

I. Purpose and Applicability

The purpose of this Drainage Criteria Manual (Criteria) is to provide guidance for designing an effective storm water management plan and drainage system for new or redeveloped properties within the City of Spring Valley Village (City). It establishes rules and regulations that must be consistently followed and will be enforced throughout the City's jurisdiction. Through this Criteria, the City is supporting property owners' rights to utilize and develop their property while prohibiting adverse impacts to adjacent neighbors' storm water drainage due to the new lot development.

The following Criteria shall apply to the proposed development of all Residential Infill lots within the City, including but not limited to New Construction on empty lots, Teardowns, Re-builds, and Major Additions (i.e. pools, building expansions, new structures, etc.). All Commercial development and Subdivisions within the City shall adhere to the latest edition of the City of Houston Infrastructure Design Manual, Chapter 9 Stormwater Design Requirements. This Drainage Criteria shall also apply to adding "fill" to a site within the City, in which a separate Grading and Filling Permit will be required, which is discussed in Section IV of this Criteria.

The City is a participant in the National Flood Insurance Program (NFIP). The flood insurance program makes insurance available at low cost where the municipal entity implements measures that reduce the likelihood of structural flooding. This Criteria is provided to support the NFIP. All development located within the City limits shall also comply with Article 3.16, FLOOD DAMAGE PREVENTION, of the Spring Valley Village Code of Ordinances.

All drainage plans and construction shall meet or exceed the requirements of the City and all other entities having jurisdiction. The goal of this Criteria is to provide storm drainage system capacity for the 2 year storm event, allow for the 100 year storm event to sheet flow across the lot, provide positive drainage away from buildings, and not create an adverse storm water drainage impact to others.

It shall be the responsibility of each property owner or developer of property, whether an individual lot, multiple lots, block, or development to design, build and maintain the drainage of such property without adversely affecting the existing drainage patterns of adjacent property owners and the City's drainage system. It shall also be the property owner's responsibility to prevent damage by overflow of water onto adjacent landowners caused either by direct diversion of water on the adjoining land or by the failure to adequately accommodate existing drainage patterns.

Proposed New Development or Redevelopment shall not alter existing overland flow

patterns and shall not increase or redirect existing sheet flow to adjacent private or public property. Sheet flow from the developed property shall discharge only to the abutting public right-of-way (R.O.W.). Where the existing sheet flow pattern is blocked by construction (i.e. raising the site elevation) of the new lot, the sheet flow shall be re-routed within the developed property to the public R.O.W. Except under special circumstances dictated by natural drainage patterns, and as approved by the City, no sheet flow from the developed property will be allowed to drain onto adjacent private property.

II. Definitions

- A. Design Rainfall Event - Rainfall intensity upon which the drainage facility will be sized.
- B. Drainage Area - The surface area determined by topography that contributes rainfall runoff to a point of interception. The drainage area represents the drainage system service area and is not limited by the project boundary or street R.O.W. The possibility of overland flow contributions from adjacent properties and/or drainage areas during certain extreme events shall be considered for accurate assurance of level of service.
- C. Rainfall Frequency - Probability of a rainfall event of defined characteristics occurring in any given year at a given location. Information on Rainfall Frequency is published by the National Weather Service. For the purpose of storm drainage design in the City, the following frequencies are applicable:
 - 1. 2-year frequency - a rainfall intensity having a 50 percent probability of occurrence in any given year, that occurs on the average every 2 years over a long period of time.
 - 2. 100-year frequency - a rainfall intensity having a 1 percent probability of occurrence in any given year, that occurs on the average every 100 years over a long period of time.
- D. Rational Method - A method for calculating the peak runoff for a drainage system using the following equation for runoff:

$$Q = I \times (CA)$$

Where: C = watershed coefficient
A = area (acres)
I = rainfall intensity (inches per hour)

- E. Sheet Flow - A shallow depth of runoff on a sloping surface that does not have a precisely defined bounding condition.

III. Design Requirements

- A. A Grading and Drainage Plan, prepared by a professional engineer licensed in the State of Texas, shall be provided for the proposed development to show the overall approach for the collection and conveyance of storm drainage from the developed site. All lot drainage shall be designed to drain towards the front of the property via a sub-surface drainage system and discharge into a City system. The use of swales to drain the property will not be allowed. Sump pumps may be utilized for circumstances where grade is too low to provide a traditional gravity system.

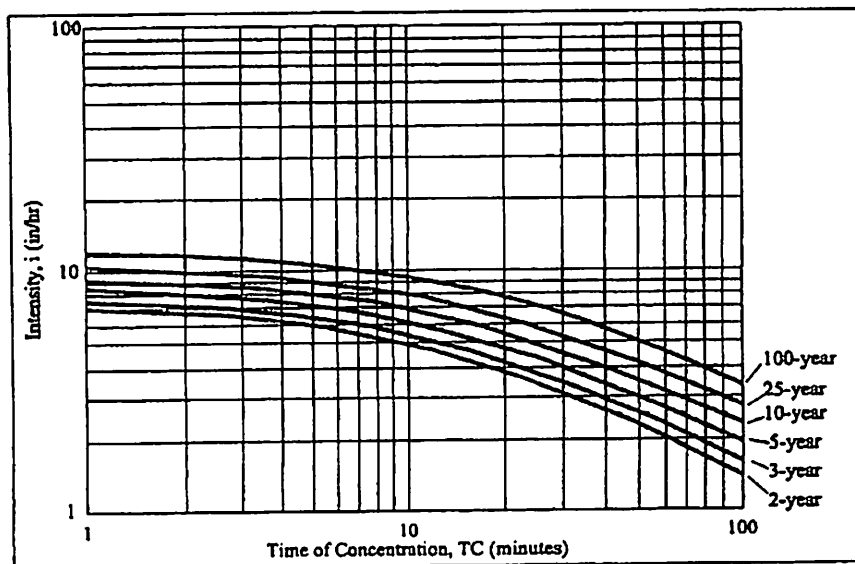
- B. Special consideration shall be taken for the development of lots that back up to creeks within the City (i.e. Briar Branch and Spring Branch). These creeks fall under the jurisdiction of the Harris County Flood Control District (HCFCD). In the event that these lots are unable to drain towards the front of the property to a City system, then the design of any drainage pipe outfalls into the creek, including necessary erosion protection, shall adhere to the latest design requirements of HCFCD, and a separate approval from HCFCD shall be required prior to approval of the drainage plan.

- C. Determination of Runoff.

1. Rainfall Intensity:

- a. Intensity Duration Frequency (IDF) Curves. Figure 1 depicts the IDF curves to be used for drainage design in the City.

City of Houston IDF Curves
Intensity vs. Time of Concentration vs Rainfall Frequency
Source: Hydro 35/TP-40



b. Calculate Intensity: The intensity calculation is based on duration equal to the time of concentration. The intensity is calculated as follows:

$$I = b/(d+T_c)^e$$

Where b, d, and e are coefficients dependent on the rainfall event as provided in Table 1 and are based on City depth-duration-frequency values.

Table 1 - Rainfall Intensity Parameters

<i>Rainfall Frequency</i>	<i>b</i>	<i>d</i>	<i>e</i>
2-year	75.01	16.2	0.8315
3-year	77.27	17.1	0.8075
5-year	84.14	17.8	0.7881
10-year	93.53	18.9	0.7742
25-year	115.9	21.2	0.7808
100-year	125.4	21.8	0.7500

D. The Rational Method will be used to estimate peak flows for individual drainage areas and will be used for design on areas served by storm sewers and open ditches.

E. Coefficients for the Rational Method.

1. Calculation of Runoff Coefficient.

a. The runoff coefficient C values in the rational method formula will vary based on the land use. Land use types and C values which can be used are as follows:

Table 2 - Runoff Coefficients (C Values) from City of Houston

<i>Residential Land Use Type</i>	<i>Runoff Coefficient (C)</i>
<i>Lots more than ½ acre</i>	0.35
<i>Lots ¼ to ½ acre</i>	0.45
<i>Lots less than ¼ acre</i>	0.55
<i>Open areas (Grass, shrubbery, etc.)</i>	0.20

b. Alternatively, the runoff coefficient C in the Rational Method formula can be calculated from the equation:

$$C = 0.6Ia + 0.2$$

Where: C = watershed coefficient
Ia = impervious area/total area

c. If the alternate form is to be submitted, the calculation of C shall be provided as part of the drainage calculations.

d. The maximum total lot coverage is 60% for the area behind the front building setback and 50% for the area within the front setback.

2. Determination of Time of Concentration.

a. Time of Concentration can be calculated from the following formula:

$$TC = 10A^{0.1761} + 15$$

Where: TC = time of concentration (minutes)
A = drainage subarea (acres)

F. A professional engineer licensed in the State of Texas shall provide calculations and designs for all of the components of the storm drainage system for any proposed construction activity. As many as three (3) analyses may be required as part of the drainage review for the proposed construction activity:

1. *Detention Summary* – to document existing and proposed conditions and identify the area of impervious cover to define the detention volume and allowable release rate from the subject property associated with the proposed construction activity.
2. *Impact Analysis* – preliminary initial evaluation of adjacent offsite properties to determine if existing sheet flow patterns will be impacted from the proposed construction activity.
3. *Drainage Study* – detailed drainage evaluation of onsite improvements and offsite impacts from the proposed construction activity sufficient to develop a mitigation plan to maintain or improve the existing drainage. Coordination with the City and adjacent property owners will be critical to define flow paths, allowable flow rates, and maximum HGL/ponding elevations.

G. *Minimum Pipe Sizes* – The minimum pipe size for residential on-site conditions (private) shall be 6 inches and for use in any public rights of way shall be 24 inches.

H. *Pipe Connections to City Facilities* – Discharges from the on-site collection

system shall be connected to a City facility (i.e. street, roadside ditch, or drainage structure). Pipe connections to the street through a curb opening shall be provided as per the details shown in Exhibit 1. Pipe discharges may also be connected directly to a nearby inlet or other drainage structure, and such connections shall be cored and made watertight.

I. *Roof Drains* – Gutters and downspouts are required and shall be tied to the on-site underground drainage system.

J. *Storm Water Detention Requirements*

Detention volume for development areas is calculated on the basis of increases to the impervious cover associated with the project development and existing conditions at the site. Impervious cover includes all structures, foundations, driveways, parking areas, patios, walkways, etc. that exist or will exist on the property.

Single family residential lots of 15,000 square feet (SF) in area or less are exempt from detention requirements. A 15,000 SF lot would be allowed to cover up to 60% of the lot or 9,000 SF.

Single family residential lots greater than 15,000 SF in area will be allowed a 9,000 SF credit for total impervious conditions. Any impervious cover that exceeds 9,000 SF will require detention. The credit is offered to avoid penalizing lots larger than 15,000 SF. The detention requirements for single family residential lots shall be 0.2 acre-feet per acre of total impervious cover over the credit of 9,000 SF. Total detention volume required is calculated as follows:

$$V_t = [43,560 \times (0.20 \times A_i)]$$

Where: V_t = Total Detention Volume (Cubic feet)
 A_i = Area of Total Impervious Cover over 9,000 square feet (Acres)

The design discharge into the public storm collection system shall not exceed the existing condition flow rate (Q) for the 100-year design storm as determined in this Standard.

In addition to a pipe outlet, the detention basin shall be provided with a gravity spillway that will protect structures from flooding should the detention basin be overtopped.

K. *Limitation on lot fill*

The height to which any point on the lot, other than the foundation, may be filled is limited to an elevation calculated by multiplying the distance from the curb by one percent per foot and adding to the top of curb elevation. Existing elevations which are higher than the calculated elevations are not required to be cut to meet the requirements of this section. The calculation only applies to fill above the existing elevation. The one percent does not apply to proposed interior grades. In no case shall any point on the lot be filled more than eight inches above the existing (pre-construction) elevations.

No elevation changes shall occur around and within 3 feet of the perimeter of the property which could become a physical barrier for the natural flow of water from adjacent properties into the property being developed or redeveloped. No raised flower beds will be allowed along the perimeter of the property.

IV. Administration

The City has authority for review and approval of drainage plans for development projects within its jurisdiction. All plans, reports and calculations shall be submitted in duplicate and contain all information and/or language required, pursuant to this section. An electronic copy of the submittal package will also be required.

- A. *Fees* – Drainage plans submitted to the City for approval must be accompanied by a check made payable to the City of Spring Valley Village in an amount specified in the Master Fee Schedule, as determined by the City Council on file at City Hall. A schedule of fees will be provided upon request to the City.
- B. *Site Visit* – The City may require a representative of the property owner or developer to meet with City staff at the project site prior to plat or drainage plan approval. This meeting shall be for the City's benefit and allow the City to understand the property owner's and/or developer's intentions.
- C. It is recommended that prior to preparation of the drainage plan that a meeting be arranged between the applicant and City staff to discuss the proposed concept for the drainage of the project.
- D. All engineering and surveying data shall be shown on the plans sufficient to locate all of the features of the plan on the ground. This data shall include, but not be limited to, full dimensions along all boundaries of the plan, street and alley rights-of-way, easements and drainage-ways, gullies, creeks and bayous, together with the location of the high bank of such drainage ways and water courses, storm drainage pipes or systems, lots, blocks, reserves, out tracts or any other tracts designated separately within the plan boundaries, fee strips or any other physical or topographical features necessary to be accurately located by

surveying methods. Such information shall include line dimensions, bearings of deflecting angles, radii, central angles and degree of curvature, length of curves and tangent distances, all of which are to be shown in feet and decimal fractions thereof.

- E. The location and approximate width of existing and proposed watercourses, ravines and drainage easements, topographical elevations and the boundaries of designated flood zones, as provided in the latest edition of the Federal Insurance Rate Map. All such information required by this subsection shall be certified by a registered professional land surveyor and/or a registered professional engineer.

F. Construction Plan Requirements

- 1. Existing Topographic Survey using a 20-foot grid pattern
 - a. Tie elevations to latest FEMA vertical datum and datum adjustments (include benchmark statement on plan)
 - b. Existing Site Plan (including all structures, paved surfaces, walls, fences, drainage features including ditches, swales, pipes, inlets, detention, flow line elevations, FEMA flood plains, etc.)
 - c. Existing trees
 - d. Existing drainage (all drainage ditches and pipes {depth, width, diameter, flowline elevations, and material}, inlets, junctions, detention, drainage areas, etc.)
- 2. Proposed Development/Building Plans (including all structures, paved surfaces, walls, etc.)
- 3. Proposed Trees - identify location of all existing trees to be removed and proposed trees to be planted
- 4. Proposed drainage plan, including all structures, surface and underground drainage, inlets, detention, pump system, low impact development information and any other features that could impact drainage.
 - a. Clearly define outfall point of connection to existing public storm water collection system.
- 5. Storm water drainage calculations for proposed conditions, including detention worksheet, if required, (total impervious cover over credit amount, required volume, and allowable release rate).
- 6. A National Flood Insurance Program (NFIP) Elevation Certificate shall be submitted with the drainage plan for the proposed development.

G. Drainage Area Map

A drainage area map and supporting data sheets shall be included with the construction plans or in a separate drainage study. The drainage area map shall include:

1. Drainage areas, including off-site areas that drain to the project area.
2. Design storm runoff. The design rainfall event to use is the 2-year event for storm sewer outfall and conveyance. All lot flow should be directed to the on-site collection system prior to outfall into a City system.

H. *Grading and Filling Permit* – A separate Grading and Filling Permit will be required for any proposed on-site “fill” to a property within the City and must adhere to the requirements of this Criteria.

I. *Construction Site Storm Water Runoff Control*

As part of the drainage plan submittal, the engineer shall prepare a Storm Water Pollution Prevention Plan showing erosion and sediment control devices to be implemented during construction. Implementation of the plan including maintenance, inspection, and termination shall be in accordance with the Texas Pollutant Discharge Elimination System (TPDES) Construction General Permit Number TXR 150000. As part of this permit, contractors must train their staff on erosion and sediment controls as well as post required notices informing the public of the activities that may impact the quality of runoff.

J. *Certificate of Occupancy*

As a condition precedent to the issuance of any certificate of occupancy, a second topographical survey shall be made under the supervision of a registered professional land surveyor registered in the State of Texas which shall show the "as-built" elevation of the residence and the finished grade elevations of the lot, patios, drives, sidewalks, landscaped areas, etc. A civil engineer licensed as a Professional Engineer in the State of Texas shall review the "as-built" survey for conformance with the approved drainage plan. The Engineer shall conduct a site visit of the location shown on the survey at a date equal to or after the date of the "as-built" survey. The Engineer shall draft a letter with the following statement to be attached to and submitted with the "as-built" survey:

I, _____, a Professional Engineer licensed in the State of Texas, have reviewed the "as-built" survey of this property and, on the basis of that review and a visit to the site, state that it conforms to the design and intent of the approved drainage plan submitted for permit and is in compliance with the drainage criteria of the City of Spring Valley Village, Texas.

_____ (Date)	_____ (Seal & Signature)
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The Building Official shall deny a Certificate of Occupancy until the "as-built" survey and the Engineer's statement have been properly submitted and approved.

V. Duty to Maintain and Penalties for Non-compliance

A. Duty to maintain drainage

1. All drainage improvements detailed in the drainage plan must be maintained to prevent storm water runoff from flowing onto adjacent property. Interim measures to prevent storm water from flowing onto adjacent properties shall be provided and maintained during construction. **It is the responsibility of the owner and all subsequent owners to maintain the drainage on their property. No alterations to the approved drainage plan shall be performed without first having submitted a revised drainage plan and obtaining City approval. A copy of the approved drainage plan and erosion control measures must be maintained on-site during construction. The City Building Official shall maintain a copy of all drainage plans approved by the City.**

B. Penalties for non-compliance

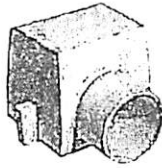
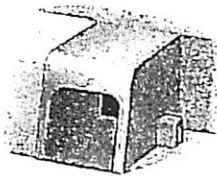
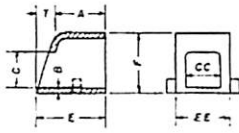
1. Any owner or agent of a residential building site or lot for which a drainage plan is required that fails to comply with, or is in violation of, any of the requirements or provisions of this section, or fails to maintain the approved drainage, shall be subject to a fine in an amount not to exceed \$2,000.00 per day. Each day during which any such violation is committed or continues shall be considered a separate offense.

C. Exceptions

1. The City Council of the City, upon application and hearing, shall have the power and authority to allow an exception from the requirements of this section upon a finding that the strict application of the requirements of this section will affect a hardship of the property and that the proposed design complies with the spirit and intent of this section and provides protection to the neighboring properties at least equivalent to that provided by this section. The City Council shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding such applications.

EXHIBIT 1

Detail for Curb Drain Connections

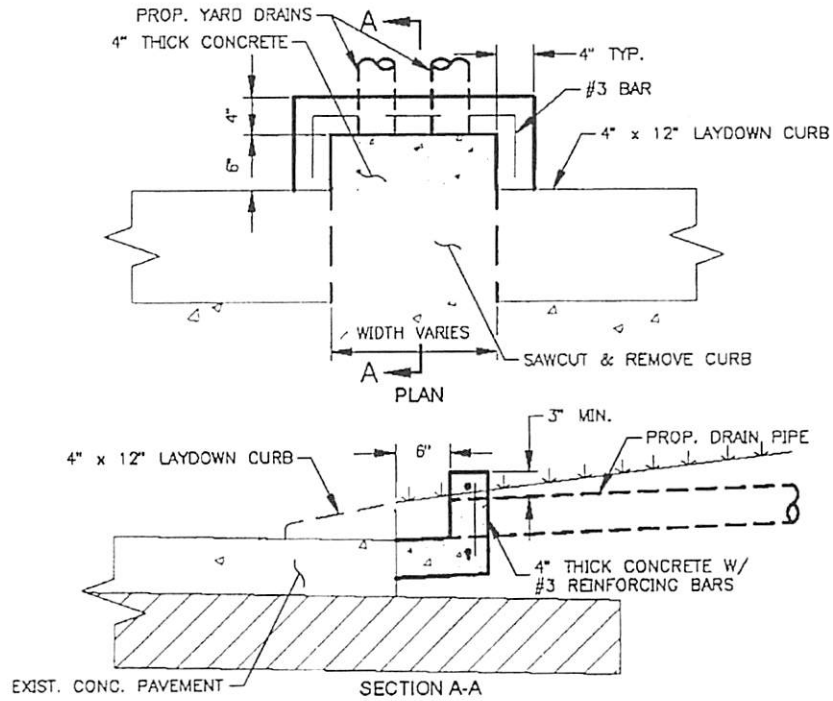


A	B	C	C-C	E	E-E	F	T
5	1/2	4	5 1/2	6	6 1/2	6 1/2	1

NOTE: MODEL R-3262 AS MANUFACTURED BY NEENAH FOUNDRY OR APPROVED EQUAL

STANDARD 6" CURB CONNECTION

Scale: NTS



4" LAYDOWN CURB CONNECTION

Scale: NTS