Drainage Plans

Poorly prepared drainage plans account for the majority of development problems. It is recommended that a professional engineer prepare the grading and drainage work.

1. Grading Plan
   a. Name and phone number of person preparing grading/drainage plans (preparer should be a professional engineer)
   b. Existing contours (use thin **dashed lines** and label; extend 50' minimum onto adjacent property)
   c. Proposed contours (use solid lines and label)
   d. Letter of consent for entry or offsite easement from adjacent landowner if proposed grading encroaches onto adjacent property (submitted with the FDP)
   e. Contours on all street intersections.
   f. Top of curb elevation 50' on streets, alleys, existing and proposed parking lots
   g. Slope
      1) Back of street curb to property line: ¼" per foot
      2) Parking lot top of curb to property line: maximum 3 horiz. to 1 vert. (3:1) See detail Attachment "F"
      3) Any unpaved area adjacent to property line: maximum slope to 3:1
      4) Driveways: ¼" per foot + 6" from street gutter up to property line (See detail Attachment "F"; should be included as part of your grading plans)
   h. Temporary erosion control, as required
   i. Existing and proposed inlets (label size)
   j. Existing and proposed storm sewer (label size)
   k. Drainage areas lines
   l. Disposal site for excavation
   m. Standard detail sheet for storm sewer
   n. Indicate CFS (Cubic foot per second) flowing out of the drive(s). A maximum of 10 CFS is permitted.
2. Drainage Area Map
   a. Runoff calculations for all areas
      1) Acreage
      2) Runoff coefficient (refer to Storm Drainage Design Manual, Table 1)
      3) Inlet time (refer to Storm Drainage Design Manual, Table 1)
      4) 100 year intensity

b. Emergency overflow adjacent to low points in street (paved surface, such as a flume)

c. Inlet size (refer to Storm Drainage Design Manual for inlet sizing and spacing criteria)

Drainage from the abutting property must not be impaired by the proposed grading; likewise, drainage to abutting property must not be concentrated or increased by the proposed grading.

Often at the time of the final review and approval, it is necessary to require relocation of proposed driveways, inlets, etc. When this occurs, the property owner should re-evaluate the grading and drainage proposals so as to avoid unnecessary expense, delays, and other undesirable consequences.

3. Creeks and Channels

   a. Stationing in plan and profile

   b. On profiles

      1) Flow line

      2) High Banks

      3) Design water surface

      4) Hydraulic Calculations

      5) Rock line

   c. Drainage area map

   d. Computations for runoff/water surface

   e. Cross sections relative to property line

   f. Erosion control

      1) Larger pipe

      2) Energy dissipaters at outfall

      3) Specify other

   g. All fill compacted to 95% standard Proctor density

   h. Velocities (not to exceed original stream velocities; see Storm Drainage Design Manual, Table 8, for maximum discharge velocities)

   i. Provide parallel streets, alleys, or pedestrian ways adjacent to creeks and/or floodways

   j. Creek/channel drainage alterations in compliance with ordinances (permits may be required; consult City Engineer)

3. Post Construction Storm Water Control

   a. Completion of the Storm Water Quality Assessment Worksheet (Refer to Post Construction Storm Water Control Requirements)

   b. Design and Implementation of BMP's on Storm Water or Utility Plan

Utility Plans

Please check the Public Services Department *Manual for General Procedures for the Design of Water and Sewer Lines in the City of Richardson, Texas*.

1. Water
    a. Standard water and sewer notes (Attachment "C")
    b. Minimum 8" for main lines
    c. Water mains looped
    d. Size of trunk lines in accordance with master water plan
    e. Valves on fire hydrant leads and fire lines
    f. Valves on main lines between each fire hydrant
    g. Maximum distance between fire hydrant
        1) Residential – 500' c-c on street
        2) Apartment – 400' c-c on street
        3) Office, retail, commercial, industrial – 300' c-c on street
    h. Fire hydrant locations
        1) Within 300' of all portions of all non-residential buildings
        2) Within 400' of all multi-family or single-family attached dwellings
        3) Within 500' of all single family detached dwellings
        4) Except for single-story or two-story residences, the path of measurement shall be along a minimum of ten feet (10') wide unobstructed pathway around the external walls of the structure
        5) No closer than 25' to an existing or proposed driveway;
        6) No closer than 10' to an existing or proposed radius turn;
        7) Located 2' – 5' behind the curb of a dedicated street or fire lane.
        8) Show and label the location of the fire department connections (FDC).
    i. Materials list
    j. Lateral service (minimum 1" copper) from main line to 2' from back of curb, located 5' upstream of center lot for a residential subdivision
    k. Water main extended to opposite property line or tied to existing main
    l. Mains 12" and larger profiled

m. Location/size of water meters
   1) Domestic
   2) Irrigation
   3) Fire Department Connection
   4) Riser Room

   (Water meters shall not be located in concrete areas)

n. Fire service mains and fire sprinkler systems (see Attachment "D" and "Fire Service mains" document available at www.cor.net/fire/permits)

o. Size of water meters

p. Utility easements up to and including fire hydrants and water meters

q. 10' minimum separation between utility lines

r. Note on plans: "Contractor to verify location of existing utilities."

s. City of Richardson standard detail sheet

2. Sanitary Sewer
   a. 8" minimum pvc
   b. Clean-out at end of all lines < 12"
   c. Manholes at change of pipe size, wyes, bends & service connections greater than 6"
   d. 500' maximum distance between manholes
   e. Minimum slope (velocity > 2fps)
      1) 6" - 0.75%
      2) 8" – 0.36%
      3) 10" – 0.24%
      4) 12" – 0.20%
      5) 15" – 0.16%
      6) 18" – 0.12%
   f. Maximum slope (velocity < 8 fps)
      1) 6" – 10.5%
      2) 8" – 9.0%
      3) 10" – 6.68%
      4) 12" – 5.24%
      5) 15" – 3.89%
      6) 18" – 3.05%

g. Sewer laterals 10' downstream from water service or 5' downstream of center lot in residential subdivisions

h. Minimum lateral size

   1) Residential, apartment – 4"

   2) Office, retail, commercial, industrial – 6"

i. All sewer lines crossing sanitary sewer on profile

j. Other utility lines crossing sanitary sewer on profile

k. Lines labeled to correspond to profile

l. Concrete encasement at creek and utility crossings

m. Stubouts to adjacent property

n. Benchmark on all sheets

o. Linear distance and type of pipe

p. Refer to detail sheet for embedment details

q. 10' minimum separation between utility lines

r. Note on plans: "Contractor to verify location of existing utilities"

s. Video inspection with new sewer line construction (refer to Manual for General Procedures for Design of Water and Sewer Lines in the City of Richardson, section V-B for details)

t. City of Richardson standard detail sheet

3. Lift Stations

   a. Standard notes from Attachment "C" added to lift station sheet

   b. Pump station layout

   c. Plan view and sections

   d. Electrical power service and details

   e. Provisions for emergency overflow

   f. Manufacturer's model number

   g. Operations and maintenance notes

   h. Design criteria of Texas Water Quality Board and the Texas Water Commission

   i. Tee and flange valve, with a blind flange on the valve, on the force main side of check valve for emergency overflow protection

   j. Security fence for facility

   k. Manufacturer's specifications supplied

Lift station must not be subject to flooding and must be accessible via all weather surface.

4. Storm Sewer
    a. Plan and profile of all proposed storm sewers including laterals
    b. Station of laterals on trunk plan/profile
    c. On plan view:
        1) Size of inlet
        2) Lateral size
        3) Flow line
        4) Paving station
        5) Top of curb elevation
    d. Curve data for storm sewers
    e. Easements with dimensions
    f. Class III RCP (typ.)
    g. Hydraulic gradients and calculations on all sections
    h. Storm sewer discharge at flow line of creek or channel
    i. All fill compacted to 95% standard Proctor density
    j. Headwalls and erosion control at outfall of storm sewers
    k. Soffits at pipe size changes to match (typical)
    l. Existing and proposed utilities in plan and profile
    m. On profile
        1) Grade
        2) Flow line elevations every station
    n. Benchmarks on every sheet
    o. 10' minimum separation between utility lines
    p. Emergency overflow in concrete lined flumes
    q. Details of all non-standard items
    r. Note on plans: "Contractor to verify location of existing utilities"
    s. City of Richardson standard detail sheet
5. Bridges
    a. Lowest member of bridge minimum of 2' above 100 year water surface elevation
    b. Soil boring locations on plans
    c. Soils report
    d. Bridge sections upstream and downstream
    e. Structural details and calculations with dead load deflecting diagram
    f. Vertical and horizontal alignment
    g. Hydraulic calculations on all sections

Paving Plans

1. Right-of-Way and Pavement Width
    a. Refer to Master Thoroughfare Plan for guidance
    b. Street r.o.w., pavement width:
        1) Single-family and duplex – 50' r.o.w., 27' b-b pavement
        2) Schools, parks and apartments – 60' r.o.w., 37' b-b pavement
        3) Retail, commercial, industrial and office – 60' r.o.w., 45' b-b pavement
        4) Where required by Thoroughfare plan – 80' r.o.w., two 25' b-b roadways
        5) Where required by Thoroughfare Plan – 110' r.o.w., two 34' b-b roadways
        6) Where required by Thoroughfare Plan – 140' r.o.w., two 34' b-b roadways
        7) Right-of-way and pavement widths flair at intersection
    c. Alley r.o.w., pavement width
        1) Single-family – 15' r.o.w., 10' pavement, 5" invert
        2) Apartment, duplex, office, retail, commercial and industrial – 20' r.o.w., 20' pavement, 5" invert

Design Standards

1. Pavement
    a. Concrete thickness
        1) Local streets and alleys – 6" minimum;
        2) Collector streets – 8" minimum;
        3) Arterial streets – 9" minimum; 10" in intersections
        4) Parking Areas – 5" minimum
        5) Fire Lanes – 6" Minimum
    b. Reinforcement
        1) Local streets and alleys – No. 4 rebars 24" o.c. both ways
        2) Collector and arterial streets – No. 4 rebars 24" o.c. both ways
    c. Class "C" Concrete (3,600 p.s.i.) in 28 days
    d. 6" curb along gutterline and 5" curb along median
    e. Expansion joints at 600' intervals
    f. Lateral saw cuts at 20' intervals
    g. Longitudinal saw cuts for streets at 10'6" intervals
    h. 2" pvc street lighting conduit 2' from median curb
    i. 3" pvc signal conduit at all thoroughfares and/or collector intersections
    j. 30' radius for drives at street intersections
    k. Arrows to indicate direction of drainage
    l. Approval of left turn lane and drive locations by Development Services Department prior to final submittal
2. Sidewalks
    a. Concrete, 4" thickness
    b. 3,000 p.s.i. in 28 days
    c. Reinforcement with No. 3 bars, 24" o.c. both ways
    d. Expansion joints at 20' intervals
    e. Tooled joint at 5' intervals
    f. Barrier free ramps are to be provided at all street and alley intersections