



# DRAINAGE DESIGN CRITERIA

Rainfall Frequency	25-Years
Maximum Time of Concentration	20 min (residential) & 15 min (commercial & others)
Starting Water Surface Elevation	1.5-ft (msl-mean tide) (Design Standards) 1.6-ft (msl) in City Study
Manning's Roughness	0.013 (RCP)
Runoff Coefficients	0.30 - Undeveloped Areas 0.55 - Minimum Developed Areas 0.90 - Commercial & others, plus lots less than 7,000 SF or areas where there are extensive paved/impervious surfaces
Minimum Storm Sewer Size	18-inch
Storm Sewer Material	- Reinforced Concrete with rubber joints, alternates must be approved by City Engineer - Use of CMP is prohibited
All drainage facilities shall be designed for the following minimum runoff intensity rates (regardless of percentage of permeable vs. impervious area)	- Commercial & others 6.6 cfs/acre - Residential 4.1 cfs/acre - Undeveloped 2.2 cfs/acre

NOTE: ALL DRAINAGE PLANS SHALL BE PREPARED BY TEXAS P.E. CIVIL ENGINEER

1. Subsurface site drainage is required for sites larger than 15,000 square feet or having a frontage wider than 150-ft. Tracts 15,000 square feet and/or no deeper than 150-ft. can have 0.7 cfs drain directly to the City system without an internal drainage system, as long as none of the drainage is directed to adjacent property owners (Subdivision of tracts to avoid provision of subsurface internal drainage system will not be permitted).
2. Detention requirements can be fulfilled with detention ponds, bioswales, oversized internal inlets/ditches and below ground pipes, storm-water tanks with pumps or adequate HGL to drain, paver drains (no permeable pavers due to wind-blown beach sand clogging) → ex: [www.pavedrain.com](http://www.pavedrain.com) or City Approved Equal are acceptable. Detention shall be provided at the rate of 1 acre-feet per 1 acre of lot (Lot area shall include developed and undeveloped portion of lot).
3. All new developments must drain north to Galveston Bay or connect to an existing drainage system with adequate capacity that drains to the north side of the island. Drainage to the Seawall, or beach areas is prohibited. Connecting to existing curb inlets is prohibited and shall be made directly to the reinforced concrete box culvert or storm sewer trunkline/pipe which collects street surface flow from inlets (if adequate capacity is available)
4. Where site drainage necessitates construction of storm sewer lines in City ROW, plan and

profile drawings showing all conflicts preceded by Level "A" subsurface utility evaluation (SUE) prepared by a Texas P.E. is required.

5. Storm sewer lines in City ROW shall be sized to drain adjacent and /or upstream property and ROW where applicable.
6. Where private or public utility easements are required for drainage it shall be acquired by applicant their expense.
7. Construction of driveways where an existing inlet exists will be prohibited. If an exception is granted by City Engineer, the existing inlet shall be relocated or modified at applicant's expense.
8. Where curbs and gutters, sidewalks, driveways or other facilities are constructed on roads with existing roadside ditches, applicant shall install drainage pipe adjacent to property to allow proper drainage. Size and location of pipe shall be approved by City Engineer.
9. The use of corrugated metal pipe is prohibited for internal site drainage and for use in street ROW.
10. When connecting a storm sewer line into a driveway culvert, an approved junction box or manhole shall be constructed. Saddle type inlets are prohibited at this connection.
11. Minimum size private storm sewer line under pavement (in City ROW) shall be 18" RCP. A City of Galveston Standard Manhole shall be constructed when connecting to a RCP Storm Sewer.
12. Where existing drainage crosses the site, the developer shall be required to provide an adequate drainage easement to allow for the conveyance of existing and future flows across the site. The developer shall in no way interfere with the existing or future drainage of upstream property unless alternate drainage facilities are provided at the expense of the developer.
13. Any development draining to a TxDOT facility must get TxDOT approval prior to City approval. TxDOT shall be notified prior to construction activities for inspection purposes.
14. Driveway culverts or other cross-drainage facilities within the City right-of-way must be sized based on upstream drainage areas and expected level of development. The City currently specifies the required driveway culvert sizes if not submitted by a registered engineer. Minimum culvert size is 18-inch in areas unserved by a curb and gutter storm sewer system.
15. Maximum distance to an inlet is 1,000 ft.
16. Applications for Building Permit/Construction plans shall include TX P.E. sealed site drainage plan with drainage calculations showing:
  - a. 25 year storm frequency runoff calculations in cfs for pre-development and post-development conditions
  - b. Total area of site to be drained
  - c. Area drained to each inlet
  - d. All buildings, regardless of occupancy, shall provide acceptable forms of roof drainage with gutters, downspouts and roof drains
  - e. Buildings discharging roof water for sites smaller than 15,000 square feet or having a frontage less than 150-ft may provide internal drainage piping to storm sewer in lieu of swale and/or curb. If grass lined ditches are provided, roof water outfall location shall be protected from erosion with concrete or riprap pads. Subdivision swales shall have

headwalls with RCP pipe to roadside ditch or inlet.

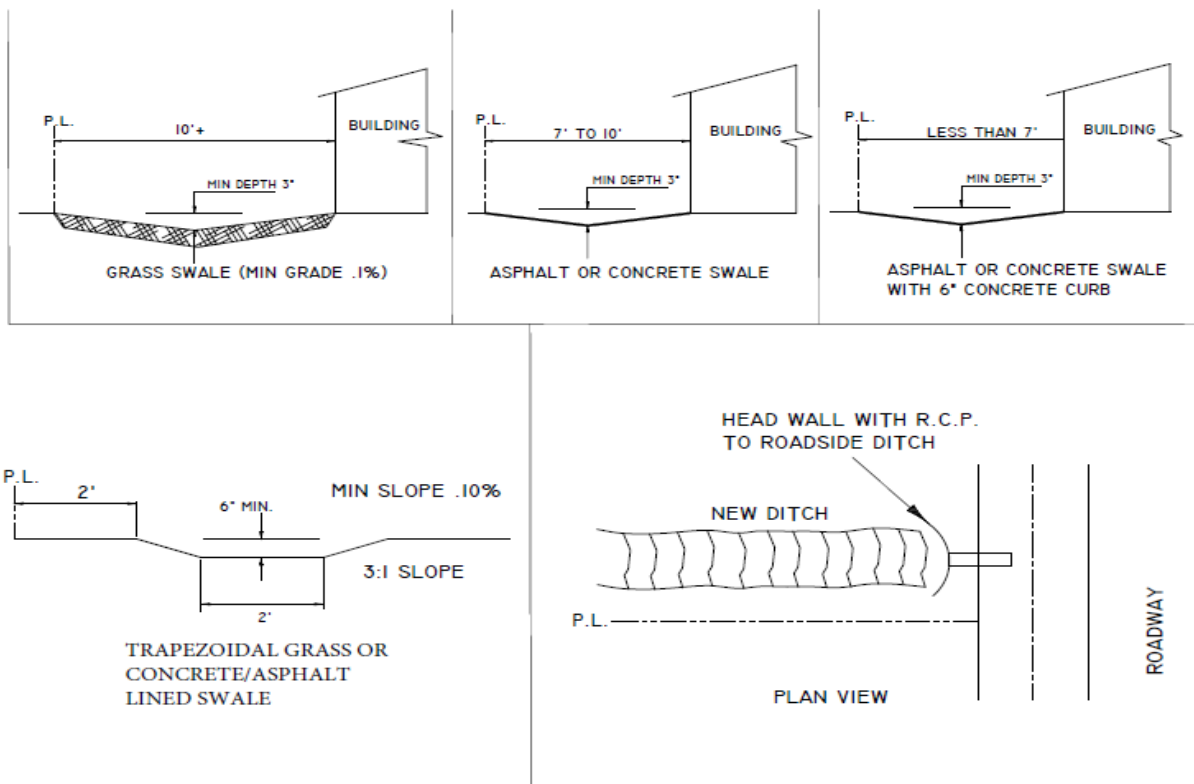
- f. The use of corrugated metal pipe is prohibited for internal site drainage and for use in the City Right of Way.
  - g. Where curbs and gutters, sidewalks, driveways or other facilities are constructed on roads with existing roadside ditches, applicant shall install drainage pipe adjacent to property which includes drainage culverts to allow proper drainage.
  - h. Separate ROW construction permits are required for driveway culverts
  - i. Contours or an adequate number of spot elevations to indicate area drained to each inlet, or directly to the ROW or the Bay.
  - j. Top elevations and flow lines at each inlet
  - k. Flowline elevation at outlet (and ditch flowline elevation, if appropriate. Ditch side slopes shall be minimum 4Horizontal:1vertical for grass lined swales)
  - l. Slope of each drain line
  - m. Sufficient contours or spot elevations (existing and proposed) onsite and around perimeter of site and vicinity to indicate extent of any filling or excavation. Cut or fill over 6" requires a retaining wall and over 12" requires an engineering design
  - n. Applicant shall provide computations to support sizes and grades shown. Velocity in ditches and pipes shall be adequate to prevent silting of pipes and ditches (min 3 fps). The minimum size of drain pipes on private and public ROW shall be 18" diameter.
  - o. When connecting a drain line into a storm pipe or driveway culvert, an approved junction box, manhole or grate inlet shall be constructed
  - p. Grates for inlets in vehicular traffic areas shall be square or rectangular and shall be no smaller than 18" x 18" or equivalent. Grates for catch basins in courtyards, etc. (foot traffic areas) may be any configuration and shall be no smaller than 8" diameter or equivalent.
  - q. Where site drainage system outfalls into roadside ditches, end treatment shall be provided to prevent erosion and to promote safety.
  - r. Where changes in direction of storm sewer lines in the City ROW are necessary, manholes or junction boxes shall be constructed.
  - s. Where the tract lies adjacent to a body of water, the drainage from the tract shall be designed to discharge into the body of water. However, no drainage will be permitted into the Gulf of Mexico or onto the adjacent Beach.
  - t. Where a development drains into the TXDOT ROW, TXDOT must approve the plans prior to submittal for City Review or Approval.
  - u.
17. Minimum proposed roadway crown elevation is 8.2-ft. unless given written approval of a lower elevation by the City Engineer. (This elevation is the approximate 25-yr tidal elevation for Galveston Bay)
18. New buildings shall be not less than 1-ft. above the centerline elevation of the street, or 1-ft. above the highest elevation within 6-ft. of the building site or 2-ft above the base flood elevation whichever is higher.
19. Minimum gradient of streets and gutters is 0.15%

20. Drainage easements and utility easements shall be shown for all drainage and utility configurations including service lines serving 2 properties and swales adjacent to properties

21. Grass/concrete swale details can be found here: <https://www.galvestontx.gov/921/Details>

22. Roof drainage regulations (after roof water hits the ground)

- A. General: All plans for new building shall show method of draining roof, pitch or slope, distance from property line, pre- and post-developed elevations at property line and all surface area regardless of existing site conditions. Curb cut pipe drains are prohibited, an alternative would be to use a yard pop-up drain.
- B. Occupancy: All buildings, regardless of occupancy, discharging roof drainage shall provide some acceptable form of roof drainage such as gutters, downspouts and roof drains.
- C. Swales are required between adjacent properties and shall be shown in a private drainage easement at the time of development application for Building Permit. Next, schematics of grass, concrete and asphalt swales are provided. The hydraulic cross section and slope of the ditches shall be designed for the 25 year storm frequency. When lots are less than 10,000 square feet in area and the development is residential, the swale dimensions shown can be used to convey the drainage around the property to an City approved ROW or outfall:



ALL DITCHES/SWALES SHALL BE LINED WITH GRASS, CONCRETE OR ASPHALT. DIRT DITCHES ARE NOT ALLOWED.