

CHAPTER 3

3.00 STORM DRAINAGE

3.10 General

The City of Airway Heights refers to Spokane County Guidelines for Storm Water Management standards for all specific criteria governing Storm Water Systems and shall include this chapter in addition thereto. Conflicting requirements made by these standards shall supersede those in the Spokane County manual.

The standards established by this chapter are intended to represent the minimum standards for the design and construction of storm drainage facilities. This section outlines standard methods for calculating runoff and infiltration rates, and details acceptable systems for stormwater disposal within the City. Design detail, workmanship, and materials shall also be in accordance with Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction, latest edition.

The storm drainage system and natural conveyance that exists is not sized to accommodate the runoff from the fully developed area, but is generally sized to accommodate runoff from the streets and undeveloped property which the storm drainage system serves. Accordingly, as private property is developed, all development within the area must allow for on-site detention/retention and possibly infiltration of storm water runoff. In addition, facilities must be provided to eliminate erosion sedimentation and all floatable pollutants. These facilities usually take the form of sedimentation basins, oil separators, and piping culverts, riprap, seeding, or other methods to prevent soil erosion.

Sizing of storm water conveyance and retention/detention systems is the responsibility of the professional engineer retained by the developer and is subject to approval by the City.

Specific projects may warrant storm drainage facilities be constructed in excess of the requirements of this chapter, e.g., slopes of 15 or greater will be subject to the criteria of the City's Critical Areas Ordinance (AHMC 18.08). Generally when this situation occurs, the environmental review (SEPA) will address the requirements of additional storm drainage runoff concerns. The City does, however, reserve the right to impose more stringent storm drainage

runoff discharge, retention/detention and infiltration criteria if the public interest is best served.

3.20 Design Standards

Storm water generated on private property shall be disposed of on-site using grass percolation area swales. Roof areas draining directly onto a paved area must be included in the impervious area computation. Roof drainage may be “tight-lined” directly into a drywell sized to take the runoff, provided there are no mechanical systems on the building’s roof and that the roof is of a non-asphalt material. All stormwater shall be treated by an approved bio-filtration facility prior to disposal.

The design of storm drainage and/or retention/detention system shall depend on their type and local site conditions. The design elements of storm drainage systems shall conform to City standards as set forth herein and follow current design practice as set forth in Section 1.010 and 1.040. The following design considerations shall apply:

- A. The facilities shall be designed to accommodate a 25 year storm, from a fully developed site. In areas where the development is on a flood plain, higher standards shall be required by the Public Works Department.
- B. Run off rates shall be determined by the rational formula:

$$Q = CIA$$

Q= Runoff in cf’s

C= Runoff coefficient

I= Rainfall intensity in inches per hour

A= Contributing area in acres

The runoff coefficient (C) shall be based on Table 3-00

- C. The rainfall-duration-frequency curve for the Spokane Area is used for rainfall intensity (Drawing 3-01). The time of concentration for rainfall shall be computed for all overland flow, ditches, channels, gutters, culverts and pipe systems. When using the rational formula, the time of concentration for overland flow may be computed by the formula:

$$T_c = C_t (L_n)^{.6} \\ (s^{1/2})$$

Where Tc is the time of concentration in minutes

L is the length of the principal channel in feet
N is the friction factor of the ground surface
S is the average slope of the principal channel in feet per foot
Ct = .40 for natural drainage basins
Ct = .15 for overland flow

The time of concentration should be calculated for each significantly different slope. Travel time for flow in pipes, ditches and gutters should be computed as a function of the velocity as defined by Mannings formula.

- C. The percolation rate shall be based upon actual percolation rates as established by tests taken in the proposed percolation area. Percolation testing shall be conducted so as to represent antecedent saturated soil conditions. Tests shall be conducted in accordance with Spokane County Guidelines for Storm Water Management requirements. Percolation test results shall accompany storm calculations. The actual perc rate, i.e., inches per minute of the test, must be divided by 2.5 for design purposes to provide a safety factor for the calculations and to extend the life of the percolation zone.
- D. Maximum storage depth within the bio-filtration facility shall be eight (8) inches. Eight inch storage shall be subject to the percolation requirements and topsoil requirements as described in the Spokane County Manual.
- F. Placement of retention/detention facility in an area that is used to satisfy an open space requirement shall be discouraged unless it enhances a recreational amenity, except that no more than 50% of the required open space may be used for stormwater control improvements.

Use of designated open space areas for stormwater detention/retention and for infiltration shall satisfy all conditions of the City of Airway Heights for usability and landscape conformity.

In determining usability of open space where drainage concepts are involved, staff will apply two main tests: orientation of design and overall aesthetic impression.

Because the primary purpose of consolidated open space is to provide usable area for recreation activities, buffer zones, and green belt areas, the open space must be designed for this intent. Any use of this area for stormwater detention/retention must clearly be subordinate to and not

detract from open space uses. Because active recreation requires primarily flat topography, the usable open space will be predominantly flat. In no event shall slopes exceed 4:1 where drainage facilities are present.

Open space also serves an aesthetic function by providing areas of green space that are attractive and an amenity to the project site. The second test applied to open space will be that of the general impression the open space provides. The open space must be designed to give the impression of an attractive open space area available for park uses.

- F. Maximum catch basin spacing shall be 300 feet on arterials and collectors and 500 feet on all other street classifications. No surface water shall cross any roadway.

The General Notes following shall be included on any plans dealing with storm systems.

GENERAL NOTES (STORM DRAIN CONSTRUCTION)

All workmanship and materials shall be in accordance with City of Airway Heights Standards and the latest edition of the State of Washington Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA).

3.21 EROSION & SEDIMENT CONTROL

- A. Temporary erosion/water pollution measures shall be required in accordance with Section 1.07.15 of the State of Washington Standard Specifications and as follows:
 - 1. Soil erosion and water pollution/flood control plans shall be submitted to the City, approved by the City, and implemented by the contractor prior to disturbing any soil on the site. Submittal and approval of these plans shall preclude any construction activity on the site.
 - 2. All permanent storage and retention/detention areas used as part of the temporary erosion control and water pollution/flood activities and conveyance systems shall be cleaned of all silts, sand, and other materials following completion of construction and the permanent facilities shall then be completed including permanent infiltration areas. Refer to Spokane County Erosion Control criteria for additional

information.

3. Comply with all other permits and other requirements by the City of Airway Heights or other governing authority or agency.
4. A preconstruction meeting shall be held with the City of Airway Heights prior to the start of construction.
5. All storm mains and retention/detention areas shall be staked for grade and alignment by an engineering or surveying firm capable of performing such work.
6. Storm drain pipe shall meet the following requirements:
 - a. PVC pipe conforming to ASTM D-3034 SDR or ASTM F-789 with joints and gaskets conforming to ASTM D-3212 and ASTM F-77.
 - b. Ductile iron pipe conforming to the requirements of AWWA C-151, thickness class as shown on the plans.
 - c. Polyethylene smooth wall pipe per Advanced Drainage Systems (ADS) N-12 constructed per WSDOT/APWA Standard Specifications 7-04.
7. Special structures, oil/water separators and outlet controls shall be installed per plans and manufacturers recommendations.
8. All disturbed areas shall receive permanent erosion control in the form of vegetation establishment such as grass seeding as shown on the Erosion and Sediment Control Plans. A means shall be established to protect the permanent storm drain system prior to establishment of the permanent erosion control measures.
9. Provide traffic control plan(s) as required in accordance with MUTCD.
10. Call underground locate line 1-509-456-8000 a minimum 48 hours prior to any excavations.
11. Where connections require "field verifications," connection points will be exposed by contractor and fittings verified 48 hours prior to distributing shut-down notices.

12. Drywells will meet Spokane County Standards.

3.25 Conveyance

- A. Pipe: Storm drain pipe within a public right-of-way or easement shall be sized to carry the maximum anticipated runoff from the possible contributing area. The 25-year storm event shall be used to size piping, however, larger storm event requirements may be imposed as the City deems appropriate to protect facilities.

The minimum main size shall be 12 inches diameter. Lateral lines may be 8 inches diameter. Nothing shall preclude the City from requiring the installation of a larger-sized main if the City determines a larger size is needed to serve adjacent areas or for future service.

All pipe for storm mains shall comply with one of the following types:

Polyvinyl Chloride: PVC pipe per chapter 4.030.

Ductile Iron: Ductile iron pipe per chapter 4.030 of these standards.

Polyethylene: PE smooth wall pipe per Advanced Drainage Systems (ADS) N-12 constructed per WSDOT/APWA Standard Specifications 7-04.

- B. Velocities: Minimum velocities in pipe systems and culverts shall be four feet per second at design flows to prevent sitting, unless otherwise permitted by the Public Works Director.
- C. Channels: The use of open vegetated channels to convey stormwater runoff may be approved. However, this type of design will only be approved on a special basis as deemed necessary by the Public Works Director. Open channels shall meet the sizing requirements of piped systems. Any open channels proposed to be located within public right-of-way shall require special approval from the Public Works Director.

Generally open channels shall not exceed 2.5 feet in depth and shall have maximum 3:1 side slopes. All open channels shall be vegetated with grass or other vegetation as approved by the City. Channel velocities shall be controlled so as to prevent scouring of the channel bottom and sides.

3.30 Staking

All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed by the State of Washington.

A preconstruction meeting shall be held with the City prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

- A. Stake centerline alignment every 25 feet with cuts and/or fills to bottom of trench.
- B. Stake location of all catch basins/manholes and other fixtures for grade and alignment.
- C. Stake location, size and depth of retention/detention facility.
- D. Stake finished grade of catch basin/manhole rim elevation and invert elevations of all pipes in catch basins, manholes and those that daylight.

3.40 Trench Excavation

See Chapter 4.160 for requirements regarding trench excavation.

3.50 Backfilling

See Chapter 4.170 for requirements regarding backfilling.

3.60 Street Patching and Restoration

See Chapter 2B.170 and 2B.180 for requirements regarding street patching and trench restoration.

3.70 Clearing of Permanent Retention/Detention Areas

Systems shall be cleared of all silt, sand, and other material when the infiltration rate because 60% of the initial. No vegetation shall be planted in

the infiltration area of the retention/detention area.

3.71 Draining Stormwater from the Public Right of Way to Private Property

Street dedications, sale of property to the City or easements are required for construction of swales on private property for the purpose of draining stormwater from the public right of way. Covenants or deeds shall be established to prohibit alteration or filling in of swale areas. Adjacent property owners shall be required to maintain the swale areas within an easement and provide access for City maintenance personnel.

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