the triangular inflow hydrograph (seconds);  
 $V_R$  = the detention inflow volume in (acre-feet);  
 $Q_I$  = the proposed 100-year peak inflow rate (cubic feet per second).

The detention inflow volume ( $V_R$ ) can be computed using Equation 50-19:

$$V_R = A(XS) \quad \text{Equation 50-19}$$

where:  $A$  = drainage area served by detention basin (acres);  
 $XS$  = rainfall excess, from Table 50-19 (feet).

The rainfall excess shall be determined from Table 50-19 based on the soil type and proposed impervious cover of the drainage area. If the proposed impervious cover falls between the values listed in this table, then the rainfall excess should be estimated by interpolation.



**TABLE 50-19: 100-YEAR RAINFALL EXCESS VALUES FOR  
LIBERTY COUNTY**

% Impervious Cover	Rainfall Excess by Soil Groups (feet)			
	A	B	C	D
0	0.03	0.43	0.81	0.95
10	0.14	0.51	0.85	0.98
20	0.26	0.58	0.89	1.00
30	0.37	0.66	0.92	1.02
40	0.49	0.73	0.96	1.04
50	0.61	0.81	1.00	1.07
60	0.72	0.88	1.04	1.09
70	0.84	0.96	1.07	1.11
80	0.95	1.03	1.11	1.14
90	1.07	1.11	1.15	1.16
100	1.18	1.18	1.18	1.18

Equation 50-20 can be used to estimate the detention storage requirement ( $V_S$ ) for drainage areas up to 200 acres.

$$V_S = \frac{0.5B(Q_I - Q_O)}{43,560} \quad \text{Equation 50-20}$$

where:  $V_S$  = detention storage requirement (acre-feet);  
 $Q_O$  = maximum allowable peak discharge rate (cubic feet per second).

(b) Design of Outfall Structures for Drainage Areas up to 200 Acres

Detention outfall structures shall be designed to limit discharges to the allowable peak discharge rates described in Section 50.3.03D2. If requested by the County or if tailwater conditions in the receiving system warrant, the detention routing analysis and outfall structure sizing described in Section 50.3.03D4 shall be used. Otherwise, the required outfall pipe diameter for drainage areas up to 200 acres can be estimated by trial and error calculations using the procedure described in this section. Equation 50-21 is an acceptable head loss equation for pipe culverts flowing full that can be used to solve for pipe diameter:

$$H_T = \left[ \frac{2.52(1 + K_e)}{D^4} + \frac{466n^2L}{D^{16/3}} \right] \frac{Q^2}{100} \quad \text{Equation 50-21}$$

where:  $H_T$  = available head (feet);  
 $K_e$  = entrance loss coefficient, typically 0.5;  
 $D$  = diameter of pipe (feet);  
 $n$  = Manning's roughness coefficient, from Table 7-4;  
 $L$  = length of culvert (feet);  
 $Q$  = design discharge rate (cubic feet per second).

If a HEC-RAS model of the receiving channel exists, then the Frequencies of Coincidental Occurrence methodology described in Section 50.3.03B(2)e shall be used to determine the constant tailwater in the receiving channel and to calculate the available head ( $H_T$ ) for the 100-year analysis using Equation 50-22. Otherwise, an  $H_T$  of two feet can be assumed for the 100-year design storm event. In addition, an  $H_T$  of two feet should be used for the 10-year design storm event.

$$H_T = h_{basin} - h_{channel} \quad \text{Equation 50-22}$$

where:  $H_T$  = available head (feet);  
 $h_{basin}$  = 100-year design WSEL in detention basin (feet);  
 $h_{channel}$  = tailwater elevation in channel from Frequencies of Coincidental Occurrence (feet).

Once a pipe diameter is selected, Equation 50-23 shall be used to calculate the design peak discharge rate for the design storm event specified in Section 50.3.03B(1) to ensure that the maximum allowable discharge rate is not exceeded.

$$Q = \sqrt{\frac{100H_T}{\frac{2.52(1 + K_e)}{D^4} + \frac{466n^2L}{D^{16/3}}}} \quad \text{Equation 50-23}$$

If the HEC-HMS detention routing methodology described in Section 50.3.03B(2) is used to analyze a detention basin with a drainage area less than or equal to 200 acres, then the outfall structure shall also be sized using the methodology for drainage areas greater than 200 acres.

### (3) Detention Analysis for Drainage Areas Greater Than 200 Acres

A detailed detention routing analysis is required for detention basins serving drainage areas greater than 200 acres. As indicated previously, this method may also be used for drainage areas less than 200 acres. Detention routing shall be performed for the 10- and 100-year rainfall events and the allowable peak discharge rates shall be determined from Section 50.3.03B discuss the hydrologic and hydraulic data required to develop detention routing models.

(a) Acceptable Detention Routing Software Programs

The detention routing may be performed in HEC-HMS, HEC-RAS unsteady flow, Storm Water Management Model (SWMM), a detention routing spreadsheet, or other generally accepted detention basin routing programs approved by the County. The HEC-HMS and HEC-RAS manuals should be consulted for additional information regarding the detention routing capabilities of these programs.

(b) Inflow Hydrographs

Proposed conditions inflow hydrographs for the various design storm events should be developed in HEC-HMS using the hydrologic criteria presented in 50.3.03A(2).

(c) Stage-Storage Relationship

A stage-storage or stage-area relationship should be developed from the detention basin grading plan and entered into the detention routing model.

(d) Outfall Structure

Detention outfall structures shall be designed to limit discharges to the allowable peak discharge rates described in 50.3.03B(2). Depending on the detention routing software program, the outfall structure will either be input directly into the model or simulated with a stage-discharge relationship calculated independently and entered into the model. For HEC-HMS, the outfall structure is described using a stage-discharge relationship. For HEC-RAS unsteady flow or other unsteady flow models, the size and material of the outfall structure along with tailwater conditions within the receiving channel are entered into the model and a stage-discharge relationship is computed automatically. In either case, the required size of the outfall structure is dependent on tailwater conditions within the receiving channel. A constant tailwater elevation in the receiving channel shall be estimated using the Frequencies of Coincidental Occurrence methodology described in 50.3.03B(2)e. This constant tailwater elevation can be used to develop a stage-discharge relationship for an outfall structure of a specific diameter using Equation 50-23 or other hydraulic modeling program. The calculated stage-discharge relationship can then be incorporated into HEC-HMS or another acceptable model. In areas where tailwater conditions are a concern (i.e., detention basins located in 100-year flood plains, channels where WSELs remain high for long periods, channels with steeply rising WSELs, and areas with existing flooding problems), a stage hydrograph (elevation versus time) shall be developed for the receiving channel and used in a HEC-RAS unsteady flow model or other acceptable software that allows stage hydrographs as a downstream boundary condition. As indicated in 50.3.03D(1)g, an extreme event overflow structure must

be provided in all detention basins to accommodate storm water runoff in excess of the 100-year event without flooding structures. Standard hydraulic methods shall be used to determine the required dimensions of the overflow structure.

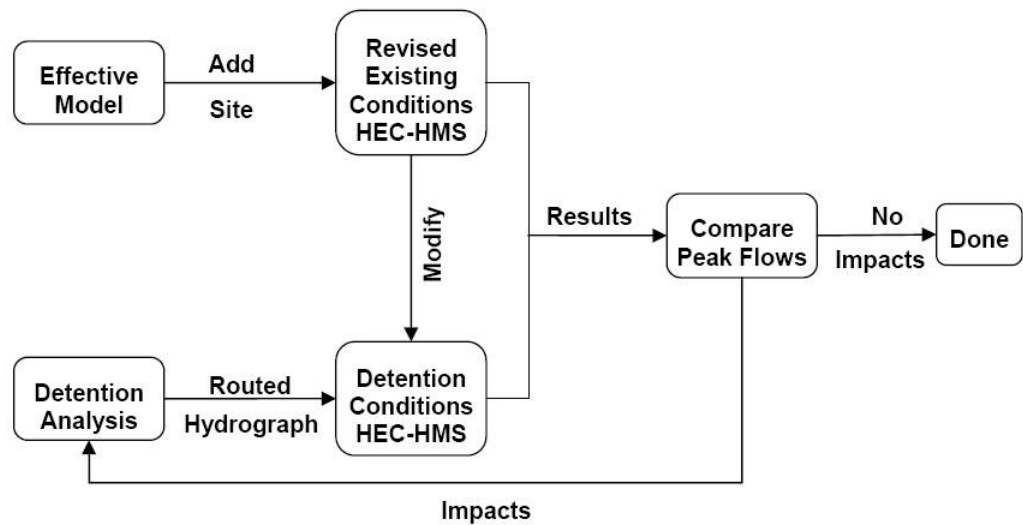
(e) Acceptable Results

Once preliminary detention routing results are obtained, the peak discharge rate from the proposed detention basin shall be compared to the allowable peak discharge rate for each design storm event being analyzed. If the peak discharge rate for any of the design storm events exceeds the allowable peak discharge rate for that event, the size and/or configuration of the outfall structure shall be adjusted until acceptable results are obtained. In addition, the detention basin grading plan may also need to be revised to ensure that adequate volume is provided to maintain one-foot of freeboard in the basin. If the grading plan is revised, an updated stage-storage relationship will need to be developed and incorporated in the detention routing model.

(4) Downstream Impacts

For drainage areas greater than 640 acres or if requested by the County for smaller drainage areas, a HEC-HMS downstream impacts analysis shall be performed to demonstrate that the proposed detention facility does not cause any impacts (increases in peak flows) downstream of the detention facility. If prior approval is obtained from the County, other standard software may be used for the downstream impacts analysis. The County has the option to request a downstream impacts analysis for drainage areas located in the lower half of their respective watershed. If a downstream impacts analysis is requested for drainage areas up to 200 acres, then the hydrologic methodology for drainage areas over 200 acres and the detention routing method for drainage areas over 200 acres shall be used. The downstream impacts analysis shall be performed for the 10- and 100-year rainfall events. At a minimum, the downstream impacts analysis shall compare peak discharges downstream of the site to the mouth of the receiving channel. However, County staff has the option to request that the downstream impacts analysis be continued further downstream.

The routed outflow hydrograph from the detention basin should be incorporated into a detention conditions HEC-HMS model of the receiving channel. The resulting peak discharge rates downstream of the proposed detention shall be compared to the existing conditions peak discharges rates prior to development of the project site. If the drainage area served by the proposed detention basin is part of a larger drainage area, then the larger area should be subdivided to create revised existing and detention conditions models where the area served by the detention basin is represented by a stand-alone sub-basin. If the analysis indicates that there are increases in peak flows downstream of the proposed detention facility, then the discharge structure and/or detention basin shall be modified to eliminate these increases.



## E. EROSION AND SEDIMENT CONTROL

This section of the manual describes methods for controlling erosion and sediment deposition in drainage facilities in Liberty County.

### (1) Effects of Erosion And Sedimentation

- (a) Erosion and sedimentation can have very serious effects on storm water drainage. Some of these effects are summarized below:
- (b) **Integrity of Drainage Facilities:** Erosion can cause slope failures, increase roughness coefficients, and generally reduce the efficiency of drainage channels. However, sediment deposition can clog drainage culverts and reduce the available conveyance in open channels.
- (c) **Maintenance:** Erosion can significantly reduce the maintainability of drainage facilities and increase the cost of maintenance by increasing the frequency with which repairs are required.

### (2) **Water Quality:** Erosion and sedimentation can increase the turbidity of water and may cause other water quality problems associated with pollutants attached to soil particles. Areas With High Erosion Potential Areas with relatively high erosion potential include the following:

- (a) In channel bends, especially where the radius of curvature is less than three times the top width of flow in the channel.

- (b) Around bridges and culverts where channel transitions and reduced flow areas create increased flow velocities.
  - (c) In steep sections of channels and ditches and on steep, unprotected slopes where flow velocities may reach erosive levels.
  - (d) Along grass-lined channel side slopes where significant amount of storm water runoff flows over the channel bank and down the sides of the channel.
  - (e) At confluences where flows in tributary channels, storm sewers, or roadside ditches enter a receiving channel.
  - (f) In areas where non-cohesive soils are particularly prone to erosion.
- (3) Slope Protection Methods  
The following sections describe some of the most common slope protection methods.
- (a) Turf Establishment  
The establishment of grass on exposed earthen side slopes is the most common method for protecting the slopes from erosion. Grass establishment should be initiated as quickly as possible after channel construction or repair work is completed. The grasses used for this purpose should be of hardy varieties which do not require repeated watering and excessive amounts of care once they are established. Grasses with deep root systems are preferable to those with shallower root systems because they are more resistant to drought.
  - (b) Slope Paving  
Concrete slope paving is an effective slope protection method, but is too expensive to apply over large areas. Therefore, slope paving is most commonly used in limited areas where the potential for erosion is very high. Table 50-20 provides a summary of slope paving requirements for varying channel side slopes.

<b>TABLE 50-20: MINIMUM THICKNESS AND REINFORCEMENT FOR CONCRETE SLOPE PAVING</b>			
<b>Channel Side Slope (H:V)</b>	<b>Minimum Thickness (inches)</b>	<b>Minimum Reinforcement</b>	
		<b>Material</b>	<b>Dimensions</b>
3:1	4 inches	welded wire fabric	6 x 6 x W2.9 x W2.9
2:1	5 inches	welded wire fabric	6 x 6 x W4.0 x W4.0
1.5:1	6 inches	reinforcement	4 x 4 x W4.0 x W4.0

Minimum requirements for concrete slope paving are as follows.

- (i) All concrete slope paving shall consist of Class A concrete.
- (ii) The side slopes of the channel shall be no steeper than 1.5 horizontal to 1 vertical (1.5:1).
- (iii) All slope paving shall include a toe wall at the top and sides with a minimum depth of 18 inches. Toe walls shall also be included along the bottom of the channel with a minimum depth of 24 inches for clay soils and 36 inches for sandy soils.
- (iv) Weep holes shall be used to relieve hydrostatic pressure behind lined channel sections. The specific type, size, and placement of the weep holes shall be based on the recommendations of the geotechnical report.
- (v) Where construction is to take place under muddy conditions or where standing water is present, a seal slab of Class C concrete shall be placed in the channel bottom prior to placement of the concrete slope paving.
- (vi) Control joints shall be provided at a maximum spacing of 25 feet. A sealing agent shall be utilized to prevent moisture infiltration at control joints.

(c) **Rip-Rap**

Rip-rap consists of rock or broken concrete pieces with a minimum dimension of about six inches and a maximum dimension of 18 to 24 inches. Rip-rap is normally hand-placed as a layer which extends 18 inches below the finished channel grade. Minimum requirements for rip-rap are as follows.

- (i) The minimum mat thickness shall be 18 inches.
- (ii) Well-graded blocks weighing from 40 pounds to 265 pounds shall be used.
- (iii) The maximum steepness of slopes protected by rip-rap shall be 2 horizontal to 1 vertical.

- (iv) Filter fabric bedding is required in areas where rip-rap is placed on sandy or silty soils. On cohesive clay soils with very little sand content (less than 20-percent sand), filter fabric is not required. Sacks of ready-mix concrete may not be used as rip-rap because lack of gradation allows water penetration and undermining of the soil under the installation.

(d) Acceptable Velocities for Various Slope Treatments

The maximum allowable velocity in open channels and at bridges or culverts shall be analyzed for the design storm event. As shown in Table 50-21, the maximum allowable velocity is related to the type of channel, the slope treatment, and the soil structure throughout the open channel section. If the maximum velocities listed in this table are exceeded during the design storm event, then the channel design shall be modified until acceptable velocities are attained.

<b>TABLE 50-21: MAXIMUM ALLOWABLE VELOCITIES IN OPEN CHANNELS</b>		
<b>Soil Description</b>	<b>Slope Treatment</b>	<b>Maximum Velocity (feet per second)</b>
Fine Sand	None	1.50
Sandy Loam	None	1.75
Silt Loam	None	2.00
Clay Loam	None	2.50
Stiff Clay	None	3.75
Sandy Soils (Easily Eroded)	Grass	4.00
Clay Soils (Erosion-Resistant)	Grass	5.00
Sandy Soils (Easily Eroded)	Rip-Rap	6.00
Clay Soils (Erosion Resistant)	Rip-Rap	8.00
Sandy Soils (Easily Eroded)	Concrete	8.00
Clay Soils (Erosion Resistant)	Concrete	10.00
Bridges and Culverts	----	8.00

(4) Requirements for Channel Bends And Confluences

Erosion protection is required for all channel bends with a radius of curvature (measured along the channel centerline) less than three times the top width of flow in the channel. When required, erosion protection must extend along the outside bank of the bend and at least 20 feet upstream and downstream of the tangent points. Slope protection on the channel bottom and the inside bank is required only if anticipated flow velocities are above non-erosive levels.

Minimum requirements for erosion protection and channel lining at the confluence of two open channels may be required. Table 50-22 may be used to determine whether erosion protection is needed given the angle of intersection between the



channels and the anticipated 25-year flow velocity in the tributary channel. Table 50-24 summarizes the minimum extent of erosion protection upstream and downstream of the confluence.

<b>TABLE 50-22: MINIMUM EROSION PROTECTION FOR CHANNEL CONFLUENCES</b>		
<b>25-Year Velocity in Tributary Channel (feet per second)</b>	<b>Angle of Intersection (<math>\theta</math>)</b>	
	<b>15 to 45 degrees</b>	<b>45 to 90 degrees</b>
$\geq 4.0$	Protection Required	Protection Required
2.0 – 4.0	No Protection Required	Protection Required
$\leq 2.0$	No Protection Required	No Protection Required

<b>TABLE 50-23: MINIMUM EXTENT OF EROSION PROTECTION AT CONFLUENCES</b>	
<b>Location</b>	<b>Minimum Distance (feet)</b>
a	20
b	larger of 50 or $0.75T_m/\tan \theta$
c	20

For both bends and confluences, the top edge of erosion protection shall extend at least as high as the 25-year design water surface elevation in the channel or two-thirds of the way up the channel side slopes, whichever is lower. A healthy grass cover must be established on the channel slope above the concrete lining.

(5) Requirements for Storm Sewer Outfalls

Storm sewer outfalls shall be designed and constructed to minimize erosion around the downstream end of the outfall pipe.

(6) Channel Backslope Drain Systems

Backslope drain systems intercept sheet flow which otherwise would flow over the banks of drainage channels leading to erosion of the side slopes. The following minimum requirements shall be applied to all backslope drainage systems.

- (a) The minimum backslope drain pipe diameter shall be 24 inches.
- (b) The maximum spacing between backslope drains shall be 600 feet.
- (c) The center-line of the backslope drainage swale shall be located five feet inside the channel right-of-way (ROW) line when 20-foot maintenance berms

are used. When a 30-foot maintenance berm width is used, the backslope drainage swale shall be located 7.5 feet inside the ROW line.

- (d) The minimum depth for backslope drainage swales shall be 0.5 feet. The maximum depth shall be two feet.
- (e) The minimum invert slope for backslope drainage swales shall be two-percent.
- (f) The maximum side slope for backslope drainage swales shall be 1.5 horizontal to one vertical (1.5:1).

(7) Interceptor Structures

Interceptor structures are designed to convey storm water from secondary drainage facilities such as roadside ditches into receiving channels. The main purpose of the interceptor is to prevent storm water runoff from flowing over the channel banks and down the channel side slopes.

#### 50.3.04 Conveyance of 100-Year Storm Frequency

In addition to the minimum design criteria included in this Subchapter, the drainage system shall be designed to convey all channelized or concentrated flows from a 100 year frequency storm within defined right-of-way or easements.

#### 50.3.05. Maximum Headwater Elevation for Roadway Crossings

- A. All roadways, culverts underneath roadways, and bridges shall be designed so that storm water runoff from the frequency storm event designated below crossing such roadway or bridge shall not produce a headwater elevation at the roadway greater than six (6) inches above the roadway crown elevation, nor shall it produce a design flow over the roadway at a velocity greater than ten (10) feet per second, based upon the classification of the roadway affected by the storm water management structure:

**Table 50.3.05 – Design Storm Frequency Based on Roadway Classification**

Roadway Classification	Storm Frequency
Neighborhood Road	25 year
Local Roadway	25 year
Minor Collector	25 year
Major Collector	100 year
Minor Arterial	100 year
Principal Arterial	100 year

- B. A permanent depth gauge shall be placed at all roadway crossings where the 100 year frequency flow or lesser frequency is anticipated to flow over the roadway surface. The Commissioners Court may require installation of gates or warning devices at all or some of such locations.
- C. All roadway storm water facility crossings shall be designed and constructed to withstand the impact of water being impounded adjacent to the storm water management facility up to and including the 100 year frequency.
- D. This Section does not apply to driveway culverts.

#### **50.3.06. Public Safety Considerations**

All public drainage facilities, including driveway culverts, shall be designed with public safety considerations. Public drainage facilities constructed within Regulated Roadways shall comply with the safety standards published by the Texas Department of Transportation.

#### **50.3.07. Identification of Special Flood Hazard Areas**

- A. Regulatory flood plains (identified as Areas of Special Flood Hazard) and Regulatory Floodways may be defined based on available mapping.
- B. A drainage area of sixty four (64) acres or greater within a contributing watershed for which a Regulatory flood plain has not previously been identified shall require the identification of a local flood plain. For areas of flow with less than sixty four (64) acres of contributing area, the identification of a local flood plain is not required; however, any concentrated flow necessitates the dedication of a drainage easement.
- C. Development within an Area of Special Flood Hazard must conform to the requirements of the Liberty County Flood Damage Prevention Ordinance. Only limited utility, roadway or pedestrian crossings and fences that do not obstruct flow will be permitted in drainage easements.

#### **50.3.08. Completion of Drainage System Prior to Acceptance of Roadway Maintenance**

No roadways will be accepted for maintenance by the County until all drainage facilities, including drain pipes for all driveways constructed as of the acceptance date, have been installed by the Applicant or Permittee and inspected and approved by the Department. Permanent vegetation must be established or financial assurance must be provided to permanently stabilize any remaining areas disturbed during construction.

### ***Sub-Section 4 - Areas Subject to Local Water Quality Requirements***

#### **50.4.01. Compliance Required**

Developments located in areas governed by the applicable water quality requirements of another jurisdiction shall identify all such requirements in their Drainage Plan. The Applicant shall furnish to the County copies of all documents prepared for the development to satisfy the requirements of such other applicable water quality management requirements.

#### **50.4.02. Incorporation by Reference**

Applicable storm water quality requirements adopted by other jurisdictions within Liberty County are hereby incorporated into these Regulations. Compliance with these referenced requirements may be included as a special provision in any Development Authorization issued by the County.

#### **50.4.03. Notice of the Storm Water Quality Requirements of Other Jurisdictions**

The following water quality requirements promulgated by other jurisdictions govern portions of Liberty County:

The TCEQ Municipal Separate Storm Sewer System (MS4) Permitting Program, effective February 11, 2008, for those portions of the County designated as “Urbanized Areas” by the U.S. Census Bureau, as identified in the County’s “Storm Water Management Program” (SWMP) approved by the Texas Commission on Environmental Quality. Urbanized areas subject to the requirements of the SWMP are designated in the SWMP.

### ***Sub-Section 5 - Incentives for Lots Larger Than Five Acres***

#### **50.5.01. Incentives for Lots Larger than Five Acres**

If the Application is for a subdivision with five (5) lots or less under Section 20 and all lots in the proposed subdivision are larger than five acres and restricted by plat note limiting future development to one single family residence per lot and prohibiting TCEQ Regulated Development, then such subdivision shall be deemed to be in compliance with this Chapter and no additional materials need be submitted to demonstrate compliance to the Director.

- A. Notwithstanding the preceding requirements, all drainage facilities affecting Local Roadways, Urbanized Local Roadways or Minor Collectors may be designed based on a five-year frequency design storm event if all lots in the development are restricted to one single family residence per lot and prohibiting TCEQ Regulated Development and the design of such drainage structures is approved by the Department. All drainage construction will, however, be subject to the remainder of this Section.
- B. Notwithstanding the preceding requirements, all Country Lanes, Local Roadways, Urbanized Local Roadways or Minor Collectors, and culverts underneath such roadways, may be designed based on a ten-year storm frequency if all lots in the development are restricted to one single family residence per lot and prohibiting TCEQ Regulated Development and the design of such drainage structures is approved by the Department. All drainage construction will, however, be subject to the remainder of this Section and the Liberty County Flood Damage Prevention Ordinance. This incentive shall not apply to bridges.

## **SECTION 60 – CONSTRUCTION, ACCEPTANCE OF MAINTENANCE, AND SECURITY**

### ***Sub-Section 1 – Applicability***

#### **60.1.01. General Requirements**

This Chapter shall govern the construction process for public infrastructure and the procedures and conditions for the County to accept maintenance responsibility for any public infrastructure. Public infrastructure shall include:

- A. Public roadways;
- B. Public storm water management facilities and features;
- C. Public utilities; and
- D. Public safety and emergency access features.

#### **60.1.02. Legal Authority**

Legal Authority for adopting and enforcing the regulations in this Chapter is granted to the County under TLGC in Chapters 232 and 562.

#### **60.1.03. Approval Required**

Construction of public infrastructure shall not commence until such time as an appropriate stage of the Development Approval has been issued by the County on an Application filed under these Regulations. Approval of the Commissioners Court is required prior to the County's acceptance of maintenance responsibility for public infrastructure.

#### **60.1.04. Submittal Requirements for Public Infrastructure**

In the application process for a Development Approval under these Regulations, an Applicant seeking approval to construct public infrastructure and related improvements that will be operated and maintained by the County, shall submit the following:

- A. Construction Plans and Final Drainage Plan for the improvements, including a certification by a Texas licensed Professional Engineer that the Construction Plans and design of the improvements are in compliance with these Regulations;
- B. The anticipated unit cost of each type of improvement and the total estimated construction cost of all improvements proposed to be constructed in conjunction with the development prepared by a Texas licensed Professional Engineer; and,

- C. All required design reports required by these Regulations.

### ***Sub-Section 2 – Construction***

#### **60.2.01. Approval Required Prior to Construction**

- A. Construction of public infrastructure that is expected to be dedicated to the County shall not commence until such a time that a Development Approval has been approved by the County on an Application filed under these Regulations. Clearing of land is not considered construction.
- B. By submitting Construction Plans for public infrastructure, the Applicant is acknowledging that they are aware of and is representing that the Permittee will comply with all requirements of Liberty County regarding construction and development in effect at the time the Application was submitted, including:
1. The requirement regulating the access of private construction vehicles from construction sites onto existing Public roadways, requiring the Permittee to take certain steps to limit and clean all mud or other debris carried onto the public roadways by such construction vehicles and imposing fines for non-compliance;
  2. The requirements: a) that a permit be obtained prior to commencement for all construction within County right-of-way, including driveways, utilities, drainage improvements, and the cutting of any existing roadways for installation of utilities; b) that the work be inspected by the Department prior to completion; and, c) imposing fines for non-compliance;
  3. The requirement concerning construction standards for structures projecting above the ground surface (including signs, etc.) installed within the right-of- way of public roadways and requiring all such structures to be made of break-away or collapsible materials, as defined by the Department, unless those structures are located along internal subdivision roads with speed limits of 30 MPH or less or non-thoroughfare roadways with speed limits of 30 MPH or less; and,
  4. The requirement to comply with all construction standards and specifications adopted by the Department, as outlined in these Regulations.
- C. The Department shall review the construction plans and cost estimates for public infrastructure submitted by the Applicant. If the Department determines that the construction plans and cost estimates comply with these Regulations, the Department shall issue a written approval of the construction plans and cost estimates. This written approval shall indicate or it understood that it is an approval of the design and construction methods only and that it is not an approval of the entire Application with which it was submitted. If

the Department determines that the construction plans and cost estimates are not in compliance with these Regulations, the Department shall issue a written request for information identifying those items the Department believes are not in compliance with these Regulations, and requesting that the construction plans and/or cost estimates be revised and re-submitted.

#### **60.2.02. Installation of Public Infrastructure Under Public Roadways**

All utility lines, drainage facilities, and other public infrastructure planned to be constructed under a new paved roadway shall be installed before the roadway is paved. All utility lines, drainage facilities, and other public infrastructure installed under an existing paved roadway shall be bored and cased with steel casing to a point at least four (4) feet beyond the edge of the pavement and must be approved in advance by the Department, unless otherwise approved by the Commissioners Court. If public utilities will be constructed after the approval of a Final Plat or the issuance of a Record Plat, all road crossings shall be coordinated between the utility owner and the Applicant prior to construction and conduits provided for road crossings or road crossing shall be bored as indicated above. Open cutting of newly accepted roads shall be prohibited without the approval of the Department. All electrical conduit shall be a minimum of Schedule 40. Gas lines may be HDPE with a minimum DR rating of 11.

Because the location of utility lines in County rights-of-way or beneath public streets may affect future road construction, re-construction, and on-going maintenance, the County reserves the right to dictate the reasonable placement of utility lines where those lines encroach upon County rights-of-way or other County property.

- A. Applicants shall consult with the Department who shall determine on a case-by-case basis whether it is appropriate to allow utility placement running parallel beneath a Permitted Street or in a County right-of-way.
- B. If t h e Applicant disagrees with the ruling of the Department , the Applicant may appeal to the Commissioners Court, which shall make a final ruling by resolution.
- C. As part of the approval process, the Applicant shall make certain that all relevant plat notes and drawings for Final Plat submittal, as well as any construction documents submitted to the County, shall conform to the utility placement dictated by the County.
- D. When allowed, construction on County right-of-way or easements must be on the back slope of the ditch with the following minimum cover:
  - ☐ Telephone line – 18 inches.
  - ☐ Gas line – 36 inches.
  - ☐ Electric line – 48 inches.
  - ☐ Television cable – 18 inches.
  - ☐ Water line – 36 inches.

- E. The Department should be notified 48 hours before utility work is commenced in a County right-of-way or easement.

#### **60.2.03. Temporary Construction Erosion Controls**

All construction of roadways, whether public or private, shall comply with the TXDOT standards on temporary erosion and sedimentation controls as well as the applicable requirements of other jurisdictions regarding temporary erosion control measures.

#### **60.2.04. Not Used**

#### **60.2.05. Construction Changes**

Changes in the construction of public infrastructure and related improvements shall require the approval of the Department. Minor changes that do not conflict with the terms of the Development Approval may be verbally authorized by the field inspector, with those changes subsequently documented in a field change form and shown on the As Built plans in red ink. For other changes, the Applicant or Permittee shall provide a written request for approval of the change to the Department. The request for the change shall be accompanied by sufficient additional information to identify the changes requested and to allow the changes to be evaluated by the Department for compliance with these Regulations. Where determined to be necessary by the Department, the changes shall be accompanied by new or revised construction plans, specifications, drainage plans, and cost estimates prepared by a Texas licensed professional engineer. If, in the opinion of the Department, the change is substantial enough, construction shall be halted until revised plans and documents are approved.

#### **60.2.06. Interim Inspections**

The Applicant or Permittee shall provide written notice to the Department of the start of construction of public infrastructure and related improvements and shall designate in such notice a contact person to coordinate construction inspections with the Department. The Department shall conduct such interim inspections as it deems necessary. Interim inspections may be conducted without notice. The Department may issue verbal or written inspection reports. The Applicant or Permittee is responsible for correcting any deficiencies noted during interim inspections. The Applicant shall provide the required notice prior to the following phases for mandatory inspections by the Department:

- A. After subgrade stabilization and prior to the beginning of the installation of any flexible base material and
- B. Prior to the beginning of the installation of any type of paving.

The Applicant shall provide a minimum notice of forty eight (48) hours prior to the time when the



inspections are desired.

The Applicant shall be responsible for submitting all test results for the road construction as required by Section 40.9.03.

#### **60.2.07. Final Inspection**

Once construction of public infrastructure and related improvements is substantially complete, the Applicant or Permittee shall submit a written request to the Department to conduct a final inspection. This inspection shall be conducted by the Department to determine if all the public infrastructure and related improvements reflected on the construction plans have been constructed in accordance with the Regulations and the construction plans. The Applicant or Permittee is responsible for correcting any deficiencies noted during final inspections. Upon satisfactory completion of a final inspection, the Department shall issue to the Applicant and/or Permittee a written final inspection report, including any minor deficiencies or “punch list” items to be corrected. Once the “punch list” has been completed, the Department will inspect the improvements and issue a Certificate of Construction Completion. The as-built submittals shall then be prepared and submitted to the Department. If permanent vegetation has not been established, the Applicant or Permittee must provide financial assurance to the County that would provide sufficient funds to complete revegetation.

#### **60.2.08. As-Built Submittals**

Following completion of the construction of public infrastructure and related improvements and a final inspection by the Department, the Applicant or Permittee shall submit to the Department:

- A. A written certification stating that the construction is “complete, complies with the construction standards as established by the Liberty County Development Regulations, and was completed in conformance with the approved construction plans and any approved changes,” signed by a Texas licensed professional engineer;
- B. A complete set of as-built plans incorporating all changes made during construction, signed and sealed by a Texas licensed professional engineer;
- C. A complete bound set of all test results and associated test location maps completed during the course of the construction, even though a copy of each was submitted during the construction; and,
- D. Electronic copies of all submittals in this section submitted in pdf format on a USB drive or on an FTP site accessible by the County for downloading.

### ***Sub-Section 3 – Construction Security***

#### **60.3.01 Construction Security**

The Applicant shall post a Construction Security in the form of cash, surety bond, or irrevocable letter of credit in an amount equal to 100% of the estimated construction costs of the streets, roads, and drainage improvements. The Commissioners Court must individually approve each application to post such Construction Security and the Construction Security shall remain in effect until the streets, roads, and all associated drainage improvements have been accepted by the County for maintenance at which time the Applicant shall post a Maintenance Security. Sample Construction Security forms are provided in Appendix H. The County shall be given a sixty day (60) Notice of Cancellation prior to the termination or end of the Security coverage period.

#### **60.3.02 Release of Construction Security**

Before release of the Construction Security, the Department shall inspect the water, wastewater, roads, and drainage facilities and the Applicant shall remedy all deficiencies. If the deficiencies are not properly remedied, the County shall draw on the security to make the necessary repairs.

#### **60.3.03 Collection on Construction Security**

Collection on security and the prosecution of construction to complete the improvements to the extent possible with resulting funds is not acceptance of the improvements for maintenance. The County is not a Subdivision developer and, if it undertakes the performance of such construction through a third party contractor, the County is acting as a third party trustee for the public and the Applicant shall be liable for all costs incurred by the county in excess of the surety amount, if any.

### ***Sub-Section 4 - Acceptance of Public Infrastructure for Maintenance***

#### **60.4.01. Applicant's Maintenance Responsibility**

The Applicant or Permittee shall remain responsible for all maintenance and repair of planned public infrastructure and related improvements associated with a development for a minimum of two (2) years in accordance with these Regulations. The County's issuance of a Development Approval or the acceptance of a Final Plat or dedication of the right-of-way for a public roadway shall not be deemed to constitute acceptance of the public infrastructure for maintenance.

#### **60.4.02. County Acceptance of Maintenance**

The County shall accept public infrastructure and related improvements when the following conditions have been satisfied:

- A. The public infrastructure has been constructed in accordance with these Regulations, the Record Documents required for the public infrastructure have been recorded and the associated right-of-way has been dedicated to the public pursuant to these Regulations;
- B. The Department has approved all required inspections and tests at the completion of each phase of construction of the streets;
- C. The Applicant or Permittee has submitted a written request to the Department for the County to formally accept maintenance of the public infrastructure. If the Applicant or the Permittee are no longer available, (i.e. has ceased to transact any business or, in the case of an individual, has died), the Owner(s) of the Subject Property may submit the written request;
- D. A Texas licensed professional engineer on behalf of the Applicant or Permittee has submitted a letter certifying that the improvements as constructed are complete and in compliance with the approved Construction Plans, approved Drainage Plan, any official plan change orders that have been made, and these Regulations;
- E. A Texas licensed professional engineer on behalf of the Applicant or Permittee has submitted a set of as-built plans incorporating all changes made during construction;
- F. The Department has performed and approved all required inspections;
- G. The Department has inspected the public infrastructure and related improvements no earlier than 30 days prior to the Commissioners Court's acceptance of the maintenance obligation and has submitted to the Commissioners Court an Inspection Report stating that:
  - 1. the public infrastructure, in its current condition and with no repairs, upgrades or improvements, is in compliance with the Regulations and all other guidelines in effect at the time of the inspection;
  - 2. All requirements regarding construction of drainage structures and driveway drain pipes have been satisfied; and
  - 3. The Department recommends acceptance of the public infrastructure by the Commissioners Court.
- H. The Permittee has posted with the Department a satisfactory Maintenance Security to secure the proper maintenance of the public infrastructure, including roads and drainage improvements, prior to County acceptance of maintenance.

#### **60.4.03. Maintenance Security**

The Applicant or Permittee shall be responsible for all requirements set forth in these Regulations. The Maintenance Security shall be provided in an amount equal to 20% of the total construction costs of the public infrastructure and related improvements. The Maintenance Security shall cover all roads, drainage improvements, and any other improvement dedicated to the County. The Maintenance Security shall have a minimum term of two (2) years following the agreement by the County that the construction of improvements required for the development are complete and in accordance with the approved plans and specifications. The Maintenance Security shall begin on the date of the County acceptance that is evidenced by a letter of acceptance from the Department.

If any new street or road was constructed on a Pre-existing sub-grade and base, the Applicant shall provide a Maintenance Security in an amount equal to 20% of the construction work completed and 100% of construction work not completed of the roads for t h e term of two (2) years following acceptance by the County.

#### **60.4.04 Release of Maintenance Security**

Before release of the Maintenance Security, the Department shall again inspect the public improvements and the Permittee shall remedy all deficiencies prior to release of the Maintenance Security. If the deficiencies are not promptly remedied, the County shall make the repairs and draw on the Maintenance Security for payment. Any expenses incurred by the County in excess of the Maintenance Security or in excess of the Maintenance Security shall be reimbursed by the Applicant and Permittee.

### ***Sub-Section 5 - Financial Assurance***

#### **60.5.01. County as Beneficiary**

All Financial Assurance used to satisfy these Regulations shall name the County as the beneficiary and recipient of all rights and privileges thereto.

#### **60.5.02. Acceptable Mechanisms**

Financial assurance, as required within these regulations, shall be provided using a mechanism acceptable to the County. The Department shall develop, maintain and make available to the public standard forms for this purpose that may be used. These can be found in **Appendix H**. While other mechanisms may be approved for use, the following mechanisms are recognized for the purposes of these regulations:

- A. A fully funded Trust Agreement, with an entity acceptable to the County serving as Trustee;
- B. A Bond that meets the following requirements.

1. The bond or financial guarantee shall be payable to the County Judge of the County, in his official capacity, or the judge's successor in office.

The bond or financial guarantee shall be in an amount determined by these Regulations to be adequate to ensure proper construction and maintenance of the public roads and drainage facilities to service the subdivision, including reasonable contingencies.

2. The bond shall be executed with sureties as may be approved by the commissioners court. The county shall establish criteria for acceptability of the surety companies issuing bonds that include but are not limited to:

- a. Registration with the Secretary of State and be authorized to do business in Texas;
- b. Authorization to issue bonds in the amount required by the commissioners court; and
- c. Rating of at least B from Best's Key Rating Guide; or if the surety company does not have any such rating due to the length of time it has been a surety company, the surety company must demonstrate eligibility to participate in the surety bond guarantee program of the Small Business Administration and must be an approved surety company listed in the current United States Department of Treasury Circular 570. Such bonds shall meet the criteria contained in the rules and regulations promulgated by the United States Department of Treasury.

3. The bond shall be conditioned upon construction or installation of public roads and drainage facilities meeting the criteria established by Liberty County and upon construction of facilities within the time stated on the plat, or on the document attached to the plat for the subdivision, or within any extension of time granted by the commissioners court.

C. Letter of credit. A letter of credit that meets the following requirements.

1. Any letter of credit submitted as a financial guarantee for combined amounts greater than \$10,000 and less than \$250,000 must be from financial institutions which meet the following qualifications.
  - a. Bank qualifications:
    - (i) Must be federally insured;
    - (ii) Sheshunoff rating must be 10 or better and primary capital must be at least 6.0% of total assets; and

- (iii) Total assets must be at least \$25 million.
  - b. Savings and loan association qualifications:
    - (i) Must be federally insured;
    - (ii) Tangible capital must be at least 1.5% of total assets and total assets must be greater than \$25 million or tangible capital must be at least 3.0% of total assets if total assets are less than \$25 million; and
    - (iii) Sheshunoff rating must be 30 or better.
  - c. Other financial institutions qualifications:
    - (i) The letter of credit must be 110% collateralized by an investment instrument that would meet the qualifications for a county investment; and
    - (ii) The investment instrument must be registered in the county's name and the county must receive safekeeping receipts for all collateral before the letter of credit is accepted.
- 2. Any letter of credit submitted as a financial guarantee for combined amounts greater than \$250,000 must be from financial institutions which meet the following qualifications.
  - a. Bank qualifications:
    - (i) Must be federally insured;
    - (ii) Sheshunoff rating must be thirty or better and primary capital must be at least 7.0% of total assets; and
    - (iii) Total assets must be at least \$75 million.
  - b. Savings and loan association qualifications:
    - (i) Must be federally insured;
    - (ii) Tangible capital must be at least 3.0% of total assets and total assets must be greater than \$75 million, or tangible capital must be at least 5.0% of total assets if total assets are less than \$75 million; and
    - (iii) Sheshunoff rating must be 30 or better.
  - c. Other financial institutions qualifications:
    - (i) The letter of credit must be 110% collateralized by an investment instrument that would meet the qualifications for a county investment; and
    - (ii) The investment instrument must be registered in the County's name and the county must receive safekeeping receipts for all collateral before the letter of credit is accepted.
- 3. The letter of credit shall list as sole beneficiary the County Judge of the County, in

his official capacity, or the judge's successor in office, and must be approved by the County Judge of the County. The form of the letter of credit shall be modeled after the form attached in Appendix 2B. Figure: 31 TAC Section 364.54(c)(3)

4. The letter of credit shall be conditioned upon installation or construction of water and wastewater facilities meeting the criteria established under Division 2 of this subchapter and upon construction of facilities within the time stated on the plat, or on the document attached to the plat for the subdivision, or within any extension of time granted by the commissioners court.

#### **60.5.03. County Claims Against Financial Assurance**

The County may make claims against any financial assurance provided under these Regulations if it finds that the actions for which the financial assurance was provided have not been completed satisfactorily. Prior to making a claim against a financial assurance mechanism, as allowed under these Regulations, the County shall provide written notice to the Trustee or Surety of such claim, with a copy to the Applicant and Permittee, and shall allow a minimum period of fourteen (14) calendar days to remedy such claim. Claims which have not been remedied within fourteen (14) calendar days shall be immediately due and payable under the terms of the applicable financial assurance mechanism.

#### **60.5.04. Financial Assurance Mechanism Expiration and Renewal**

In the event that a financial assurance mechanism submitted to the County pursuant to this Chapter expires prior to the acceptance by the County of the work assured by the financial assurance mechanism, the Permittee shall submit a replacement financial assurance mechanism prior to its expiration. Such replacement financial assurance mechanisms shall comply with all the requirements of this Subchapter.

# **APPENDIX A**

## **Application Forms and Checklists**





**LIBERTY COUNTY ENGINEERING  
PROPOSED SUBDIVISION PRELIMINARY PLAT  
SUBMITTAL APPLICATION**

**TO BE COMPLETED BY APPLICANT**

Name of Proposed Subdivision: \_\_\_\_\_

Number of Lots: \_\_\_\_\_

Legal Location: \_\_\_\_\_  
\_\_\_\_\_

Physical Location: \_\_\_\_\_

Owner/Developer Name: \_\_\_\_\_

Address \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Engineer/Surveyor Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

**TO BE COMPLETED BY COUNTY**

Fee Received: \_\_\_\_\_

Received By: \_\_\_\_\_

Date Received: \_\_\_\_\_

Additional Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**LIBERTY COUNTY  
ENGINEERING DEPARTMENT  
PRELIMINARY PLAT SUBMITTAL DOCUMENTS**

**PRELIMINARY PLAT CHECKLIST**

- ☐ Four (4) black and white copies of the Preliminary Plat
- ☐ Application Form
- ☐ Application Deposit for Development Review Fees
- ☐ Preliminary Drainage Plan
- ☐ Application Report and Supplemental Information required in Section 20.6
- ☐ Master Plan (if required)



**LIBERTY COUNTY, TEXAS  
PROPOSED SUBDIVISION FINAL PLAT  
APPROVAL APPLICATION**

**TO BE COMPLETED BY APPLICANT**

Name of Proposed Subdivision: \_\_\_\_\_

Number of Lots: \_\_\_\_\_

Legal Location: \_\_\_\_\_  
\_\_\_\_\_

Physical Location: \_\_\_\_\_

Owner/Developer Name: \_\_\_\_\_

Address \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Engineer/Surveyor Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_



## **LIBERTY COUNTY ENGINEERING DEPARTMENT**

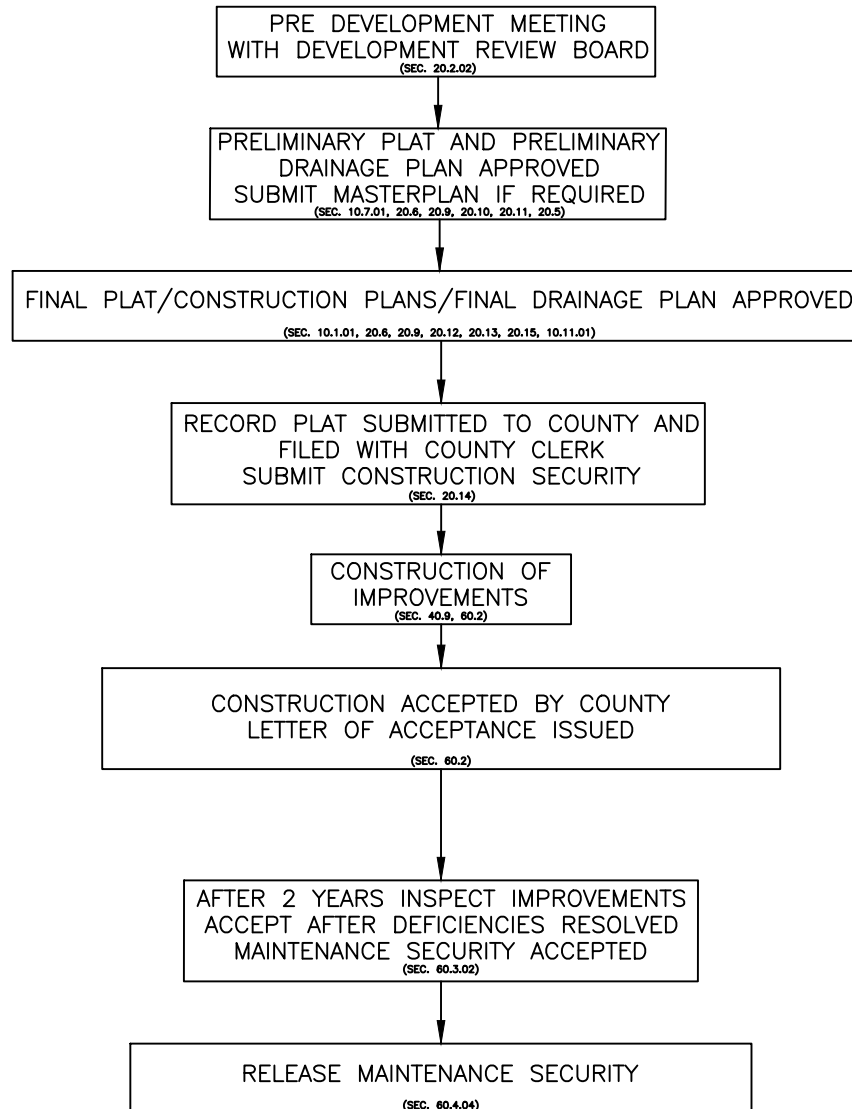
### **FINAL PLAT CHECK LIST**

- ❑ One (1) Mylar and Four (4) Black and White Copies and CD of the Final Plat
- ❑ Construction Plans and Specifications
- ❑ Final Drainage Report
- ❑ Construction Cost Estimates for all improvements
- ❑ Engineering Reports (OSSF, Stormwater Drainage Design, Flood Plain Issues)
- ❑ Application Form
- ❑ Application Information Report and Supplemental Information Required in Section 20.6
- ❑ Roadway Design Report
- ❑ Water and Wastewater Service Engineering Report
- ❑ A letter indicating approval of the subdivision components of direct concern to other jurisdictional entities: such as Utility Companies, Mud Districts, etc.

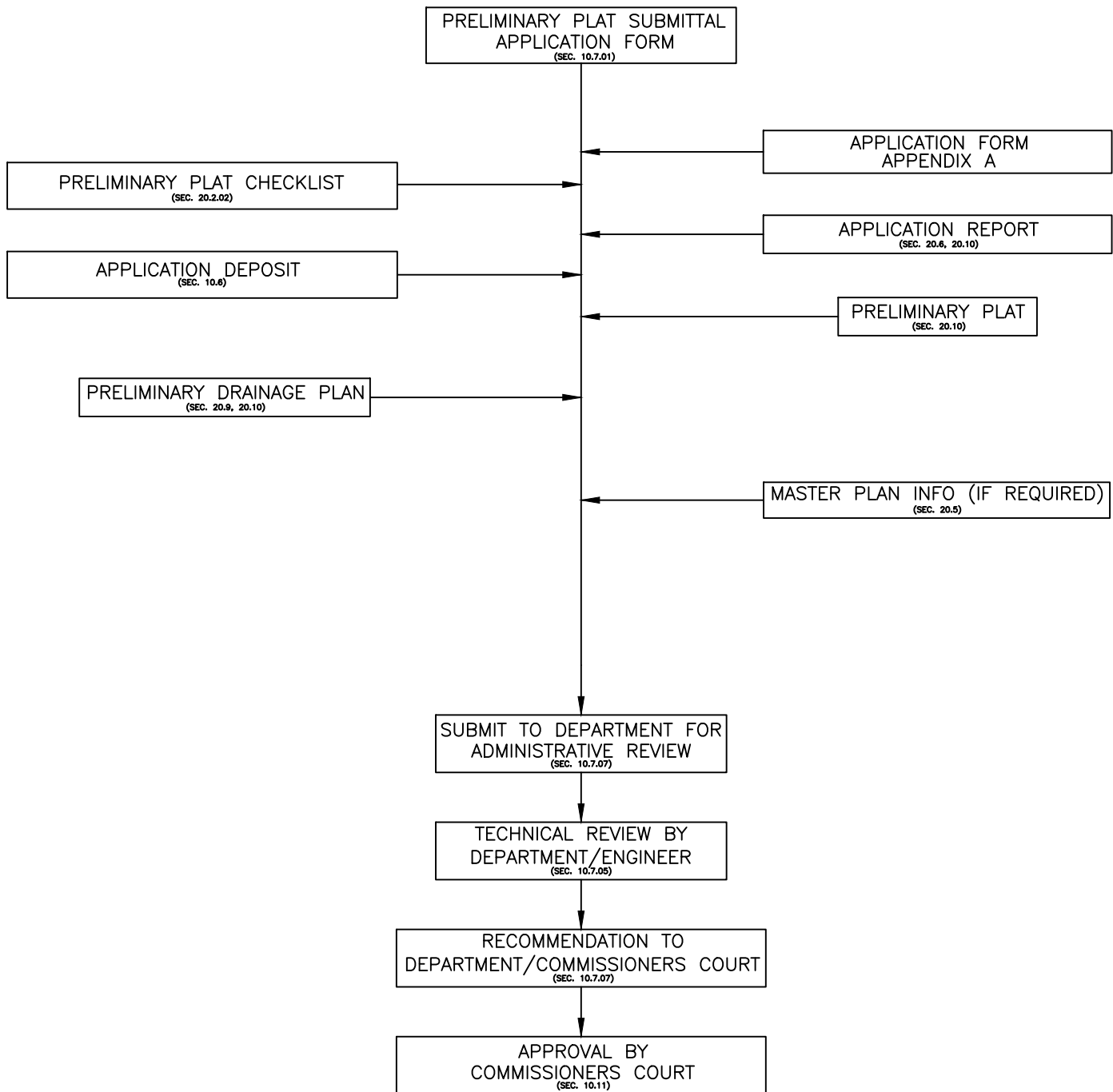
**APPENDIX B**

**Subdivision Process Flow Charts**

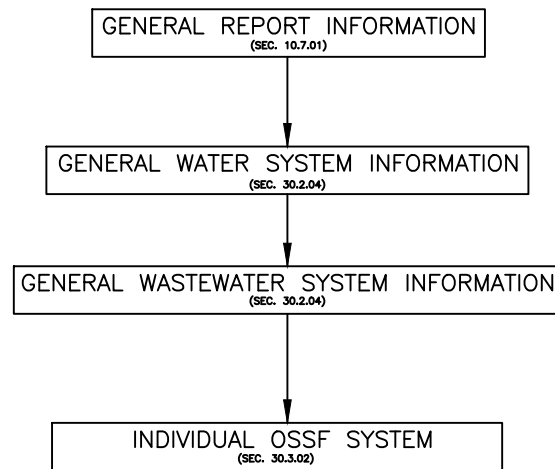
# SUBDIVISION PLATTING PROCESS



# PRELIMINARY PLAT

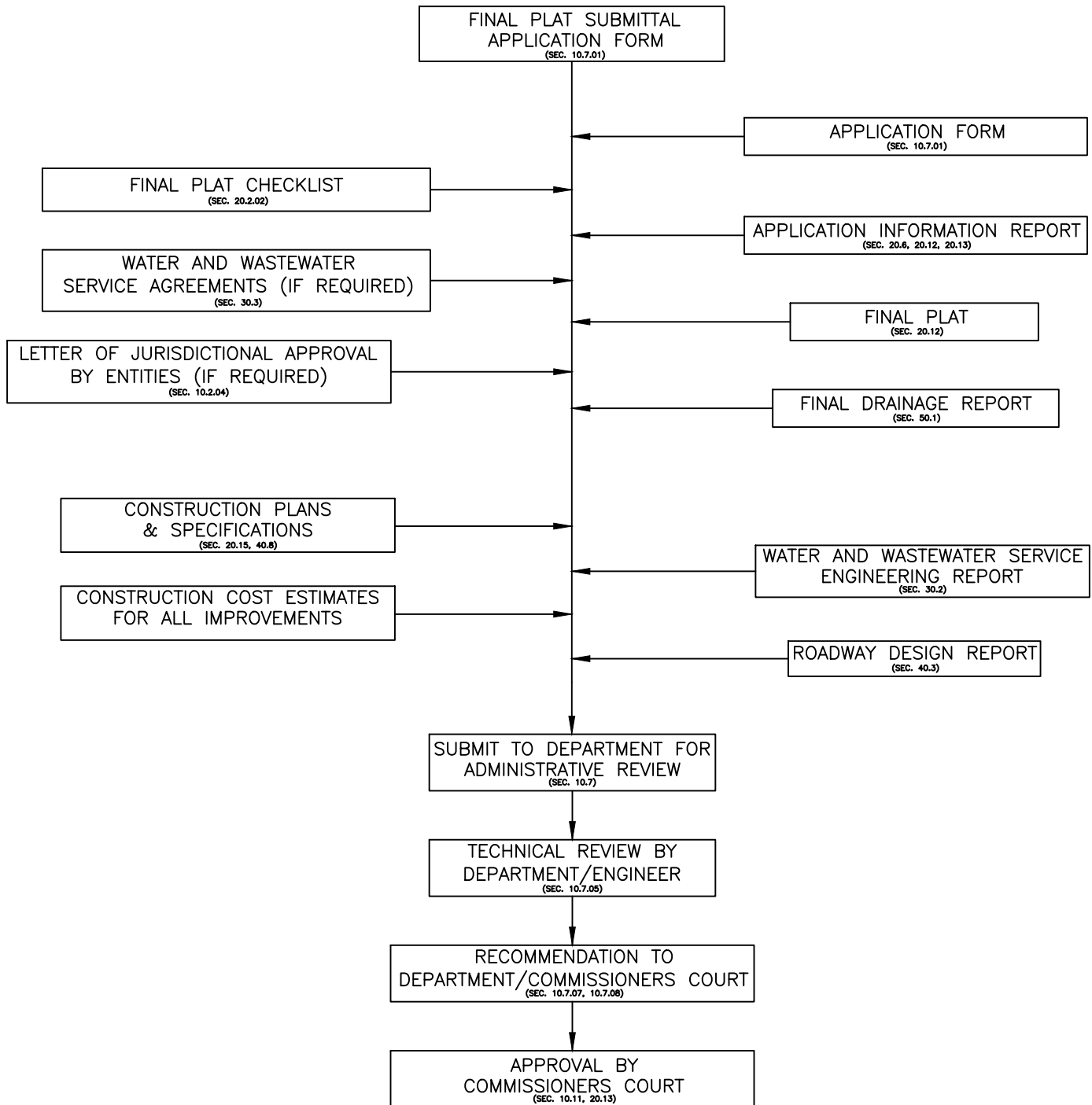


# WATER AND WASTEWATER SERVICE ENGINEERING REPORT

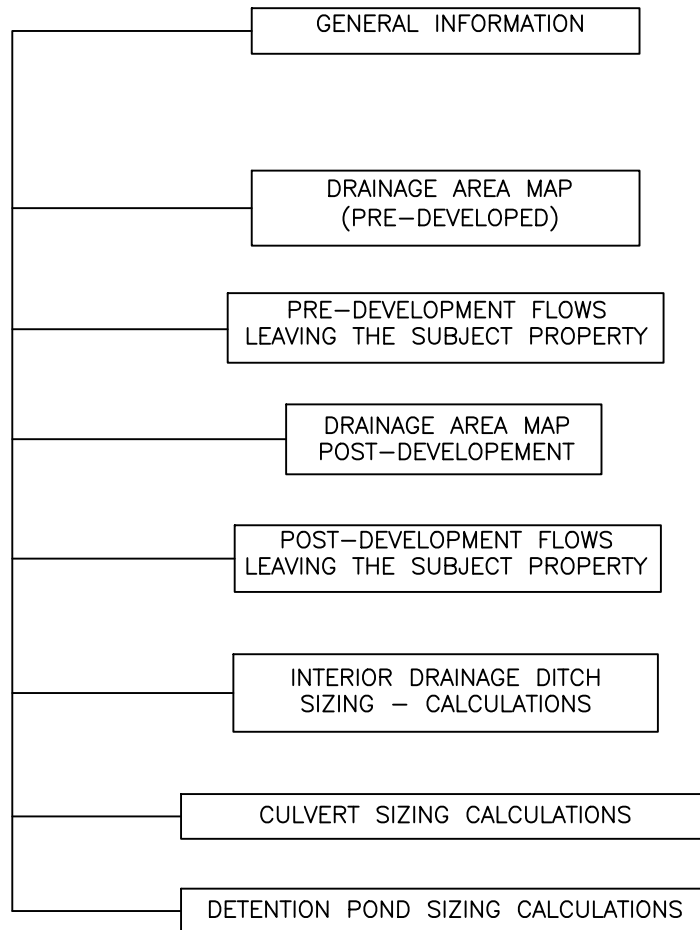




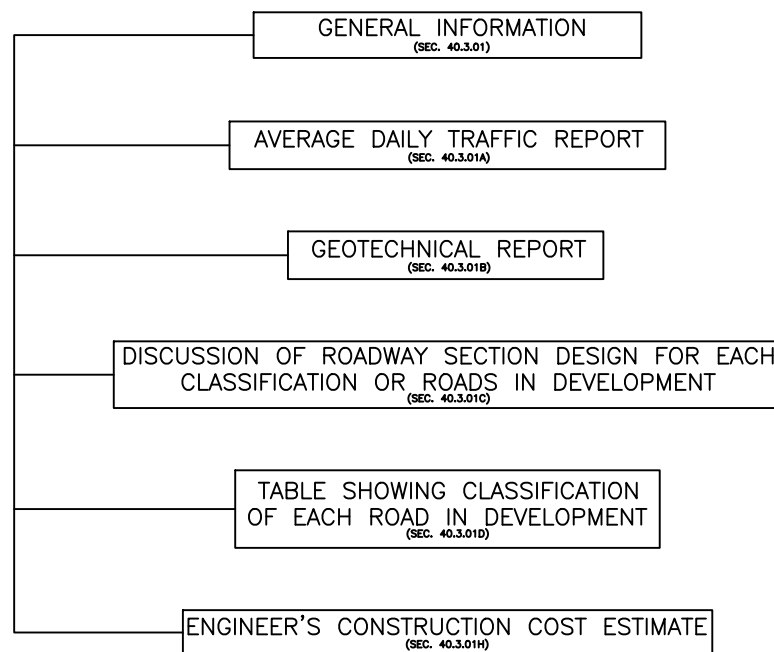
# FINAL PLAT



# FINAL DRAINAGE REPORT



# ROADWAY DESIGN REPORT



## **APPENDIX C**

### **Standard Plat Notes and Certifications**

**1A. Acknowledgment and Certificate of Dedication by the Owner – For an Individual**

STATE OF TEXAS COUNTY  
OF LIBERTY

KNOW ALL MEN BY THESE PRESENTS, That I (Owner), owner of (Subdivision Acreage) acres of land out of the \_\_\_\_\_, Liberty County, Texas as conveyed to me by deed dated \_\_\_\_\_, and recorded in Volume \_\_\_\_\_, Page \_\_\_\_\_, Liberty County Deed Records, DO HEREBY SUBDIVIDE (Subdivision Acreage) acres of land out of the \_\_\_\_\_, (Note: If the subdivision lies in more than one survey, determine the acreage in each survey and repeat for each original survey within the subdivision) to be known as the (Subdivision Name), in accordance with the plat shown hereon, subject to any and all easements or restrictions hereto fore granted and do hereby dedicate to the public (or: “owners of the property shown hereon” for private streets) the streets and easements shown hereon.

WITNESS MY HAND, this \_\_\_\_\_ day of \_\_\_\_\_, A.D., 20\_\_\_\_\_.

---

(Owner’s Name) Owner

STATE OF TEXAS COUNTY  
OF LIBERTY

BEFORE ME, the undersigned authority, on this day personally appeared (Owner’s Name) known to me to be person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same for the purposes and consideration therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the \_\_\_\_\_ day of \_\_\_\_\_, A.D., 20\_\_\_\_\_.

---

NOTARY PUBLIC in and for Liberty County, Texas

**1B. Acknowledgment and Certificate of Dedication by the Owner – For a Corporation**

STATE OF TEXAS COUNTY  
OF LIBERTY

KNOW ALL MEN BY THESE PRESENTS, That (Corporation Name), a corporation organized and existing under the laws of the State of Texas, with its home address at (Address, City and State), owner of (Subdivision Acreage) acres of land out of the Original Survey, Liberty County, Texas as conveyed to me by deed dated \_\_\_\_\_, and recorded in Volume \_\_\_\_\_, Page \_\_\_\_\_, Liberty County Deed Records, DOES HEREBY SUBDIVIDE (Subdivision Acreage) acres of land out of the Original Survey, (Note: If the subdivision lies in more than one survey, determine the acreage in each survey and repeat for each original survey within the subdivision) to be known as the (Subdivision Name), in accordance with the plat shown hereon, subject to any and all easements or restrictions hereto fore granted and do hereby dedicate to the public (or: “owners of the property shown

hereon" for private streets) the streets and easements shown hereon.

IN WITNESS WHEREOF the said Corporation Name has caused these presents to be executed by its Corporate Title, Name, thereunto duly authorized,

---

(Owners Name) Owner

STATE OF TEXAS COUNTY  
OF LIBERTY

BEFORE ME, the undersigned authority, on this day personally appeared (Owner's Name) known to me to be person whose name is subscribed to the foregoing instrument as Title of Corporate Name and acknowledged to me that he executed the same in such capacity as the act and deed of said corporation for the purposes and considerations therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the \_\_\_\_\_ day of \_\_\_\_\_,  
A.D., 20\_\_\_\_.

---

NOTARY PUBLIC in and for Liberty County, Texas

## **2. Certificate of County Approval**

STATE OF TEXAS COUNTY OF  
LIBERTY

I, \_\_\_\_\_, County Clerk of Liberty County, Texas, do hereby certify that on the \_\_\_\_\_ day of \_\_\_\_\_, A.D. 20\_\_\_\_, the Commissioners Court of Liberty County, Texas passed an order authorizing the filing for record of this plat, and said order has been duly entered in the minutes of the said Court in Book , Page \_\_\_\_\_.

WITNESS MY HAND AND SEAL OF OFFICE this the \_\_\_\_\_ day of \_\_\_\_\_, A. D.,  
20\_\_\_\_\_.

---

County Judge  
Liberty County, Texas

---

County Clerk  
Liberty County, Texas

## **3. Certificate of Recording:**

STATE OF TEXAS COUNTY OF  
LIBERTY

I, \_\_\_\_\_, County Clerk of Liberty County, Texas, do hereby certify that the foregoing

instrument of writing with its certificate of authentication was filed for record in my office on the \_\_\_\_ day of \_\_\_\_, 20\_\_, at \_\_\_\_ o'clock \_\_.m., and duly recorded on the \_\_\_\_ day of \_\_\_\_, 20\_\_, at \_\_\_\_ o'clock \_\_.m., in the Plat Records of Liberty County, Texas, in Book \_\_\_\_, Page \_\_\_\_.

---

COUNTY CLERK – LIBERTY COUNTY, TEXAS

**4. Certification of Surveyor**

I, \_\_\_\_\_, a Texas Registered Professional Land Surveyor certify that this plat has been prepared in accordance with the Subdivision Regulations of Liberty County.

**5. Development Regulations Notes**

No construction or other development within this subdivision may begin until all Liberty County development requirements have been met.

**6. Municipal/ETJ Note**

No portion of this subdivision lies within the boundaries of any municipality's corporate city limits, or area of extra territorial jurisdiction.

OR

A portion of this subdivision lies within the (corporate limits) or (area of extra territorial jurisdiction) of the City of\_.

**7. School District Plat Note**

This subdivision is within the boundaries of the \_\_\_\_\_ School District(s).

**8. FEMA flood plain note**

A portion of (or no Portion of) this subdivision lies within the boundaries of the 100 year flood plain as delineated on the FEMA Flood Insurance Rate Map for Liberty County Community Panel #\_\_, date\_\_.

**9. Utility Notes**

Electric utility service will be provided by \_\_\_\_\_.

Telephone utility service will be provided by \_\_\_\_\_.

Gas utility service will be provided by \_\_\_\_\_.

**10. Sewage Disposal Note:**

No structure in this subdivision shall be occupied until connected to a permitted public or private sanitary sewer system or to an on-site wastewater system that has been approved and permitted by Liberty County. Sanitary sewer

service shall be provided to each lot by \_\_\_\_\_.

### **11. Individual Water Supply Note**

No structure in this subdivision shall be occupied until connected to an individual water supply or a state approved community water system. Potable water service shall be provided to each lot by\_\_\_\_\_.

### **12. Water Supply Note**

\_\_\_\_\_, the entity to provide for the potable water supply, is an approved public water supply system, has adequate quantity to supply the subdivision and provisions have been made to provide service to each lot in accordance with the policies of the water supply system.

\_\_\_\_\_  
Water Supply Representative

### **13. Pipeline Easement Note:**

All existing pipeline easements within the limits of the subdivision have been shown.

### **14. Easement Note**

All easements shown hereon shall be kept clear of fences, buildings, plantings, and other obstructions to the operation and maintenance of the drainage facilities. No permanent structure shall encroach upon an alley or an easement without the approval of the Liberty County Commissioners Court.

### **15. Benchmark(s) Note**

All Applicants are required to set a minimum of one permanent Benchmark.

Benchmark: \_\_\_\_\_

### **16. Engineer or Surveyor Hydrological Features Note**

Under his or her professional seal that, to the best of his or her knowledge, the plat accurately reflects the general location (or absence) of all such features in accordance with the terms of these Regulations.

### **17. Driveway Construction Note**

No driveway constructed on any lot within this subdivision shall be permitted access onto a public roadway unless:

- (1) A Culvert/Driveway Permit for use of the County Roadway Right-Of-Way has been issued; and,
- (2) The driveway satisfies the minimum spacing requirement for driveways set forth in Table 40.7.09B of



the Liberty County Subdivision and Development Regulations.

**18A. Water and Wastewater Service Engineering Report Submitted**

If the Applicant submits a Water and Wastewater Service Engineering Report under Section 30, the following statements, utilizing the words “water”, “wastewater” or both, as required, shall appear prominently on the Preliminary Final Plat:

“The filer of this plat has submitted to the Department a Water and Wastewater Service Engineering Report describing how [water] [and] [wastewater] service will be provided to this subdivision.”

**18B. Water and Wastewater Service Engineering Report Submitted**

For Subdivisions exempt from submitting a Water and Wastewater Service Engineering Report under Section 40.2.02, the following statements shall appear prominently on the Preliminary Final Plat:

“Under Department Regulations, this subdivision is exempt from the requirements to demonstrate the availability of water and wastewater service.”

**19. Single Dwelling Per Residential Lot Note**

No more than one single family detached dwelling shall be located on each lot.

**20. Roadway Note**

A certification in the form of a plat note from a Texas Professional Engineer or Texas Registered Professional Land Surveyor that the location and dimensions of roadways as set forth are in accordance with these Regulations.

**21. Shared Access Driveway Note**

Any application proposing shared access driveways shall include a plat note stating:

“All lots served by a Shared Access Driveway are restricted to one single family residence per lot and if any other Development of a Dwelling Unit occurs on any of the lots obtaining access through the Shared Access Driveway, then such new Dwelling Unit must be constructed on a separately platted lot with direct frontage onto and physical access to a Regulated Roadway prior to construction of the Dwelling Unit. A duplex will not be considered a single family residence for purposes of this subparagraph.

The owners of the Single Family Residence obtaining access through the Shared Access Driveway shall be solely responsible for all maintenance of the driveway, including maintaining any drainage structures associated with the driveway. The driveway must be maintained at all times in a condition that will permit unencumbered vehicular access by emergency vehicles.”

**APPENDIX D**

**Sample Form for Water and Wastewater  
Service Agreement**

## APPENDIX D. SAMPLE FORM FOR WATER SERVICE AGREEMENT

### AGREEMENT REGARDING WATER SERVICE FOR THE PROPOSED \_\_\_\_\_ SUBDIVISION

PARTIES: This Agreement is by and between the Utility and the Subdivider, to wit:  
The Utility is the governing board or owner of a retail public utility which supplies of drinking water known as \_\_\_\_\_.

The Subdivider is \_\_\_\_\_,  
who is the owner, or the authorized agent of the owner, of a tract of land in Liberty County, Texas, that has been proposed to be divided into a subdivision (the Subdivision) known as \_\_\_\_\_.

TERMS: The Subdivider has prepared a plat of the Subdivision for submission to Liberty County for its approval. The Subdivider plans to construct for the Subdivision a drinking water distribution system to be connected to the Utility's public water system. The Utility has reviewed the plans for the Subdivision (the Plans) and has estimated the drinking water flow anticipated to be needed by the Subdivision under fully built-out conditions (the anticipated water flow) to be approximately \_\_\_\_\_ gallons daily.

The Utility covenants that it has or will have the ability to provide the anticipated water flow for at least thirty years, and that it will provide that water flow. These covenants will be in effect until thirty years after the plat of the Subdivision has been recorded and the Subdivision's water distribution system has been connected to the Utility's water supply system.

The Subdivider covenants that the water distribution system will be constructed as shown in the Plans and as provided for through the plat-approval process so that the residents of the lots of the Subdivision may receive drinking water service from the Utility. Upon completion of the water distribution system and upon its approval and acceptance by the Utility, the Subdivider will convey to the Utility all right and title to the water distribution system.

The Subdivider has paid the Utility the sum of \$\_\_\_\_\_ which sum represents the total costs of water meters, water rights acquisition fees, and all membership or other fees associated with connecting the individual lots in the Subdivision to the Utility's water supply system.

The above provisions notwithstanding, this Agreement shall no longer be in effect if the plat of the Subdivision is not approved by Liberty County or by a municipality whose approval is required.

By affixing his or her signature to this Agreement, the person signing for the Utility warrants that he or she is authorized to sign this Agreement on behalf of the Utility. By affixing his or her signature to this Agreement, the person signing for the Subdivider warrants that he or she is authorized to sign this Agreement on behalf of the Subdivider.

This Agreement is effective on \_\_\_\_\_, 20 .

The Utility

By: \_\_\_\_\_  
Printed \_\_\_\_\_ Name: \_\_\_\_\_  
Office \_\_\_\_\_ or \_\_\_\_\_ Position: \_\_\_\_\_  
Date: \_\_\_\_\_

The Subdivider

By: \_\_\_\_\_  
Printed Name: \_\_\_\_\_  
Office or Position: \_\_\_\_\_  
Date: \_\_\_\_\_

APPENDIX D. SAMPLE FORM FOR WASTEWATER SERVICE AGREEMENT

AGREEMENT REGARDING WASTEWATER SERVICE FOR THE PROPOSED  
\_\_\_\_\_ SUBDIVISION

PARTIES: This Agreement is by and between the Utility and the Subdivider, to wit:  
The Utility is the governing board or owner of a retail public utility which provides wastewater treatment and is known as \_\_\_\_\_.

The Subdivider is \_\_\_\_\_,  
who is the owner, or the authorized agent of the owner, of a tract of land in Liberty  
County, Texas, that has been proposed to be divided into a subdivision (the Subdivision) known  
as \_\_\_\_\_.

TERMS: The Subdivider has prepared a plat of the Subdivision for submission to Liberty County for its approval. The Subdivider plans to construct for the Subdivision a wastewater collection system to be connected to the Utility's wastewater treatment system. Such wastewater will consist of domestic sewage, i.e., waterborne human waste and waste from domestic activities such as bathing, washing, and food preparation. The Utility has reviewed the plans for the Subdivision (the Plans) and has estimated the wastewater flow projected from the Subdivision under fully built-out conditions (the projected wastewater flow) to be approximately \_\_\_\_\_ gallons daily.

The Utility covenants that it has or will have the capacity to treat the projected wastewater flow, and that it will treat that wastewater flow for at least thirty years. These covenants will be in effect until thirty years after the plat of the Subdivision has been recorded and the Subdivision's wastewater collection system has been connected to the Utility's wastewater treatment plant.

The Subdivider covenants that the wastewater collection system will be constructed as shown in the Plans and as provided for through the plat approval process so that the residents of the lots of the Subdivision may receive wastewater treatment service from the Utility. Upon completion of the wastewater collection system and upon its approval and acceptance by the Utility, the Subdivider will convey to the Utility all right and title to the wastewater collection system.

Insert the following paragraph if the Utility imposes any fees for connection of individual lots to the Utility's wastewater collection and treatment system:

The Subdivider has paid the Utility the sum of \$ \_\_\_\_\_ which sum represents the total costs of tap fees, capital recovery charges, and other fees associated with connecting the individual lots in the Subdivision to the Utility's wastewater collection and treatment system.

The above provisions notwithstanding, this Agreement shall no longer be in effect if the plat of the Subdivision is not approved by Liberty County or by a municipality whose approval is required.

By affixing his or her signature to this Agreement, the person signing for the Utility warrants that he or she is authorized to sign this Agreement on behalf of the Utility. By affixing his or her signature to this Agreement, the person signing for the Subdivider warrants that he or she is authorized to sign this Agreement on behalf of the Subdivider.

This Agreement is effective on \_\_\_\_\_, 20 .

The Utility

By: \_\_\_\_\_ PrintedName: \_  
Office                      or                      Position: \_\_\_\_\_ Date: \_\_\_\_\_

The Subdivider

By: \_\_\_\_\_ PrintedName: \_  
Office                      or                      Position: \_\_\_\_\_ Date: \_\_\_\_\_

# **APPENDIX E**

## **(Not Used)**

**APPENDIX F**

**Concrete Pavement Details Contraction Design**



DATE:  
FILE:

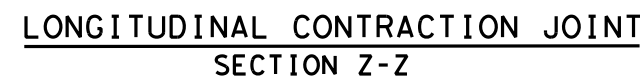
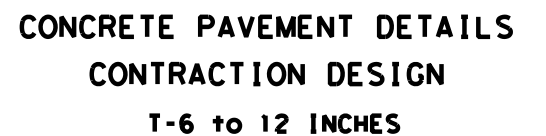


TABLE NO.1 DOWELS (SMOOTH BARS)		
SLAB THICKNESS T (IN.)	BAR DIA. AND LENGTH	AVERAGE SPACING (IN.)
6 to 7.5	1" X 18"	12
8 to 10	1 1/4" X 18"	12
>= 10.5	1 1/2" X 18"	12

SLAB THICKNESS T (IN.)	BAR SIZE	AVERAGE SPACING (IN.)
6 to 7.5	#5	24
>= 8	#6	24

1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND LOAD TRANSFER DEVICES REFER TO THE GOVERNING SPECIFICATION FOR "CONCRETE PAVEMENT".
3. THE SPACING BETWEEN TRANSVERSE CONTRACTION JOINTS SHALL BE 15 FT. UNLESS OTHERWISE SHOWN IN THE PLANS.
4. TRANSVERSE CONSTRUCTION JOINTS MAY BE FORMED BY USE OF METAL OR WOOD FORMS EQUAL IN DEPTH TO THE DEPTH OF PAVEMENT, OR BY METHODS APPROVED BY THE ENGINEER.
5. USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL THE FORMED JOINTS.
6. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
7. THE JOINT BETWEEN OUTSIDE LANE AND SHOULDER SHALL BE A LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) UNLESS OTHERWISE SHOWN IN THE PLANS. THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS ( $T/3$ ).
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
10. WHEN AN MONOLITHIC CURB IS SPECIFIED, THE JOINT IN THE CURB SHALL COINCIDE WITH PAVEMENT JOINTS AND MAY BE FORMED BY ANY MEANS APPROVED BY THE ENGINEER.
11. DOWEL BAR PLACEMENT TOLERANCE SHALL BE  $\pm 1/4$  IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.
12. THE DETAIL FOR JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."

**SHEET 1 OF 2**

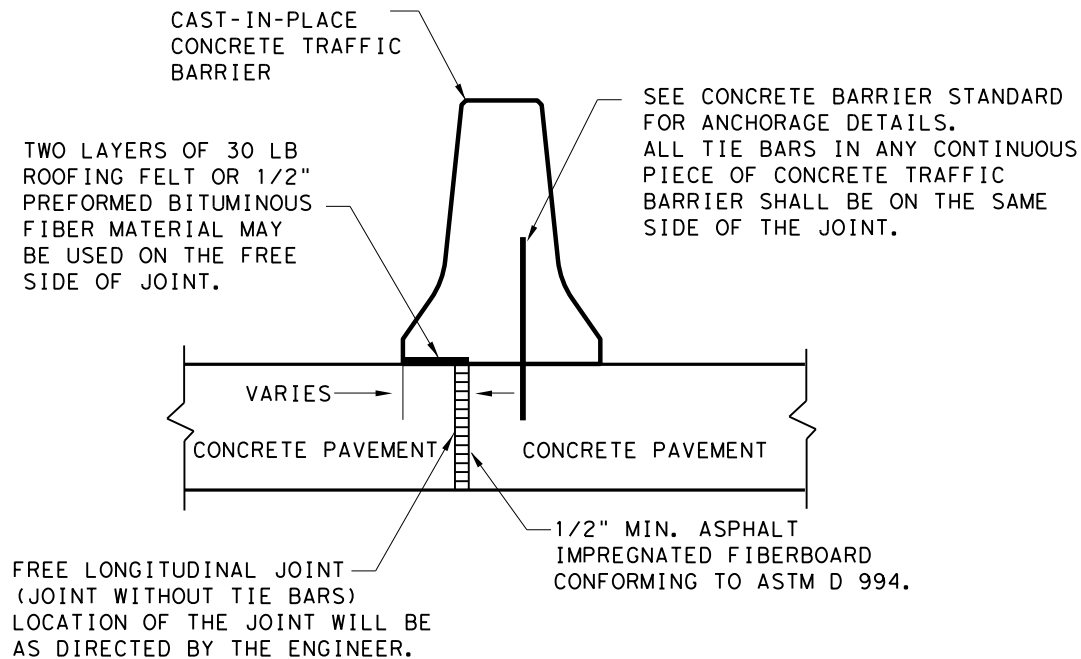


**CPCD-14**

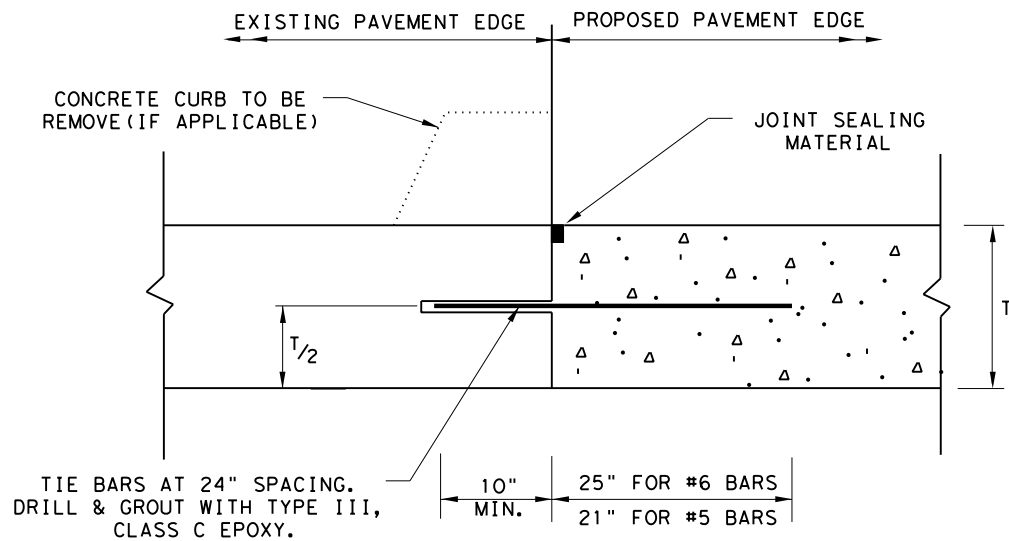
FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
③ TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:  
FILE:

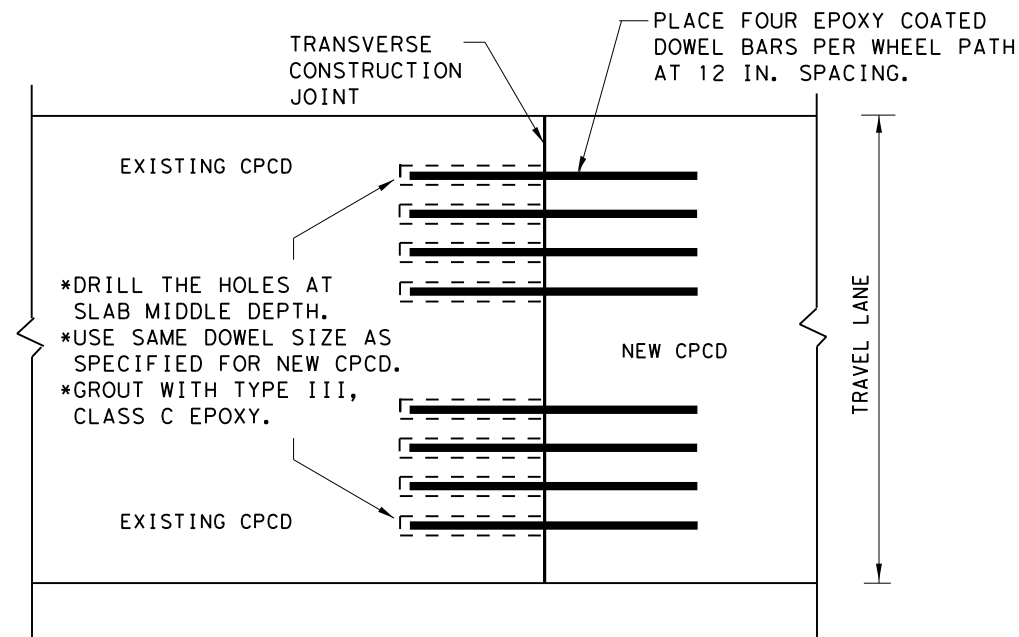


**FREE LONGITUDINAL JOINT DETAIL**

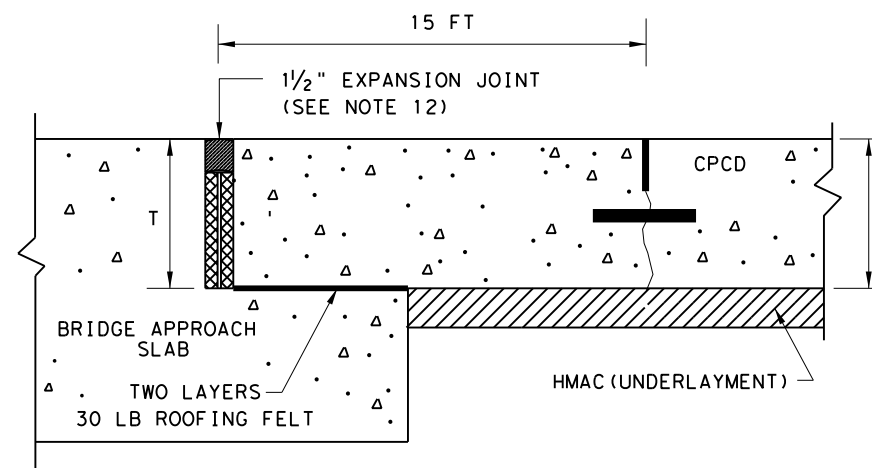


1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 BARS FOR 8" AND THICKER SLABS, USE #5 BARS FOR LESS THAN 8" THICK SLABS.
3. THE TRANSVERSE JOINTS OF PROPOSED PAVEMENT SHALL COINCIDE WITH EXISTING PAVEMENT JOINTS UNLESS OTHERWISE SHOWN ON THE PLANS.

**LONGITUDINAL WIDENING JOINT DETAIL**



**TRANSVERSE JOINT DETAIL  
EXISTING CPCD TO NEW CPCD  
PLAN VIEW (NOT TO SCALE)**



**TRANSVERSE EXPANSION JOINT DETAIL  
AT BRIDGE APPROACH**

SHEET 2 OF 2



**CONCRETE PAVEMENT DETAILS  
CONTRACTION DESIGN  
T-6 to 12 INCHES**

**CPCD-14**

FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DN: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.	

**APPENDIX G**

**TXDOT Special Specification 3016 for**

**Roller Compacted Concrete**

# Special Specification 3016

## Roller Compacted Concrete



### 1. DESCRIPTION

Construct roller compacted concrete (RCC) pavement. RCC will provide the final riding surface unless shown on the plans as base course where it will be covered with one or more lifts of asphalt concrete pavement.

This specification references select Sections in Items 360, 420, and 421 of the Texas Department of Transportation's Standard Specifications for Construction and Maintenance for Highways, Streets, and Bridges incorporating current Texas Department of Transportation required special provisions to the Items. Contractor must comply with Item 360, "Concrete Pavement" unless otherwise specified herein.

### 2. MATERIALS

Furnish materials in accordance with Section 421.2, "Materials" of Item 421, "Hydraulic Cement Concrete" and meet requirements of the following:

- 2.1. **Aggregate.** Meet the requirements of Section 421.2.6, "Aggregate" except for gradation and additional requirements shown below. For aggregate, use a well-graded aggregate and conforming to one of the combined gradation(s) shown in Table 1.

Table1  
RCC Combined Aggregate Gradation

Sieve Size	RCC Surface Course - Percent Passing by Weight	RCC Base/Subbase Course - Percent Passing by Weight
1"	100	100
3/4"	100	90-100
1/2"	70-90	70-90
3/8"	60-85	60-85
#4	40-60	40-60
#16	20-40	20-40
#100	6-18	0-10
#200	0-8	----

The surface course gradation may be used for a RCC base/subbase course. The base/subbase gradation is not allowed for a surface course mix.

The maximum Plasticity Index (PI) for materials passing the #40 sieve is four (4).

The use of recycled crushed hydraulic cement concrete as a coarse or fine aggregate is allowed. Limit recycled crushed concrete fine aggregate to a maximum of 20% of the fine aggregate.

- 2.2. **RCC Mix Design.** Design the RCC mix to meet Sections 421.4.2, "Mix Design Proportioning" and 421.4.3, "Concrete Trial Batches" except for the following;

- The requirements of Table 8 in Item 421 do not apply to RCC;
- The requirements of Table 9 along with all requirements for slump, and mix design options in Item 421 do not apply to RCC. The mix shall be stiff enough to support the compaction equipment and while containing adequate cement paste, evenly distributed, to achieve the required strengths.
- The use of Type III cement or accelerators is not allowed unless field demonstrated to allow adequate time for placement and compaction and approved by the Engineer.
- Develop design strength in accordance with the following procedure:

1. Select Aggregates meeting the requirements of Section 2.1, "Aggregate"
2. Select a minimum of three cementitious contents. (Select the cementitious contents such that one content will be at an estimated optimum content, a minimum of one additional content below estimated optimum and a minimum of one above estimated optimum)
3. Determine the optimum moisture content for each cementitious content in accordance with ASTM D 1557, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort."
4. Cast three samples at optimum moisture content for each cementitious content in accordance with ASTM C 1435, "Standard Practice for Molding Roller-Compacted Concrete in Cylinder Molds Using a Vibrating Hammer."
5. Unless otherwise approved, test all specimens cast for compressive strength in accordance with Tex-418-A at 28 days. Plot the obtained compressive strengths (psi) with their cementitious contents (%). Determine the optimum cementitious content to have a minimum compressive strength of 4,000 psi at 28 days.
6. If the determined optimum cementitious content varies significantly from all cementitious contents used for specimens, determine the optimum moisture content in accordance with ASTM D1557 at the determined optimum cementitious content, recast three specimens in accordance with ASTM C 1435, and test recast specimens with Tex-418-A to verify the compressive strength.

- 2.3. **Curing Compound.** Provide Type 2 membrane curing compound conforming to DMS 4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants." Provide SS 1 emulsified asphalt conforming to Item 300, "Asphalts, Oils, and Emulsions," for RCC pavement to be overlaid with asphalt concrete under this Contract unless otherwise shown on the plans or approved.

---

### 3. EQUIPMENT

Construct roller compacted concrete with any combination of equipment that will produce a completed pavement meeting the requirements for mixing, transporting, placing, compacting, finishing, and curing and in accordance with this specification. Meet the requirements of Section 421.3, "Equipment" except as follows. The mixing equipment will only include the Pugmill and Central-Mixed.

All equipment shall allow for the following requirements to insure quality production.

- **Inspection of Equipment.** Before start-up, the Contractor's equipment will be carefully inspected. Should any of the equipment fail to operate properly, cease work until the deficiencies are corrected.
- **Access for Inspection and Calibration.** Provide the Engineer or their representative access at all times for any plant, equipment, or machinery to be used in order to check calibration, scales, controls, or operating adjustments.
- **Measurement of Materials.** Meet the requirements of 421.4.5, "Measurement of Materials," except that Section 4.4.2, Table 2, "Tolerances for Mixture Ingredients" applies.

- 3.1. **Mixing Plant.** Locate the mixing plant within a thirty-minute haul time from the point of RCC placement. Use only plants capable of producing an RCC pavement mixture in the proportions defined by the final approved mix design and within the specified tolerances. The capacity of the plant must be sufficient to produce a uniform mixture at a rate compatible with the placement equipment.

If the plant is unable to produce material at a rate adequate to prevent unnecessary cold joints and frequent paver stoppages, the Engineer may halt production until such time that a plant of appropriate capacity is used. Provide and operate plants in accordance with the requirements here and Section 421.4.6, "Mixing and Delivering Concrete."

- 3.1.1. **Pugmill Plant.** Use only pugmill plants of the central plant type with a twin-shaft mixer, capable of batch or continuous mixing, equipped with synchronized metering devices and feeders to maintain the correct

proportions of aggregate, cement, pozzolan, water and chemical admixtures, capable of producing a uniform mixture. Other pugmill plant requirements are as follows:

- **Aggregate Storage.** If previously blended aggregate is furnished, storage may be in a stockpile from which it is fed directly to a conveyor feeding the mixer. If aggregate is furnished in two size groups, follow proper stockpiling techniques to ensure aggregate separation.
- **Aggregate Feed Rate.** Use aggregate bins with a feed rate controlled by a variable speed belt, or an operable gate calibrated to accurately deliver any specified quantity of material. If two aggregate size stockpile sources are used, the feed rate from each bin must be readily adjustable to change aggregate proportions, when required. Feed rate controls must maintain the established proportions of aggregate from each stockpile bin when the combined aggregate delivery is increased or decreased.
- **Cement and Pozzolan Material Storage.** Supply separate and independent storage silos for portland cement and pozzolan.
- **Preblended Portland Cement and Pozzolan.** If using on-site preblended portland cement and pozzolan (such as fly ash or slag), employ blending equipment acceptable to the Engineer and demonstrate, with a testing plan, the ability to successfully produce a uniform blended material meeting the mix design requirements. Perform testing on at least a daily basis to ensure both uniformity and proper quantities.
- **Cement and Pozzolan Feed Unit.** Provide a satisfactory means of dispensing portland cement and pozzolan, volumetrically or by weight, to ensure a uniform and accurate quantity of cementitious material enters the mixer.
- **Water Control Unit.** Use a water control unit capable of measuring the required amount of water for the approved mix by weight or volume. Ensure that the unit is equipped with an accurate metering device. Vary the amount of water to be used only with the approval of the Engineer.
- **Gob Hopper.** For continuous operating pugmills, provide a gob hopper attached to the end of the final discharge belt to temporarily hold the RCC discharge in order to allow the plant to operate continuously.

### 3.1.2.

**Central Mixed Rotary Drum.** Provide a rotary drum batch mixer capable of producing a homogeneous mixture, uniform in color, and having all coarse aggregate coated with mortar. Equip the mixer with batching equipment to meet the following requirements:

- **Weighing Equipment.** Measure the amounts of cement, pozzolan, and aggregate entering into each batch of RCC by direct weighing equipment. Use only weighing equipment that is readily adjustable in order to compensate for the moisture content of the aggregate or to change the proportionate batch weights. Include a visible dial or equally suitable device that will accurately register the scale load from zero to full capacity. The cement and pozzolan may be weighed separately or cumulatively in the same hopper on the same scale, provided the cement is weighed first.
- **Weigh Hoppers.** Use only bulk cement and pozzolan weigh hoppers that are equipped with vibrators to operate automatically and continuously while weighing hoppers are being dumped. Ensure that the weigh hopper has sufficient capacity to hold not less than 10 percent in excess of the cementitious material required for one batch.
- **Water Metering.** Measure the amount of water entering each batch of RCC by weight or volume. Use only equipment capable of measuring the water to within a tolerance of plus or minus one percent and equipped with an accurate gauge or dial measuring device. Vary the amount of water to be used only with the approval of the Engineer. During batching, admit water to the mixer only through the water measuring device and then only at the time of charging.
- **Mixing Time.** Use only drum mixers equipped with an accurate clock or timing device, capable of being locked, for visibly indicating the time of mixing after all the materials, including the water, are in the mixer.
- **Recharging.** Discharge all material in the drum before recharging. Ensure that the volume of mixed material per batch does not exceed the manufacturer's rated capacity of the mixer.

- 3.1.3. **Alternate Plants.** Obtain approval from the Engineer to use other type plants. Demonstrate that the mixing equipment has the ability to produce a consistent, well-blended, non-segregated RCC mix meeting capacity requirements and tolerances of this specification. Meet the requirements of Section 421.4.6, "Mixing and Delivering Concrete."
- 3.2. **Paver.** Place RCC with an asphalt-type paver manufactured with a high-density screed subject to approval by the Engineer. Use only pavers equipped with compacting devices capable of producing an RCC pavement with a minimum of 90 percent of the maximum density in accordance with Tex-451-A (ASTM C 1040, "Standard Test Methods for In-Place Density of Unhardened and Hardened Concrete, including Roller Compacted Concrete, By Nuclear Methods") prior to any additional compaction. Ensure that the paver is of suitable weight and stability to spread and finish the RCC material, without segregation, to the required thickness, smoothness, surface texture, cross-section, and grade.
- 3.3. **Compactors.** Use self-propelled steel drum vibratory rollers having a minimum static weight of 10 tons for primary compaction. For final compaction, use either a steel drum roller, operated in a static mode, or a rubber-tired (pneumatic) roller of equal or greater weight. Use walk-behind vibratory rollers or plate tampers for compacting areas inaccessible to large rollers.
- 3.4. **Haul Trucks.** Use trucks for hauling the RCC material from the plant to the paver fitted and equipped with retractable protective covers for protection from inclement weather or excessive evaporation. To ensure adequate and continuous supply of RCC material to the paver, have a sufficient number of trucks. If the number of trucks is inadequate to prevent frequent starts and stops of the paver, cease production until additional trucks are obtained.
- 3.5. **Water Trucks.** Keep at least one water truck, or other similar equipment, on-site and available for use throughout the paving and curing process. Equip such equipment with a spreader pipe containing fog spray nozzles capable of evenly applying a fine spray of water to the surface of the RCC without damaging the final surface.

---

#### 4. CONSTRUCTION REQUIREMENTS.

- 4.1. **Submittals for Proposed RCC Mix Design and Paving/Joining Plan**
- 4.1.1. **Proposed RCC Mix Design.** Submit a proposed mix design to the Engineer for review. If accepted by the Engineer, prepare and test a trial batch mixture at the Contractor's facilities to verify that the design criteria for strength are met in accordance with 421.4.3, "Concrete Trial Batches." Perform batch mixture preparation and testing in the presence of representatives of the Engineer. Make no production until the mix design has been reviewed and the Engineer has given authorization to proceed.
- 4.1.2. **Proposed Paving/Joining Plan.** Submit a paving plan that includes paving sequence, hand pour areas, locations of cold joints, transverse contraction joints, and joints at structures. Use following guides when develop the Paving/Joining Plan.
- Avoid odd-shaped RCC slabs
  - Avoid joint intersection angles less than 60°
  - Space transverse contraction joints at 20 ft. spacing
  - Saw cut the transverse contraction joint through the curb when RCC has curb.
  - Appropriately make field adjustment for joint locations to meet the inlets and manholes
- 4.2. **Storage of Materials.** Meet the requirements of 421.2.8, "Storage of Materials."
- 4.3. **Sampling and Testing of Concrete.** Unless otherwise specified, all fresh and hardened concrete is subject to testing as follows:
- 4.3.1. **Sampling Fresh Concrete.** Provide all material to be tested. Fresh concrete will be sampled for testing at the discharge end if using belt conveyors or pumps. When it is impractical to sample at the discharge end, a

sample will be taken at the time of discharge from the delivery equipment and correlation testing will be performed and documented to ensure specification requirements are met at the discharge end.

4.3.2. **Testing of Fresh Concrete.**

- Temperature. Tex-422-A.
- In-Place Field Density Testing. Tex-451-A (ASTM C-1040)
- Making and Curing Strength Specimens. ASTM C-1435 and ASTM C-31 (for cast-in-place concrete).

4.3.3. **Testing of Hardened Concrete.** Only compressive strength testing in accordance with Tex-418-A will be used unless otherwise specified or shown on the plans.

4.3.4. **Quality Control Test Specimens.** For each day's production, up to 1500 cubic yards of mix produced, prepare at least two sets of test specimens in accordance with ASTM C-1435 and ASTM C-31 under the direct observation of the Engineer or Engineer's representative. A set of specimens consists of three cylinders. Make an additional two sets for each additional 1500 cubic yards or fraction thereof. Cure and transport the specimens to the Contractor's curing tank. The Engineer will test two cylinders for compressive strength in accordance with Tex-418-a at 7 days. If the measured compressive strength between two cylinders varies by more than 10 percent of the stronger cylinder, the Engineer will test the third cylinder and average the results of the three cylinders. Otherwise, the Engineer will average the measured compressive strengths of the two cylinders tested at 28 days to determine the compressive strength of the lot.

The Engineer may adjust compressive strength targets at 7 days as production continues based on field experience.

4.4. **Mixing Process.** Use the same mixture for the entire project unless otherwise stated in the project documents. If, during production, the source of hydraulic cement, pozzolan, or aggregates is changed, then suspend production and submit a new mix design to the Engineer for approval. Do not exceed the manufacturer's rated capacity for dry concrete mixtures in the mixing chamber. Keep the sides of the mixer and mixer blades free of hardened RCC or other buildups. Routinely check mixer blades for wear and replace if wear is sufficient to cause inadequate mixing.

4.4.1. **Mixing Time.** Use a mixing time adequate to ensure a thorough and complete mixing of all materials. Do not allow the mixing time, after all materials including water are in the mixer, to be less than 1½ minutes for one cubic yard and 20 seconds for each additional cubic yard.

4.4.2. **Mixture Ingredient Tolerances.** Measure mixing water, consisting of water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates, and water introduced in the form of admixtures, by volume or weight. Measure ice by weight. Correct batch weight measurements for moisture. Ensure that the mixing plant receives the quantities of individual ingredients to within the tolerances shown in Table 2.

Table 2  
Tolerances for Mixture Ingredients

Material	Variation
Cementitious Materials, wt.	± 2.0%
Water, wt or volume	± 3.0%
Aggregates, wt	± 4.0%
Admixtures, wt. or volume	± 3.0%

4.4.3. **Plant Calibration.** Prior to commencement of RCC production, carry out a complete and comprehensive calibration of the plant in accordance with the manufacturers recommended practice.

Provide all scales, containers, and other items necessary to complete the calibration. For volumetric mixers, provide test data showing mixers meet the uniformity test requirements of Tex-472-A.



- 4.4.4. **Daily Reports.** Supply daily plant records of production and quantities of materials used that day to the Engineer. These records may be used as a check on plant calibration.
- 4.5. **Transportation.** Transport the RCC pavement material from the plant to the areas to be paved in dump trucks equipped with retractable protective covers for protection from rain or excessive evaporation. Ensure that the trucks are dumped clean with no buildup or hanging of RCC material in the corners. Have the dump trucks deposit the RCC material directly into the hopper of the paver or into a secondary material distribution system that deposits the material into the paver hopper. Dump truck delivery must be timed and scheduled so that RCC material is spread and compacted within the specified time limits.
- 4.6. **Placing.**
- 4.6.1. **Subbase Condition.** Prior to RCC placement, meet the requirements of the pertinent Item for the underlying layer and ensure that the surface of the subbase is clean and free of foreign material, ponded water, and frost. Ensure that the subbase is uniformly moist at the time of RCC placement. If sprinkling of water is required to remoisten certain areas, ensure that the method of sprinkling will not form mud or pools of freestanding water.
- 4.6.2. **Weather Conditions.**
- **Cold Weather Precautions.** Meet the requirements of Section 360.4.7.3, "Temperature Restrictions."
  - **Hot Weather Precautions.** During periods of hot weather or windy conditions, take special precautions to minimize moisture loss due to evaporation. Cooling of aggregate stockpiles by shading or the use of a fine mist may be required. Protective covers may be required on dump trucks. Keep the surface of the newly placed RCC pavement continuously moist.
  - **Rain Limitations.** Conduct no placement of RCC pavement during rain conditions sufficient to be detrimental to the finished product. Placement may continue during light rain or mists provided the surface of the RCC pavement is not eroded or damaged in any way. Use dump truck covers during these periods. The Engineer may suspend paving when, in the Engineer's judgment, the rain is detrimental to the finished product.
- 4.6.3. **Paver Requirements.** Place all RCC with an approved paver in accordance with in Section 3.2, "Paver" and the following:
- **Filling the Paver.** Do not allow the quantity of RCC material in the paver to approach empty between loads. Maintain the material above the auger at all times during paving. Material transfer devices are allowed at the option of the contractor.
  - **Stopping the Paver.** Ensure that the paver proceeds in a steady, continuous operation with minimal starts and stops, except to begin a new lane. Maximum paver speed during laydown is 10 feet per minute. Higher paver speeds may be allowed at the discretion of the Engineer if the higher speeds may be obtained without distress to the final product or cause additional starts and stops.
  - **Surface Condition.** Ensure that the surface of the RCC pavement is smooth, uniform, and continuous without excessive tears, ridges, or aggregate segregation once it leaves the paver.
- 4.6.4. **Inaccessible/Transition Areas.** When approved by the Engineer, inaccessible areas to either the rollers or the paver, or other areas such as transitions may be paved with cast-in-place concrete in accordance with the requirements of Item 360 and CPCD-14 standard sheet or as shown in the plans.
- 4.6.5. **Adjacent Lane Pavement.** Place adjacent paving lanes within 60 minutes. If more than 60 minutes elapses between placement of adjacent lanes, the vertical joint must be considered a cold joint and prepared in accordance with Section 4.8.2, "Cold Vertical Joints". At the discretion of the Engineer, this time may be increased or decreased depending on ambient conditions of temperature, wind, and humidity. Multiple pavers may be used in tandem to reduce the occurrence of cold joints.

- 4.6.6. **Hand Spreading.** Broadcasting or fanning the RCC material across areas being compacted is not permissible. Such additions of materials may only be done immediately behind the paver and before any compaction has taken place. Remove segregated coarse aggregate from the surface before rolling.
- 4.6.7. **Segregation.** Suspend placement if segregation occurs in the RCC during paving operations until the cause is determined and corrected to the satisfaction of the Engineer. If the segregation is judged by the Engineer to be severe, remove and replace the segregated area at no additional cost to the Department.
- 4.7. **Compaction.**
- 4.7.1. **Time to Compaction.** Ensure that compaction begins with the placement process and is completed within 60 minutes of the start of the mixing at the plant and in compliance with the previously submitted paving plan. The time may be increased or decreased at the discretion of the Engineer depending on ambient conditions of temperature and humidity and the use of chemical admixtures. Do not delay rolling unless approved by the Engineer.
- 4.7.2. **Rolling.** Establish the sequence and number of passes by vibratory and non-vibratory rollers to obtain the specified density and surface finish. Only operate rollers in the vibratory mode while in motion. Rubber-tire rollers may be used for final compaction. Use additional rollers if specific density requirements are not obtained or if placing operations outpace the rolling operations.
- 4.7.3. **Rolling Longitudinal and Transverse Joints.** Do not operate the roller within 2 feet of the edge of a freshly placed lane until the adjacent lane is placed. Upon placement, roll both edges of the lanes simultaneously within the allowable time. If a cold joint is planned or expected, roll the complete lane and follow cold joint procedures as specified in Section 4.8.2, "Cold Vertical Joints" .
- 4.7.4. **Inaccessible Areas.** Compact areas inaccessible to large rollers using walk-behind rollers or hand tampers.
- 4.7.5. **Density Requirements.** Perform field density tests at a frequency of 2 for 1500 cubic yards placed as soon as possible, but no later than 30 minutes after the completion of the rolling. Only wet density is used for evaluation. The required minimum density is 98 percent of the maximum laboratory density obtained according to Tex-451-A (ASTM C 1040). The in-place density and moisture content may be determined with a nuclear moisture-density gauge. Calibrate the gauge for moisture content at the beginning of the work and at any time during the work. RCC properly placed and compacted, but not meeting the density requirements, shall be cored and tested at the Contractor's expense. If the tested area achieves 28-day design strength, it will be paid at the full unit price. If the tested area indicates strength less than 4,000 psi but greater than 3,650 psi, payment will be made in accordance with Table 3.

If the cores indicate strengths less than 3,650 psi at 28 days or longer, the Department will evaluate the results and may reject the affected area and require removal and replacement or elect to pay at an appropriate reduced rate. The Engineer may allow areas with strengths less than 3,650 psi to remain in place with no pay.

The area for pay adjustment will be determined by the Engineer and may be further defined by their direction for additional cores.

Table 3  
Price Reduction

Compressive Strength (psi)	Price Reduction (percent of unit bid price)
3999-3800	5
3799-3650	15

- 4.8. **Joints.** Multiple pavers may be used in tandem to reduce the occurrence of cold joints.

- 4.8.1. **Fresh Vertical Joints.** A joint is considered a fresh joint when an adjacent RCC lane is placed within 60 minutes of placing the previous lane or as specified by the Engineer based on ambient conditions. The time may be increased or decreased at the discretion of the Engineer depending on ambient conditions of temperature and humidity and the use of chemical admixtures. Other than rolling procedures, fresh joints do not require special treatment.
- 4.8.2. **Cold Vertical Joints.** Any planned or unplanned construction joints that do not qualify as fresh joints are considered cold joints. Prior to placing fresh RCC mixture against a compacted cold vertical joint, thoroughly clean the cold joint of loose or foreign material. Wet the vertical joint face and maintain it in a moist condition immediately prior to placement of the adjacent lane.
- For uncompacted surfaces or slopes more than 15 degrees from the vertical, cut the joint vertically for the full depth. Within 2 hours of final compaction, the edge of a cold joint may be cut with approved mechanical equipment. For edges cut after 2 hours, saw-cut to the full depth of the pavement.
- Demonstrate any modification or substitution of the saw-cutting procedure to the Engineer for approval prior to use. In no case allow cutting of the edge to cause raveling or tearing of the surface. Moisten the cut edge immediately prior to placement of the adjacent lane.
- For all longitudinal cold joints, route the joint ¼ inch wide and seal in accordance with Section 360.2.7, "Joint Sealants and Fillers."
- 4.8.3. **RCC Pavement Joints at Structures.** Line structures such as manholes, valves, or concrete curb and gutter with preformed joint filler in accordance with DMS-6310, "Joint Sealants and Fillers" for Class 6 Preformed Seals. Provide preformed joint fillers with a thickness equal to the width of the joint required and furnish in lengths equal to the width of the slabs in which they are installed. Use preformed joint filler shaped so that, after installation, the upper and lower surfaces conform to the shape of the slab and subbase surfaces. Position the lower surface of the preformed joint filler on or below the surface of the base while the upper surface is ½ inch below the surface of the slab unless otherwise specified.
- 4.8.4. **Control Joints.** Construct transverse contraction joints in the RCC pavement by sawing. Green-cut shall be utilized as soon as possible behind the rolling operation to prevent random cracking, typically one (1) to four (4) hours. Cut all joints to 1/4 the depth of the RCC pavement to a single saw blade width. Joints should be spaced at intervals of 20 ft for all pavement thicknesses and follow the guides in Section 4.1.2. Control joints shall be sealed in accordance with Section 360.2.7, "Joint Sealants and Fillers."
- 4.9. **Multi-lift Placements.** Do not exceed 60 minutes between the start of moist mixing and the end of compaction of any load of RCC in multi-layer construction. Where two or more layers are to be constructed consecutively, do not exceed 120 minutes between the start of moist mixing of the material for the bottom layer and completion of finish, grading, and compaction of the top layer. Grading or operating graders, compacting, or finishing is not allowed after the specified times have elapsed, however, the time may be increased or decreased at the discretion of the Engineer depending on ambient conditions of temperature and humidity and the use of chemical admixtures. Multiple pavers may be used in tandem to reduce the occurrence of cold joints. Keep the surface of the underlying layers moist by fog-spray until covered by the next layer.
- 4.10. **Finishing.** Ensure that the finished surface of the RCC pavement, when tested with a 10-foot straightedge or crown surface template, does not vary from the straightedge or template by more than 1/4 inch at any one point and shall be within 5/8 inch of the specified finished grade. When surface irregularities are outside these tolerances, diamond-grind the surface to meet the tolerance. Corrective measures are at the Contractor's cost and will not be reimbursed.
- For final surfaces, provide a uniform diamond grind texture on all areas under traffic prior to opening to traffic. Target a diamond grind texture of 0.04 in. as measured by Tex-436-A. Correct any location with a texture less than 0.03 in. by performing additional diamond grinding.

For surfaces where an overlay is the final riding surface, unless otherwise directed, correct grade deviations greater than 1/2 in. in 16 ft. measured longitudinally or greater than 1/2 in. over the entire width of the cross-section.

- 4.11. **Curing.** Immediately after final rolling and compaction testing, keep the surface of the RCC pavement continuously moist until an approved curing compound, a suitable prime coat, or a layer of asphalt concrete is applied or for 72 hours after placement, whichever comes first. Apply water cure by water trucks equipped with fog spray nozzles, soaking hoses, sprinkling system, or other means such that a uniform moist condition on the surface of the RCC is ensured. Apply this moisture in a manner that will not erode or damage the surface of the finished RCC pavement. Use either water cure or curing compound methods in Sections 4.11.1 and 4.11.2.
- 4.11.1. **Water Cure.** The use of wet mat curing is allowed in accordance with Section 420.4.10. "Curing Concrete" using interim Type 1-D curing compound and wet mats.
- 4.11.2. **Curing Compound.** Do not use curing compounds when the RCC material is to be promptly covered with asphalt. Apply curing compound conforming to DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" in accordance with Section 360.4.9, "Curing" with the exception of application will be prior to texturing. Provide SS-1 emulsified asphalt conforming to Item 300, "Asphalts, Oils, and Emulsions," for concrete pavement to be overlaid with asphalt concrete under this Contract unless otherwise shown on the plans or approved. Do not use emulsified asphalt when the RCC is the final surface.
- 4.12. **Opening to Traffic.** Protect the RCC from vehicular traffic during the curing period. Completed portions of the RCC pavement may be opened to light construction traffic as soon as the strength is sufficient to prevent visible damage to the RCC but no sooner than 24 hours. Water trucks will be allowed on the surface after compaction for the purposes of maintaining moisture. The pavement may be opened to unrestricted traffic after 72 hours and when the strength exceeds 2,500 psi. However, if the temperature drops below 40° F, then the period of time the temperature is below 40° F will be added to the minimum time to opening. Temperature will be based on the hourly ambient air temperature reported by the nearest National Weather Service station.
- 4.13. **Maintenance.** Maintain the RCC pavement in good condition until all work is completed and accepted at no additional cost to the Department.
- 4.14. **Thickness and Thickness Tolerance.** Provide and operate equipment capable of extracting a small (approximately 1 inch diameter or greater) core to determine the pavement thickness. Extract samples in the presence of the Engineer or Engineer's representative unless otherwise directed.

Repair the core holes using a packaged quick set repair mortar such as SikaQuick 1000 or approved equivalent or a Class 4000 or better ready mix concrete. Rod and neatly strike off the repair material.

Measure the thickness in the travel lanes of the completed RCC at staggered intervals not to exceed 500 feet in length for two-lane roads. Measure the core to the nearest 0.10 inch at three different, evenly spaced locations and record the average. Where the RCC is deficient in depth by more than 0.75 inch, take an additional core within 3 feet of the original core. If the average of the 2 cores is in excess of 0.75 inches, correct the area by removal and replacement. The extent of the area of correction will be determined by the Engineer and may be further defined by their direction for additional cores. The Engineer may allow areas in excess of 0.75 inches deficient to remain in place with no pay.

Where the thickness of a core shows to be deficient by more than 0.2 inches but 0.75 inches or less, a pay adjustment will be made in accordance with Section 6, "Payment" and Table 4. The area for pay adjustment will be determined by the Engineer and may be further defined by their direction for additional cores.

Table 4  
Deficient Thickness Price Adjustment Factor

Deficiency in Thickness Determined by Cores (in.)	Proportional Part of Contract Price Allowed (adjustment factor)
Not deficient	1.00
Over 0.00 through 0.20	1.00
Over 0.20 through 0.30	0.80
Over 0.30 through 0.40	0.72
Over 0.40 through 0.50	0.68
Over 0.50 through 0.75	0.57

- 4.15. **Ride Quality.** Unless otherwise shown on plans, measure the ride quality in accordance with Item 585, "Ride Quality for Pavement Surfaces," Surface Test Type B, with Pay Adjustment Schedule 2.

---

5. **MEASUREMENT**

RCC will be measured by the square yard completed and accepted in place. Pavement constructed outside the area designated to be paved will be not be measured for payment.

---

6. **PAYMENT**

RCC will be paid for at the unit price for RCC Pavement, of the thickness specified, which price and payment will be full compensation for furnishing all materials, equipment, tools, labor, and incidentals necessary to satisfactorily complete the work. Pavement that is deficient in thickness addressed in Section 4.14, "Thickness and Thickness Tolerance" and density/strength deficiencies addressed in Section 4.7.5, "Density Requirements," but is permitted to be left in place, will be paid at the reduced unit price as provided in Tables 3 and 4 or no pay in accordance with this Item. No compensation will be made for the materials or labor involved in the removal or replacement of defective material and for diamond grinding or other corrective measures to meet requirements.

Cast-in-place concrete placed in areas as allowed under Section 4.6.4., Inaccessible/Transition Areas, will be paid as roller compacted concrete.

Concrete curbs required will be for paid for under Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."

# **APPENDIX H**

## **Standard Forms for Maintenance Security**

Surety Bond:

PRINCIPAL:

SURETY: \_\_\_\_\_  
With an A.M. Best Company, rating of "A" or greater and authorized to write  
Bonds in the State of Texas

BENEFICIARY:

SUBDIVISION:

SUM:

DATE:

EXPIRATION DATE: Two years from Date of Bond

The PRINCIPAL and SURETY, a Corporation with an A.M. Best Company rating of "A" or greater and authorized to write bonds in the State of Texas, are jointly and severally held and bound unto the BENEFICIARY in the above stated sum in U.S. currency, and amount fixed by the BENEFICIARY pursuant to Chapter 232 of the Texas Local Government Code.

This Bond is conditioned on the faithful performance of the duties of the PRINCIPAL prior to the Expiration Date to provide for the construction and completion of the street and drainage Improvements in the SUBDIVISION to current Liberty County Road and Drainage Standards and Specifications so that the Improvements are performing to the Standards upon the approval of the construction of the Improvements.

Partial reductions in the Sum of this Bond may be allowed. Multiple recoveries less than the total amount of the Bond are allowed. If this Bond is unenforceable as a statutory Bond, the PRINCIPAL and SURETY shall be bound by this contract as a common law obligation.

In lieu of drawing on the BOND, BENEFICIARY, in its sole discretion, may accept a Substitute Bond in the then current amount of the estimated cost of constructing the Improvements in the SUBDIVISION.

PRINCIPAL

SURETY

By: \_\_\_\_\_  
Authorized Representative

By: \_\_\_\_\_  
Authorized Representative\*

\_\_\_\_\_  
Mailing Address

\_\_\_\_\_  
Mailing Address

\_\_\_\_\_  
City, State & Zip Code

\_\_\_\_\_  
City, State & Zip Code

\*A certified copy of the Bylaws of the Surety or a Power of Attorney evidencing the authority of the representative to sign this Bond obligation must be provided to the County.



Irrevocable Letter of Credit:

IRREVOCABLE LETTER OF CREDIT NO. \_\_\_\_\_

TO: \_\_\_\_\_,

County Judge of Liberty County, Texas and his successors in office

ISSUER: \_\_\_\_\_, a federally insured financial institution  
licensed to do business in the state of Texas

CUSTOMER:

AMOUNT OF SECURITY:

SUBDIVISION:

DATE OF POSTING:

EXPIRATION DATE: Two years from Date of Credit

The ISSUER hereby establishes this Credit and shall duly honor all drafts drawn and presented in accordance with this Credit. Liberty County may draw on the ISSUER for the account of the CUSTOMER up to the aggregate AMOUNT OF SECURITY.

This Credit is conditioned on the performance of the duties of the CUSTOMER prior to the Expiration Date to provide for the construction and completion of the street and drainage improvements in the SUBDIVISION to according to the adopted Rules & Regulations of Liberty County Road and Drainage Standards and Specifications and filing of the plat, so that the Improvements are performing to the Standards upon the approval of the construction of the Improvements.

The only requirement necessary to draw on any part or all of the total amount of this Credit is a letter from the County Judge indicating that the County considers a drawing on this Letter of Credit necessary in order to complete all or part of the SUBDIVISION Improvements to the County Standards. No further substantiation of the necessity for the draw is required by this Letter.

Partial reductions in the amount of this Credit may be allowed. Multiple recoveries less then the total amount of the Credit are allowed. If this Letter of Credit is unenforceable as a statutory obligation, the ISSUER shall be bound by this contract as a common law obligation.

Drafts must be presented on or before the EXPIRATION DATE by the close of business and will be honored within five (5) calendar days of presentment. In lieu of drawing on the Security, the County, in its discretion, may accept a substitute Security in the then current amount of the

estimated cost of constructing the Improvements. This credit may be revoked only by the written consent of the ISSUER and the County.

Except as expressly set forth herein, this credit is governed by the “Uniform Customs and Practices for Documentary Credits” (International Chamber of Commerce Publication No. 500 (1993)).

ISSUER

ADDRESS OF ISSUER

BY: \_\_\_\_\_

NAME: \_\_\_\_\_

TITLE: \_\_\_\_\_

Authorized Representative

**APPENDIX I**  
**On Site Sewage Facilities Order**

**ORDER ADOPTING RULES OF LIBERTY COUNTY, TEXAS  
FOR ON-SITE SEWAGE FACILITIES  
PREAMBLE**

WHEREAS, Liberty County by Order of Commissioner's Court adopted Rules for On-Site Sewage Facilities in 2011, six (6) years ago.

WHEREAS, Liberty County Commissioner's Court recognizes that during this time new rules have been established and there is at this time a necessity to adopt a new Order for On-site Sewage Facilities.

WHEREAS, the Texas Commission on Environmental Quality (TCEQ) has established Rules for on-site sewage facilities to provide the citizens of this State with adequate public health protection and a minimum of environmental pollution; and

WHEREAS, the Legislature has enacted legislation, codified as Texas Health & Safety Code (THSC), Chapter 366, which authorizes a local government to regulate the use of on-site sewage facilities in its jurisdiction in order to abate or prevent pollution or injury to public health arising out of the use of on-site sewage facilities; and

WHEREAS, due notice was given of a public meeting to determine whether the Commissioners Court of Liberty County, Texas should enact an order controlling or prohibiting the installation or use of on-site sewage facilities in the County of Liberty, Texas; and

WHEREAS, the Commissioners Court of Liberty County, Texas finds that the use of on-site sewage facilities in Liberty County, Texas is causing or may cause pollution, and is injuring or may injure the public health; and

WHEREAS, the Commissioners Court of Liberty County, Texas has considered the matter and deems it appropriate to enact an Order adopting Rules regulating on-site sewage facilities to abate or prevent pollution, or injury to public health in Liberty County, Texas.

**NOW, THEREFORE, BE IT ORDERED BY THE COMMISSIONERS COURT OF LIBERTY COUNTY, TEXAS:**

**SECTION 1.** THAT the matters and facts recited in the preamble hereof are hereby found and determined to be true and correct.

**SECTION 2.** THAT the use of on-site sewage facilities in Liberty County, Texas is causing or may cause pollution or is injuring or may injure the public health;

**SECTION 3.** THAT an Order for Liberty County, Texas be adopted entitled "On-Site Sewage Facilities", which shall read as follows:

**AN ORDER ENTITLED ON-SITE SEWAGE FACILITIES**

#### **SECTION 4. CONFLICTS.**

This Order repeals and replaces any other On-site Sewage Facility (OSFF) Order for Liberty County, Texas.

#### **SECTION 5. ON-SITE SEWAGE FACILITY REGULATION AND ENFORCEMENT.**

This Order hereby adopts Chapter 366 of the Texas Health & Safety Code, as amended, entitled On-Site Sewage Disposal Systems. The County of Liberty, Texas clearly understands that there are technical criteria, legal requirements, and administrative procedures and duties associated with regulating on-site sewage facilities, and will fully enforce Chapter 366 of the THSC and Chapters 7 and 37 of the Texas Water Code (TWC), and associated rules referenced in Section 8 of this Order.

#### **SECTION 6. AREA OF JURISDICTION.**

This Order shall apply to all areas lying within the jurisdiction of the County of Liberty, Texas except for those areas under an existing Order, Ordinance or Resolution and those areas which may be under the responsibility of the corresponding TCEQ Regional Office. The County may regulate OSSF matters in all areas within its area of jurisdiction without an existing Order, Ordinance or Resolution.

#### **SECTION 7. ON-SITE SEWAGE FACILITY RULES.**

Any owner of a building discharging sewage into an on-site sewage facility within the jurisdictional area of the County of Liberty must comply with this Order. Any permit issued for an on-site sewage facility within the jurisdictional area of the County of Liberty must comply with the Rules adopted in Section 8 of this Order.

#### **SECTION 8. ON-SITE SEWAGE FACILITY RULES ADOPTED.**

The Rules, Title 30 Texas Administrative Code (TAC) Chapter 30, Subchapters A and G, and Chapter 285 attached hereto, promulgated by TCEQ for on-site sewage facilities are hereby adopted, and all officials and employees of Liberty County, Texas having duties under said Rules are authorized to perform such duties as are required of them under said Rules.

#### **SECTION 9. INCORPORATION BY REFERENCE.**

The Rules, 30 TAC Chapters 30, Subchapters A and G, and Chapter 285 and all future amendments and revisions thereto are incorporated by reference and are thus made a part of these Rules.

## **SECTION 10. AMENDMENTS.**

The County of Liberty, Texas wishing to adopt more stringent Rules for its OSSF Order understands that the more stringent conflicting local Rule shall take precedence over the corresponding TCEQ requirement. Listed below are the more stringent Rules adopted by Liberty County, Texas:

- (A) Any tract, lot or parcel of land proposed to be occupied by more than one residence herein referred to "Multi-Residential Development" shall provide additional planning materials as referred in the current Rules under 285.4.Facility Planning, (c), (1 ), (A) through (H), Liberty County feels this requirement will provide equity for all residences on the tract, lot or parcel and provide the County additional information on how multiple residences will impact the area for the health and welfare of the area involved.
- (B) Site Evaluators, Professional Engineers, Registered Sanitarians, Installers and Maintenance Providers will use the standardized forms provided by the Liberty County Engineering Permit Division. Liberty County believes the use of standardized forms will provide less confusion for the public especially in the form of Maintenance Agreements.
- (C) A re-inspection fee in the amount of (One Hundred Dollars) \$100 will be assessed to the Installer if the installed system does not pass the Final Inspection and the County Inspector must return for an additional trip. The fee must be paid by check or money order to the Permit Clerk or Field Inspector prior to the re-inspection. This rule is necessary to offset additional time and fuel cost to travel to the inspection site.
- (D) Homeowners must keep in force a Maintenance Agreement by a licensed Maintenance Company for the first two (2) years of operation.
- (E) For the modification of an existing OSSF, a permit fee of \$90 (ninety dollars) plus \$10 (ten dollars to TCEQ) shall be charged along with all design calculations and drawings for the modification are provided. Since the initial permit fee was charged, the less amount will be charged for modifications.
- (F) The Liberty County Engineering and Permit Department reserves the right at some future date to implement a County Operated Maintenance Inspection Department for all OSSF systems with an inspection fee accessed to the Home Owner in lieu of inspections by third party maintenance providers.
- (G) Latitude and Longitude shall be provide by Site Evaluator for all boreholes dug on the proposed OSSF site. This is necessary for field inspectors to locate test holes.

- (H) All Site Evaluations, Septic Designs and any planning material must have original Signature, date and seal. This includes Site Evaluators, Registered Sanitarians and Professional Engineers. The seal must be acceptable to Liberty County and/or the State of Texas. The original signature and seal are necessary to prevent fraudulent documents or un-authorized changes to documents.
- (I) The fee for an OSSF permit is \$240.00 to Liberty County and \$10.00 to The State of Texas. The increase is necessary to off-set additional fuel costs and overhead.

## **SECTION 11. DUTIES AND POWERS**

The OSSF Designated Representative (DR) (30 TAC § 285.2(17)) in and for Liberty County, Texas, must be certified by TCEQ before assuming the duties and responsibilities.

## **SECTION 12. COLLECTION OF FEES.**

All fees collected for permits and/or inspections shall be made payable to Liberty County, Texas. A fee of \$10 will also be collected for each on-site sewage facility permit to be paid to the credit of the TCEQ Water Resources Management Account as required by the THSC, Chapter 367.

## **SECTION 13. APPEALS.**

Persons aggrieved by an action or decision of the designated representative may appeal such action or decision to the Commissioners Court of Liberty County, Texas.

## **SECTION 14. ENFORCEMENT PLAN.**

The County of Liberty, Texas clearly understands that, at a minimum, it must follow the requirements in 30 TAC § 285.71 Authorized Agent Enforcement of OSSFs.

This Order adopts and incorporates all applicable penalty provisions related to on-site sewage facilities, which includes, but is not limited to, those found in Chapters 341, 343 and 366 of the THSC, Chapters 7, 26, and 37 of the TWC and 30 TAC Chapters 30, Subchapters A and G, and Chapter 285.

## **SECTION 15. SEVERABILITY**

It is hereby declared to be the intention of the Commissioners Court of Liberty County, Texas, that the phrases, clauses, sentences, paragraphs, and sections of this Order are severable, and if any phrase, clause, sentence, paragraph, or section of this Order should be declared unconstitutional by the valid judgment or decree of any court of competent jurisdiction, such unconstitutionality shall not affect any of the remaining phrases, clauses, sentences, paragraphs, or sections of this Order, since the same would have been enacted by the Commissioners Court without incorporation in this Order of such unconstitutional phrases, clauses, sentences, paragraphs, or sections.

## **SECTION 16. RELINQUISHMENT OF ORDER**

If the Commissioner's Court of Liberty County, Texas decides that it no longer wishes to regulate on-site sewage facilities in its area of jurisdiction, the Commissioner's Court, as the authorized agent, and the TCEQ shall follow the procedures outlined in 30 TAC § 285.10 (d) (1) through (4).

After relinquishing its OSSF authority, the authorized agent understands that it may be subject to charge-back fees in accordance with the 30 TAC § 285.10 (d) (5) and § 285.14 after the date that delegation has been relinquished.

## **SECTION 17. EFFECTIVE DATE**

This Order shall be in full force and effect from and after its date of approval as required by law and upon the approval of the TCEQ.

AND IT IS SO ORDERED:

PASSED AND APPROVED THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_.

APPROVED:

(SEAL)

\_\_\_\_\_  
County Judge

ATTEST:

\_\_\_\_\_  
County Clerk



## **APPENDIX J**

### **Liberty County Flood Damage Prevention Ordinance (Under Separate Cover)**



## **APPENDIX J**

### **LIBERTY COUNTY**

### **FLOOD DAMAGE PREVENTION ORDINANCE**

**May 2018**

## **APPENDIX J**

### **SECTION 10 - LIBERTY COUNTY FLOOD DAMAGE PREVENTION ORDINANCE**

#### ***Sub-Section 1 – Applicability***

##### **10.1.01. General Requirements**

This Section shall govern activities associated with development in Liberty County, Texas.

##### **10.1.02. Legal Authority**

The Legislature of the State of Texas has, in TEXAS WATER CODE ANNOTATED, Sections 16.313, 16.315, and 16.318, delegated the responsibility to local governmental units to adopt regulations designed to minimize flood losses. Legal Authority for adopting and enforcing the regulations in this Section is granted to the County under Texas Local Government Code (TLGC) in Chapter 232 and under the Texas Water Code in Chapters 26 and 35. Therefore, the Commissioners Court of Liberty County, Texas, does hereby adopt the following flood management regulations.

##### **10.1.03. Findings of Fact**

- (A) The flood hazard areas of Liberty County are subject to periodic inundation, which results in loss of life and property, health and safety hazards, disruption of commerce and governmental services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the public health, safety, and general welfare.
- (B) These flood losses are created by the cumulative effect of obstructions in flood plains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses which are vulnerable to floods and hazardous to other lands because they are inadequately elevated, flood-proofed, or otherwise protected from flood damage.

##### **10.1.04. Statement of Purpose**

- (A) It is the purpose of this Section to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to: Protect human life, health, safety, and welfare;
- (B) Minimize expenditure of public money for costly flood control projects;

- (C) Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
- (D) Minimize prolonged business interruptions;
- (E) Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets, and bridges and culverts located in flood plains;
- (F) Help maintain a stable tax base by providing for the sound use and development of flood-prone areas in such a manner as to minimize future flood blight areas; and,
- (G) Ensure that potential buyers are notified that property is in a flood hazard area.
- (H) Protect the beneficial functions of flood plains.

#### **10.1.05. Approval Required Prior to Development**

Approval of the County is required prior to conducting development activities in Flood Hazard Areas, unless excluded or exempted under State law or as exempted below.

#### **10.1.06. Methods of Reducing Flood Losses**

In order to accomplish its purposes, this Section authorizes the use of the following methods:

- (A) Restrict or prohibit uses that are dangerous to health, safety or property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
- (B) Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage throughout their intended lifespan;
- (C) Control the alteration of natural flood plains, stream channels, and natural protective barriers, which are involved in the accommodation or channeling of flood waters;
- (D) Control filling, grading, dredging and other development which may increase flood damage; and,
- (E) Prevent or regulate the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards to other lands.

### ***Sub-Section 2 - Definitions Specific to This Section***

Unless specifically defined below, words or phrases used in this Section shall be interpreted to give them the meaning they have in common usage and to give this Section its most reasonable application.

- (A) Alluvial Fan Flooding - means flooding occurring on the surface of an alluvial fan or similar landform which originates at the apex and is characterized by high-velocity flows; active processes of erosion, sediment transport, and deposition; and unpredictable flow paths.
- (B) Apex - means a point on an alluvial fan or similar landform below which the flow path of the major stream that formed the fan becomes unpredictable and alluvial fan flooding can occur.
- (C) Appeal Board - means the Liberty County Commissioners Court.
- (D) Appurtenant Structure – means a structure which is on the same parcel of property as the principal structure to be insured and the use of which is incidental to the use of the principal structure.
- (E) Area of Future Conditions Flood Hazard – means the land area that would be inundated by the 1-percent-annual chance (100 year) flood based on future conditions hydrology.
- (F) Area of Shallow Flooding - means a designated AO, AH, AR/AO, AR/AH, or VO zone on a community's Flood Insurance Rate Map (FIRM) with a 1 percent or greater annual chance of flooding to an average depth of 1 to 3 feet where a clearly defined channel does not exist, where the path of flooding is unpredictable, and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.
- (G) Area of Special Flood Hazard - means the land in the flood plain within a community subject to a 1 percent or greater chance of flooding in any given year. The area may be designated as Zone A on the Flood Hazard Boundary Map (FHBM). After detailed rate making has been completed in preparation for publication of the FIRM, Zone A usually is refined into Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, or V. The term “special flood hazard area,” for purposes of these regulations, is synonymous with the phrase “area of special flood hazard.”
- (H) Base Flood - means the flood having a 1 percent chance of being equaled or exceeded in any given year (also called the “regulatory flood”).
- (I) Base Flood Elevation (BFE) - means the elevation shown on the Flood Insurance Rate Map (FIRM) and found in the accompanying Flood Insurance Study (FIS) for Zones A, AE, AH, A1-A30, AR, V1-V30, or VE that indicates the water surface elevation resulting from the flood that has a 1% chance of equaling or exceeding that level in any given year - also called the Base Flood.

- (J) Basement - means any area of the building having its floor subgrade (below ground level) on all sides.
- (K) Breakaway Wall – means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces, without causing damage to the elevated portion of the building or supporting foundation system.
- (L) Building – see “Structure.”
- (M) Certification – means a certification by a Texas registered professional engineer or other party that does not constitute a warranty or guarantee of performance, expressed or implied. Certification of data is a statement that the data is accurate to the best of the certifier’s knowledge. Certification of analyses is a statement that the analyses have been performed correctly and in accordance with sound engineering practices. Certification of structural works is a statement that the works are designed in accordance with sound engineering practices to provide protection from the base flood. Certification of “as built” conditions is a statement that the structure(s) has been built according to the plans being certified, is in place, and is fully functioning.
- (N) Critical Facility – means a facility for which even a slight chance of flooding might be too great. Critical facilities include, but are not limited to, schools, nursing homes, hospitals, police, fire, and emergency response installations, and installations which produce, use, or store hazardous materials or hazardous waste.
- (O) Critical Feature - means an integral and readily identifiable part of a flood protection system, without which the flood protection provided by the entire system would be compromised.
- (P) Development - means any man-made change to improved and unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, or drilling operations or storage of equipment or materials.
- (Q) Elevated Building – means, for insurance purposes, a non-basement building, which has its lowest elevated floor, raised above ground level by foundation walls, shear walls, posts, piers, pilings, or columns.
- (R) Existing Construction - means for the purposes of determining rates, structures for which the "start of construction" commenced before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date. "Existing construction" may also be referred to as "existing structures."
- (S) Existing Manufactured Home Park or Subdivision - means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the flood plain management regulations adopted by a

community.

- (T) Expansion to an Existing Manufactured Home Park or Subdivision - means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).
- (U) Fill, also known as Earthen fill – means fill that is sometimes placed in a Special Flood Hazard Area (SFHA) to reduce flood risk to the filled area. The placement of fill is considered development and will require a permit under applicable Federal, state and local laws, ordinances, and regulations. Fill is prohibited within the floodway unless it has been demonstrated that it will not result in any increase in flood levels. Some communities limit the use of fill in the flood fringe to protect storage capacity or require compensatory storage. The use of fill is prohibited for structural support of buildings in V Zones.
- (V) Flood or Flooding - means a general and temporary condition of partial or complete inundation of normally dry land areas from:
  - (1) the overflow of inland or tidal waters.
  - (2) the unusual and rapid accumulation or runoff of surface waters from any source.
- (W) Flood Boundary and Floodway Map (FBFM) – means the official map of a community on which FEMA has delineated the areas of flood hazards and regulatory floodway.
- (X) Flood Elevation Study – means an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluation, and determination of mudslide (i.e., mudflow) and/or flood-related erosion hazards.
- (Y) Flood Hazard Boundary Map (FHBM) – means an official map of a community, issued by FEMA, where the boundaries of the special flood hazard areas have been identified in Zone A.
- (Z) Flood Insurance Rate Map (FIRM) - means an official map of a community, on which the Federal Emergency Management Agency has delineated both the special flood hazard areas and the risk premium zones applicable to the community.
- (AA) Flood Insurance Study (FIS) – see “Flood Elevation Study.”
- (BB) Flood plain or Flood-Prone Area - means any land area susceptible to being inundated by water from any source (see definition of flooding).
- (CC) Flood plain Management - means the operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency

preparedness plans, flood control works and flood plain management regulations.

- (DD) Flood plain Management Regulations - means this Section, along with such other subdivision and development regulations, building codes, health regulations, special purpose ordinances (such as a flood plain ordinance, grading ordinance, and erosion control ordinance) and other applications of police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction.
- (EE) Flood Proofing - means any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.
- (FF) Flood Protection System - means those physical structural works for which funds have been authorized, appropriated, and expended and which have been constructed specifically to modify flooding in order to reduce the extent of the area within a community subject to a "special flood hazard" and the extent of the depths of associated flooding. Such a system typically includes hurricane tidal barriers, dams, reservoirs, levees, or dikes. These specialized flood modifying works are those constructed in conformance with sound engineering standards.
- (GG) Floodway – see “Regulatory Floodway.”
- (HH) Freeboard – means a factor of safety usually expressed in feet above a flood level for purposes of flood plain management. “Freeboard” tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effects of urbanization of the watershed.
- (II) Functionally Dependent Use - means a use, which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, but does not include long-term storage or related manufacturing facilities.
- (JJ) Habitable Structure – means a structure suitable for human habitation including, but not limited to, single or multi-family residences, hotels, condominium buildings, and buildings for commercial purpose. Each building of a condominium regime is considered a separate habitable structure, but if a building is divided into apartment, then the entire building, not the individual apartment, is considered a single habitable structure. Additionally, a habitable structure includes porches, gazebos, and other attached improvements.
- (KK) Highest Adjacent Grade - means the highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.



- (LL) Historic Structure - means any structure that is:
- (1) Listed individually in the National Register of Historic Places (a listing maintained by the Department of the Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
  - (2) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
  - (3) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or,
  - (4) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
    - (a) By an approved state program as determined by the Secretary of the Interior; or,
    - (b) Directly by the Secretary of the Interior in states without approved programs.
- (MM) Increased Cost of Compliance (ICC) – means the coverage by a standard flood insurance policy under the NFIP that provides for the payment of a claim for the cost to comply with the State of Texas and Liberty County flood plain management laws or ordinances after a direct physical loss by flood, when Liberty County declares the structure to be “substantially” or “repetitively” flood-damaged. ICC coverage is provided for in every standard NFIP flood insurance policy and will help pay for the cost to floodproof, relocate, elevate, or demolish the structure.
- (NN) Levee - means a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.
- (OO) Levee System - means a flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices.
- (PP) Lowest Floor - means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking or vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; **provided** that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirement of Section 60.3 of the National Flood Insurance Program regulations.
- (QQ) Manufactured Home - means a structure transportable in one or more sections, which is built

on a permanent chassis and is designed for use with or without a permanent foundation when connected to the required utilities. The term "manufactured home" does not include a "recreational vehicle."

- (RR) Manufactured Home Rental Community or Subdivision - means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.
- (SS) Map – means the Flood Hazard Boundary Map (FHBM) or the Flood Insurance Rate Map (FIRM) for a community issued by FEMA.
- (TT) Mean Sea Level - means, for purposes of the National Flood Insurance Program, the North American Vertical Datum (NAVD) of 1988 or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced.
- (UU) New Construction - means, for the purpose of determining insurance rates, structures for which the "start of construction" commenced on or after the effective date of an initial FIRM or after December 31, 1974, whichever is later, and includes any subsequent improvements to such structures. For flood plain management purposes, "new construction" means structures for which the "start of construction" commenced on or after the effective date of a flood plain management regulation adopted by a community and includes any subsequent improvements to such structures.
- (VV) New Manufactured Home Rental Community or Subdivision - means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the effective date of flood plain management regulations adopted by a community.
- (WW) Non-habitable Structure - means a structure that is not suitable or intended for human habitation.
- (XX) Participating Community – means a community in which FEMA has authorized the sale of flood insurance. Also known as an eligible community.
- (YY) Principally Above Ground – mean that at least 51 percent of the actual cash value of the structure is above ground.
- (ZZ) Recreational Vehicle - means a vehicle which is:
  - (1) built on a single chassis;
  - (2) 400 square feet or less when measured at the largest horizontal projections;
  - (3) designed to be self-propelled or permanently towable by a light duty truck; and,

- (4) designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.
- (AAA) Reasonably safe from flooding – means base flood waters will not inundate the land or damage structures to be removed from the SFHA and that any subsurface waters related to the base flood will not damage existing or proposed buildings.
- (BBB) Repetitive Loss – means flood-related damages sustained by a structure on two separate occasions during a 10-year period ending on the date of the event for which the second claim is made, for which the cost of repairs at the time of each such flood event, on the average, equaled or exceeded 25% of the market value of the structure before the damages occurred.
- (CCC) Regulatory Floodway - means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.
- (DDD) Riverine – means relating to, formed by, or resembling a river (including tributaries), stream, brook, etc.
- (EEE) Special Flood Hazard Area – see “Area of Special Flood Hazard” – means an area having special flood hazard and shown on an FHBM or FIRM as Zone A, AO, A1-30, AE, AH, A99, or AR,.
- (FFF) Start of Construction - (for other than new construction or substantial improvements under the Coastal Barrier Resources Act (Pub. L. 97-348)), includes substantial improvement and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading, and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.
- (GGG) Structure – means, for flood plain management purposes, a walled and roofed

building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home.

- (HHH) Substantial Damage - means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.
- (III) Substantial Improvement - means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before "start of construction" of the improvement. This term includes structures which have incurred "repetitive loss" or "substantial damage," regardless of the actual repair work performed. The term does not, however, include either: (1) any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions, or (2) any alteration of a "historic structure," provided that the alteration will not preclude the structure's continued designation as a "historic structure."
- (JJJ) Variance – means a grant of relief by a community from the terms of a flood plain management regulation. (For full requirements see Section 60.6 of the National Flood Insurance Program regulations.)
- (KKK) Violation - means the failure of a structure or other development to be fully compliant with the community's flood plain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in Section 60.3(b)(5), (c)(4), (c)(10), (d)(3), (e)(2), (e)(4), or (e)(5) of the National Flood Insurance Program regulations is presumed to be in violation until such time as that documentation is provided.
- (LLL) Water Surface Elevation - means the height, in relation to the North American Vertical Datum (NAVD) of 1988 (or other datum, where specified), of floods of various magnitudes and frequencies in the flood plains of coastal or riverine areas.

### ***Sub-Section 3 - General Provisions***

#### **10.3.01. Lands to Which This Section Applies**

This Section shall apply to all areas of special flood hazard within the jurisdiction of Liberty County, Texas.

#### **10.3.02. Basis for Establishing the Areas of Special Flood Hazard**

The areas of special flood hazard identified by the Federal Emergency Management Agency in the

current scientific and engineering report entitled, "The Flood Insurance Study for Liberty County, Texas," dated May 5, 2008, with accompanying effective Flood Insurance Rate Maps and/or Flood Boundary- Floodway Maps (FIRM and/or FBFM) dated January 19, 2018, and any revisions thereto, are hereby adopted by reference and declared to be part of this Section.

#### **10.3.03. Establishment of Development Permit System**

A Flood Hazard Area Permit System is hereby established to ensure compliance with the provisions of this Chapter. This system shall require an Application for a Development Authorization by the Applicant or the Permittee seeking the Development Authorization.

A county-wide application system is a necessary and reasonable action to insure that all permits for development in flood hazard areas have been obtained. The Commissioners Court through the Flood plain Administrator will develop and promulgate any and all forms as may be necessary for the implementation of this court order.

Additional flood plain data may be generated which will improve the accuracy of flood plain boundary identification. Since the County will constantly be aware of map changes and additional data, the responsibility for determining whether a property or development is within a flood hazard area must rest with the Liberty County Flood Plain Administrator. Flood Hazard Boundary Maps published by the Federal Insurance Administration delineate only the major flood prone areas within the County. With a County-wide review procedure, the Flood Plain Administrator will be able to make recommendations for construction standards which will minimize or eliminate the possibility of damage from localized drainage problems.

#### **10.3.04. Compliance**

No structure or land shall hereafter be located, altered, or have its use changed without full compliance with the terms of this Section and other applicable regulations.

#### **10.3.05. Abrogation and Greater Restrictions**

This Section is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this Section and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

#### **10.3.06. Interpretation**

In the interpretation and application of this Section, all provisions shall be: (1) considered as minimum requirements; (2) liberally construed in favor of the governing body; and (3) deemed neither to limit nor repeal any other powers granted under State statutes.

#### **10.3.07. Warning and Disclaimer of Liability**

The degree of flood protection required by this Section is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. On rare occasions greater floods

can and will occur and flood heights may be increased by man-made or natural causes. This Section does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This Section shall not create liability on the part of the community or any official or employee thereof for any flood damages that result from reliance on this Section or any administrative decision lawfully made hereunder.

#### **10.3.08. Establishment of Fees**

The Commissioners Court, upon the recommendation of the Flood Plain Administrator, shall establish application fees commensurate with the service rendered by the County. Development fees are payable at the time of application.

### ***Sub-Section 4 – Administration***

#### **10.4.01. Designation of the Flood Plain Administrator**

The Commissioners Court shall appoint the Flood Plain Administrator to administer and implement the provisions of this Chapter and other appropriate sections of 44 CFR (Emergency Management and Assistance - National Flood Insurance Program Regulations) pertaining to flood plain management. If no other individual has been appointed by the Commissioners Court, the Director of the Department, or his designee, shall serve as the Flood Plain Administrator.

#### **10.4.02. Duties and Responsibilities of the Flood Plain Administrator**

Duties and responsibilities of the Flood Plain Administrator shall include, but not be limited to, the following:

- (A) Maintain and hold open for public inspection all records pertaining to the provisions of this Section.
- (B) Review permit application to determine whether to ensure that the proposed building site project, including the placement of manufactured homes, will be reasonably safe from flooding.
- (C) Review, approve, or deny all applications for development permits required by adoption of this Section.
- (D) Verify and record the actual elevation (in relation to mean sea level) of the lowest floor of all new construction and substantial improvements, in accordance with Sec. 10.04.04(B)(2).
- (E) Verify and record the actual elevation (in relation to mean sea level) to which the new or substantially improved non-residential structures in A-Zones have been flood proofed, in accordance with 10.04.04(B)(2).

- (F) Review permits for proposed development within a special flood hazard area to assure that all necessary permits have been obtained from those Federal, State, or local governmental agencies (including Section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334) or by area-wide agencies from which prior approval is required prior to issuing a development permit. Such documentation is to be maintained on file with the development permit.
- (G) Where interpretation is needed as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions) the Flood Plain Administrator shall make the necessary interpretation.
- (H) Notify, in riverine situations, adjacent communities and the State Coordinating Agency which is the Texas Water Development Board (TWDB), prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Emergency Management Agency.
- (I) Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained.
- (J) When base flood elevation data has not been provided in accordance with Section 10.3.02, the Flood Plain Administrator shall obtain, review, and reasonably utilize any base flood elevation data and floodway data available from a Federal, State or other source, in order to administer the provisions of Sub-section 5 of this Section.
- (K) When a regulatory floodway has not been designated, the Flood Plain Administrator must require that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, a community may approve certain development in Zones A1-30, AE, AH, on the community's FIRM which increases the water surface elevation of the base flood by more than 1 foot, provided that the community first completes all of the provisions required by Section 65.12 of the NFIP regulations.
- (L) Participate actively in evaluating the variance requests and provide input and recommendations in variance hearings/proceedings.
- (M) Coordinate all change requests to the FIS and FIRM or FHBM, or both, with the requester, State, and FEMA.

#### **10.4.03. Classification of Flood Hazard Area Permits**

Development Approvals issued as Flood Hazard Area Permits (FHAP) shall be classified as follows:

- (A) Development located on real property for which there is no Flood Hazard area delineated shall qualify for a Class A (Exemption Certificate) FHAP. The FHAP shall state that the proposed development is located on real property that does not lie within an identified Flood Hazard Area and that the construction standards contained in this Section are not applicable to the proposed development. Class A FHAPs (Exemption Certificates) shall be issued by the Flood Plain Administrator.
- (B) Habitable structures located on real property in flood hazard areas shall require a Class B FHAP. Class B FHAPs that comply with the terms of this Section may be issued by the Flood Plain Administrator. Variances requested in conjunction with a Class B FHAP shall require approval of the Commissioners Court.
- (C) Non-habitable structures or development located on real property in flood hazard areas shall require a Class C FHAP.

The Flood Plain Administrator shall issue FHAPs that comply with the terms of this Section, including specifically authorized variances.

#### **10.4.04. Permit Procedures**

- (A) Applications for an FHAP will be processed in accordance with Section 10 of the Liberty County Development Regulations.
- (B) Application for a Flood Hazard Area Permit shall be presented, prior to undertaking any development activities, to the Flood Plain Administrator on forms furnished by him/her and must include, but not be limited to, plans in duplicate drawn to scale showing the nature, location, dimensions, and elevations of the area under consideration for development, proposed landscape alterations, existing and proposed structures and other features, including the placement of manufactured homes, earthen fill, storage of materials or equipment, drainage facilities, perimeter setbacks, environmental features such as base flood plain areas, wetlands, and other protected areas, and the location of the foregoing in relation to areas of special flood hazard. Additionally, the following information, certified by a Texas professional who is authorized to certify such information, is required:
  - (1) Application Stage:
    - (a) Elevation (in relation to mean sea level) of the area of development for both existing and proposed development.
    - (b) Elevation (in relation to mean sea level), of the lowest floor (including basement) of all new and substantially improved structures;



- (c) Elevation (in relation to mean sea level) to which any nonresidential structure shall be flood proofed;
  - (d) A certificate from a Texas registered professional engineer or Texas licensed architect that the nonresidential flood proofed structure shall meet the flood proofing criteria of Sub-section 5 of this Section;
  - (e) Existing and proposed infrastructure;
  - (f) Description of the extent to which any watercourse or natural drainage will be altered or relocated as a result of proposed development; and,
  - (g) Maintain a record of all such information in accordance with Subchapter 4 of this Chapter.
- (2) Construction Stage:  
 Upon placement of the lowest floor, or flood proofing by whatever construction means, it shall be the duty of the permit holder to submit to the Flood Plain Administrator a certification of the elevation of the lowest floor or flood proofed elevation, as built, in relation to mean sea level. Said certification shall be prepared by or under the direct supervision of a Texas registered land surveyor or Texas licensed professional engineer who is authorized to certify such information, and certified by same. Any work undertaken prior to submission of the certification shall be at the permit holder's risk.  
 The Flood Plain Administrator shall review the lowest floor elevation and flood proofing certificate. Should these documents be found not in conformance with the requirements of these rules, the permit holder shall immediately cease further work, and shall correct any deficiencies. Failure of the permit holder to submit the surveyed lowest floor elevation and flood proofing certificate, and failure to correct said deficiencies required hereby, shall be the cause to issue a stop-work order for the project.
- (C) Approval or denial of a Flood Hazard Area Permit by the Flood Plain Administrator shall be based on all of the provisions of this Section and the following relevant factors:
- (1) The danger to life and property due to flooding or erosion damage;
  - (2) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;
  - (3) The danger that materials may be swept onto other lands to the injury of others;
  - (4) The compatibility of the proposed use with existing and anticipated development;
  - (5) The safety of access to the property in times of flood for ordinary and emergency vehicles;

- (6) The costs of providing governmental services during and after flood conditions including maintenance and repair of streets and bridges, and public utilities and facilities such as sewer, gas, electrical, and water systems;
  - (7) The expected heights, velocity, duration, rate of rise, and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site;
  - (8) The necessity to the facility of a waterfront location, where applicable; and,
  - (9) The availability of alternative locations, not subject to flooding or erosion damage, for the proposed use.
- (D) It shall be unlawful to use, occupy or permit the use or occupancy of any building, development, or premises or part thereof hereafter created, erected, changed, converted, altered, or enlarged in its use or structure until a Flood Hazard Area Permit has been issued by the Flood Plain Administrator stating that the use of the development conforms to the requirements of this Section.

#### **10.4.05. Expiration of Flood Hazard Area Permits**

Approval of a Flood Hazard Area Permit shall expire and be of no further force and effect in the event that:

- (A) None of the activities authorized in the permit are commenced within one (1) year from the date of issuance; or,
- (B) All of the activities authorized in the permit are not completed within two (2) years from the date of issuance.

#### **10.4.06. Variance Procedures**

- (A) The Appeal Board, as established by the community, shall hear and render judgment on requests for variances from the requirements of this Section.
- (B) The Appeal Board shall hear and render judgment on an appeal only when it is alleged there is an error in any requirement, decision, or determination made by the Flood Plain Administrator in the enforcement or administration of this Section.
- (C) Any person(s) aggrieved by the decision of the Appeal Board may appeal such decision in the courts of competent jurisdiction.
- (D) The Flood Plain Administrator shall maintain a record of all actions involving an appeal and shall report variances to the Federal Emergency Management Agency upon request.

- (E) Variances may be issued for the reconstruction, rehabilitation, or restoration of structures listed on the National Register of Historic Places or the State Inventory of Historic Places, without regard to the procedures set forth in the remainder of this Section.
- (F) Variances may be issued for new construction and substantial improvements to be erected on a lot of 1/2 acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, providing the relevant factors in Section 10.4.04(c) have been fully considered. As the lot size increases beyond the 1/2 acre, the technical justification required for issuing the variance increases.
- (G) Upon consideration of the factors noted above and the intent of this Section, the Appeal Board may attach such conditions to the granting of variances as it deems necessary to further the purpose and objectives of this Section.
- (H) Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.
- (I) Variances may be issued for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.
- (J) Prerequisites for granting variances:
  - (1) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.
  - (2) Variances shall only be issued upon:
    - (a) showing a good and sufficient cause;
    - (b) a determination that failure to grant the variance would result in exceptional hardship to the applicant, and
    - (c) a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances.
  - (3) Any applicant to which a variance is granted shall be given written notice that the structure will be permitted to be built with the lowest floor elevation below the base flood elevation, that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation, and that such construction below the base flood level increases risks to life and property.

- (K) Variances may be issued by a community for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that (i) the criteria outlined in Section 10.04.04(B) are met, and (ii) the structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.
- (L) A request for variance is not an after-the-fact request and should be made prior to the commencement of any development activities sought under an FHAP.

### ***Sub-Section 5 - Provisions for Flood Hazard Reduction***

#### **10.5.01. General Standards**

In all areas of special flood hazards the following provisions are required for all new construction and substantial improvements:

- (A) All new construction or substantial improvements shall be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy;
- (B) All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damage;
- (C) All new construction or substantial improvements shall be constructed with materials and utility elements resistant to flood damage;
- (D) All new construction or substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding;
- (E) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;
- (F) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharge from the systems into flood waters; and,
- (G) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.
- (H) When located in multiple flood zones with varying base flood elevations or in the same flood zone with multiple base flood elevations, the requirements for the flood zone with the most stringent requirements and the highest base flood elevation shall apply.

- (I) Base flood elevation data and floodway boundaries shall be generated by a detailed engineering study for development purposes in Zone A and within 100 feet of the contour lines of Zone A, as indicated on the community's FIRM, if the Flood Plain Administrator requires this based on proximity to channel, or obvious inaccuracy of the FIRM in area of the proposed development, or historical records of flooding. The Applicant shall bear the cost of the engineering studies.

## **10.5.02. Specific Standards**

In all areas of special flood hazards where base flood elevation data has been provided as set forth in (i) SubSection 3, (ii) SubSection 4, or (iii) SubSection 5, the following provisions are required:

- (A) Residential Construction - new construction and substantial improvement of any residential structure shall have the lowest floor (including basement) elevated to at least two 2 feet above the base flood elevation. A Texas registered professional engineer, Texas licensed architect, or Texas licensed land surveyor shall submit a certification to the Flood Plain Administrator that the standard of this subsection as proposed in Section 10.5.01 is satisfied.
- (B) Nonresidential Construction - new construction and substantial improvements of any commercial, industrial, or other nonresidential structure shall either have the lowest floor (including basement) elevated to at least two 2 feet above the base flood level or together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. A Texas registered professional engineer or Texas licensed architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice as outlined in this subsection. A record of such certification which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained by the Flood Plain Administrator.
- (C) Enclosures - new construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access, or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a Texas registered professional engineer or Texas licensed architect or meet or exceed the following minimum criteria:
  - (1) A minimum of two openings on separate walls having a total net area of not less than 1 square inch for every square foot of enclosed area subject to flooding shall be provided.
  - (2) The bottom of all openings shall be no higher than 1 foot above the floor or bottom

of the interior of the enclosed structure

- (3) Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

(D) Manufactured Homes –

- (1) Require that all manufactured homes to be placed within Zone A on a community's FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.
- (2) Require that manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the community's FIRM, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to at least 2 feet above the base flood elevation, and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement, on all sites:
  - (a) Outside of a manufactured home park or subdivision;
  - (b) In a new manufactured home park or subdivision;
  - (c) In an expansion to an existing manufactured home park or subdivision; or,
  - (d) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as a result of a flood.
- (3) Require that manufactured homes be placed or substantially improved on sites in an existing manufactured home park or subdivision with Zones A1-30, AH, and AE on the community's FIRM that are not subject to the provisions of Section 10.04.06 be elevated so that either:
  - (a) The lowest floor of the manufactured home is at or above the base flood elevation; or,  
  
The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.

- (E) Recreational Vehicles - Require that recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either (i) be on the site for fewer than 180 consecutive days, or (ii) be fully licensed and ready for highway use, or (iii) meet the permit requirements of Section 10.4.03, and the elevation and anchoring requirements for "manufactured homes" in Section 10.5.02(C). A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.
- (F) Fences in Special Flood Hazard Area
  - (1) Exempted Fencing -- No Flood Hazard Area Permit is required for open pipe, rail, or wire fencing that is 90% "open" and that have posts less than 14" diameter placed no closer than 8-feet apart.
  - (2) Non Exempt Fencing-- any proposed fence in a 100-year flood plain that is not an exempt fence is considered to be development and requires issuance of a Flood Hazard Area Permit.
  - (3) Any fencing that crosses a stream channel must be designed and constructed so that it will break away or collapse to allow discharge of flood waters.
  - (4) On a navigable stream or river a property owner must comply with the Texas Parks and Wildlife Code so that public recreational use is not limited, obstructed, restricted, or interfered with.

### **10.5.03. Standards for Subdivision Proposals**

- (A) All subdivision proposals including the placement of manufactured home parks and subdivisions shall be consistent with this Section and shall be approved by the County Flood Plain Administrator prior to issuance of the Development Authorization by the County. Plat specifications and details for submission will be governed by Section 10 and other applicable provisions of these Regulations.
- (B) All proposals for the development of subdivisions including the placement of manufactured home parks and subdivisions shall meet the requirements this Section.
- (C) Base flood elevation data shall be generated for subdivision proposals and other proposed development including the placement of manufactured home parks and subdivisions which ~~is~~ are greater than 50 lots or 5 acres, whichever is lesser, if not otherwise provided pursuant to this Section.
- (D) All subdivision plats shall have the Flood Plain and Floodway clearly delineated on the plat and, where appropriate, shall have the lowest floor elevations for all lots located within Flood Hazard Areas. Finish floor elevations and floodway will not be required if Flood Plain is contained within a drainage easement prohibiting development.

- (E) All subdivision Applications including the placement of manufactured home parks and subdivisions shall include provisions for adequate drainage as required under Section 50, to reduce exposure to flood hazards.
- (F) All subdivision Applications including the placement of manufactured home parks and subdivisions shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize or eliminate flood damage.
- (G) All subdivision Applications which include land which is encroached by areas of special flood hazard, must include the placement of a permanent benchmark indicating the elevation relative to mean sea level. The benchmark must be located within the platted property, and must be indicated on the subdivision plat. If all flood plain is contained within a drainage easement, a benchmark is not required.

#### **10.5.04. Standards for Areas of Shallow Flooding (AO/AH Zones)**

Located within the areas of special flood hazard as defined above are areas designated as shallow flooding. These areas have special flood hazards associated with flood depths of 1 to 3 feet where a clearly defined channel does not exist, where the path of flooding is unpredictable, and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow; therefore, the following provisions apply:

- (A) All new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated to at least 2 feet above the base flood elevation or the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least 2 feet if no depth number is specified).
- (B) All new construction and substantial improvements of non-residential structures:
  - (1) have the lowest floor (including basement) elevated to at least 2 feet above the base flood elevation or the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least 2 feet if no depth number is specified); or,
  - (2) together with attendant utility and sanitary facilities be designed so that below the base specified flood depth in an AO Zone, or below the Base Flood Elevation in an AH Zone, level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads of effects of buoyancy.
- (C) A Texas registered professional engineer, Texas licensed architect, or, for purposes of satisfying the requirements of 10.5.04(B)(1) above, a Texas registered professional land surveyor, shall submit a certification to the Flood Plain Administrator that the standards of this Section are satisfied.



- (D) Require within Zones AH or AO adequate drainage paths around structures on slopes to guide flood waters around and away from proposed structures.

#### **10.5.05. Floodways**

Located within areas of special flood hazard are areas designated as floodways. Since the floodway is an extremely hazardous area due to the velocity of flood waters which carry debris, potential projectiles, and erosion potential, the following provisions shall apply:

- (A) Encroachments are prohibited, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.
- (B) If Section 10.5.05 above is satisfied, all new construction and substantial improvements shall comply with all applicable flood hazard reduction provisions of the remainder of this Section.
- (C) Under the provisions of 44 CFR Section 1, Section 65.12, of the National Flood Insurance Program Regulations, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first completes all of the provisions required by Section 65.12.

#### **10.5.06. Critical Facilities**

Construction of new critical facilities shall be, to the extent possible, located outside the limits of the SFHA, preferably outside the 0.2% annual chance flood plain. Construction of new critical facilities may be permissible within the SFHA if feasible alternative sites are unavailable. Critical facilities constructed within the SFHA shall have the lowest floor elevated at least 3 feet above the base flood elevation at the site. Floodproofing and sealing measures must be taken to ensure that toxic substances will not be displaced by or released into floodwaters. Access routes elevated to or above the level of the base flood elevation shall be provided to all critical facilities to the maximum extent possible.

#### **10.5.07. Severability**

If any section, clause, sentence, or phrase of this Section is held to be invalid or unconstitutional by any court of competent jurisdiction, then said holding shall in no way affect the validity of the remaining portions of this Section.

#### **10.5.08. Penalties for Non-Compliance**

No structure or land shall hereafter be constructed, located, extended, converted, or altered without full compliance with the terms of this Section and other applicable regulations. Violation of the

provisions of this Section by failure to comply with any of its requirements (including violations of conditions and safeguards established in connection with conditions) shall constitute a misdemeanor. Any person who violates this Section or fails to comply with any of its requirements is subject to the following penalties:

- (A) **CIVIL PENALTY:** A person who violates this Section is subject to a civil penalty of not more than \$100 for each act of violation and for each day of violation.
- (B) **CRIMINAL PENALTY:**
  - (1) A person commits an offense if the person violates this Section.
  - (2) An offense under this Section is a Class C misdemeanor.

Each violation of this Section and each day of continuing violation is a separate offense. Any person shall, upon conviction, pay the related fine as specified above for each violation, along with all costs and expenses involved in the case.

#### **10.5.09. ENFORCEMENT BY POLITICAL SUBDIVISION:**

- (A) If it appears that a person has violated, is violating, or is threatening to violate this Section or a rule adopted by order issued under this Section, a political subdivision may institute a civil suit in the appropriate court for:
  - (1) Injunctive relief to restrain the person from continuing the violation or threat of violation, including an order directing the person to remove illegal improvements and restore preexisting conditions;
  - (2) The assessment and recovery of the civil penalty; or
  - (3) Both the injunctive relief and the civil penalty.
- (B) On application for injunctive relief and a finding that a person has violated, is violating, or is threatening to violate this Section or rule adopted, or order issued under this Section, the court shall grant the injunctive relief that the facts warrant.

Nothing herein contained shall prevent Liberty County from taking such other lawful action as is necessary to prevent or remedy any violation.