

CHAPTER 7 PLAN REQUIREMENTS

7.1 Scope

This section governs the preparation of plans for stormwater systems

7.2 General

The plans shall include all information necessary to build and check the design of storm drainage systems and related appurtenances. The plans shall be arranged as required by the Director. Plans shall be prepared and certified by a Registered Professional Engineer, licensed in the State of Missouri, and shall be submitted to the Director for review. The submittal shall consist of the following:

7.2.1 Calculation Summary

7.2.2 Required Plan Sheets

7.3 Calculation Summary

The Engineer shall submit a summary of all calculations and investigation analysis: hydraulic, hydrologic, erosion and sediment control, structural, geotechnical and others as necessary to adequately and fully explain the designs being submitted. The calculation summary shall indicate the methods outlined in Chapters 1 - 6 which were used to perform the calculations and determine the final results. These results shall be submitted on the forms labeled Figures 7.3.1, 7.3.2, 7.3.3, 7.3.4 and 7.3.5 in Appendix F. All the information required on the forms shall be provided. The Director may require additional supporting documentation when the results cannot be verified using the methods indicated in the summary.

7.4 Required Plan Sheets

The plans shall consist of:

7.4.1 Title sheet

7.4.2 General layout sheets

7.4.3 Plan and profile sheets, these may be combined or separate

7.4.4 Cross-section sheets

7.4.5 Drainage area map and table

7.4.6 Standard and special detail sheets, City standard structures are assumed where applicable

- 7.4.7 Traffic control plans (if required)
- 7.4.8 Temporary erosion control plans
- 7.4.9 Grading plans (if required)
- 7.4.10 Property line and easement sheets (if required)

Each sheet shall contain a sheet number, including the individual sheet number and the total number of sheets, proper project identification and all revision dates. The Engineer's seal shall appear on all sheets.

7.5 Sheet Sizes

Plans shall be submitted on 24 inch by 36 inch sheets.

7.6 Scales

Plans shall be drawn at a scale appropriate to clearly present the design and of not more than one (1) inch equals one hundred (100) feet. Bar Scales shall be shown on each sheet for each scale.

7.7 Required information for Title Sheet

- 7.7.1 Name of project.
- 7.7.2 Index to sheets.
- 7.7.3 A location map adequately showing the project location in relation to major streets, with north arrow and scale. Map shall be oriented with north arrow up.
- 7.7.4 A signature block for City approval.
- 7.7.5 Name, address and telephone number of the consulting engineer and owner/developer.
- 7.7.6 A legend of symbols shall be shown that apply to all sheets.
- 7.7.7 List containing name and telephone number of each utility company and state One-Call system.
- 7.7.8 Engineer's seal, signed and dated
- 7.7.9 Other information as required by the Director.

7.8 Required Information for General Layout Sheet

- 7.8.1** General Notes: Minor construction notes shall appear on the proper plans and profile sheets.
- 7.8.2** North arrow and bar scale. North arrow should be oriented up or to the right.
- 7.8.3** Surveyed or aerial base map detail indicating existing man-made or natural topographical features, such as buildings, fences, trees, channels, ponds, streams, etc. and existing utilities.
- 7.8.4** Subdivision information including, but not limited to Rights-of-Way, Property and lot lines, existing and proposed easements, subdivision nomenclature, Street names and other pertinent information impacting the project.
- 7.8.5** Identification and location of all existing and proposed drainage features.
- 7.8.6** Elevation and location of all applicable benchmarks: All elevations shall be based upon city datum. A minimum of two (2) benchmarks are required for each project.
- 7.8.7** Survey control line or base line with adequate ties to land lines.
- 7.8.8** Locations of test borings if taken.
- 7.8.9** Existing and finish grade contours at intervals of 2.0 feet or less in elevation; or equivalent detail indicating existing and finish grades and slopes.
- 7.8.10** The lowest elevation for the top of foundation for each lot. This elevation typically represents the elevation of the top of the foundation however, in cases where a full basement or crawlspace is constructed the elevation will represent the lowest opening through the foundation into the basement or crawlspace. This elevation will need to be high enough to protect the structure from flooding per 4.7.1.
- 7.8.11** Addresses of homes abutting the projects, and current homeowner names associated with properties impacted by the project.

7.9 Required Information for Plan and Profile Sheets

- 7.9.1** North arrow and bar scale. North should be oriented up or to the right.
- 7.9.2** Existing man-made and natural topographic features, such as buildings, fences, trees, channels, ponds, streams, etc., and all existing and proposed utilities.
- 7.9.3** Identification and location of each storm drainage segment and existing utilities affecting construction.
- 7.9.4** Length, size and slope of each line or channel segment. The profile shall indicate the hydraulic grade line of the underground as well as the overland design flows.
- 7.9.5** Right-of-Way, property, easement lines and street names. The 1 percent floodplain and applicable stream buffers.
- 7.9.6** Location of test borings representing depth of drilled hole and refusal elevation if applicable.
- 7.9.7** Headwater elevation at the inlet end of each culvert.
- 7.9.8** Invert elevations in and out and top elevations of each structure shall be shown. At least two elevations shall be shown for inlet tops matching sloped grades.
- 7.9.9** Each utility line crossing the alignment shall be properly located and identified as to type, size and material. This information shall be to the best information available and provided through records, field prospecting and or excavation.
- 7.9.10** All station and invert elevations of manholes, junction boxes, inlets and other significant structures.
- 7.9.11** The profile shall show existing grade above the centerline as a dashed line, proposed finish grades or established street grades by solid lines. Each line shall be properly identified. The proposed sewer shall be shown as solid lines properly showing the inside top and bottom of pipe.
- 7.9.12** All structures shall be shown and labeled with appropriate drawing references.

7.10 Cross-Section Sheets

Cross-sections shall be drawn for all open channels. Sections shall be drawn at all structures, intersecting drainage systems, grade breaks and change in section. Additional sections may be required by City to adequately convey design. Cross-sections shall also provide for overflow drainage paths that are designated to convey overland flows in excess of underground system capacity. The following shall be indicated on each section.

7.10.1 Existing and proposed grades.

7.10.2 Elevation of proposed flow-lines.

7.10.3 Cut and fill end areas if required for bid quantities.

7.11 Drainage Area Map

The drainage area map shall be supported by a drainage table tabulating the physical properties of the drainage sub-basins, as well as the hydrologic and hydraulic properties of the design. The drainage map shall have the following.

7.11.1 North arrow and bar scale. North should be oriented up or to the right.

7.11.2 Drainage area boundaries for all watersheds including sub-watersheds of analysis including pass through waters, inlet drainage areas, culvert drainage areas and other points of interest.

7.11.3 Drainage system nomenclature matching that on the “designed” systems shown in the plans.

7.12 Standard and Special Detail Sheets

Detail sheets shall be included to show all details of appurtenances, materials and construction. Details shall conform to the requirements of the City and are to be drawn clearly and neatly with proper identifications, dimensions materials and other information necessary guide desired construction. City standard structures are assumed where applicable.

7.13 Traffic Control Plans

Traffic control plans shall conform to design and principals contained the most recent copy of Manual of Uniform Traffic Control Devices (MUTCD) and the City of Columbia Traffic Control Manual for Street Construction and Maintenance Operations.

7.14 Grading and Erosion Control Plan Sheets

Grading and erosion control plan sheets shall be per Chapter 12A of the City Code of Ordinances.

7.15 Property Line and Easement Sheets

Separate property line and easement sheets may be required by the Director. The information on this sheet shall be sufficient to display the existing and proposed property line and easement changes relative to the project.