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SECTION 103 - DRAWINGS AND CALCULATIONS

Plan review and submittal procedures are set forth in Section 101.11. This section describes the requirements for drawings and calculations for storm drainage facilities which must be submitted and approved prior to filing of final plats for subdivisions, issuance of commercial building permits or issuance of grading permits.

Review and approval of drawings and calculations by Greene County is conceptual in nature only and does not imply detailed approval to any particular design item or data shown on the drawings, nor does it give implied approval for any variance from any Greene County regulations or design standards. The design professional whose seal appears on the plans is responsible for all lines and grades, field data, and constructability of the design in compliance with the Greene County standards and regulations.

103.1 SUBDIVISIONS

103.1.1 Professional Requirements

Construction drawings and calculations for subdivisions shall be prepared by an engineer registered to practice in the State of Missouri, having experience and training in the fundamentals of hydraulic engineering and storm drainage.

103.1.2 Submittal Requirements

Construction plans for storm drainage improvements required by the Greene County Subdivision Regulations must be completed and approved by the Stormwater Engineer before the final plat can be filed or a grading permit can be issued for construction of the improvements. Construction plans must be submitted to the Greene County Planning Director in accordance with Article IV, Section 3 of the Subdivision Regulations. The following items must be submitted:

1. Six (6) sets of construction drawings, or the number currently specified in Article IV, Section 3.C of the Subdivision Regulations.
2. Two (2) copies of the Drainage Area Map.
3. Two (2) copies of computation sheets. Summary tables shown in Figures 103.3 and 103.4 may be used to summarize computations for storm drain piping and inlets. Other formats or computer program output summaries may be used provided they are clear and concise.

Incomplete submittals will be returned without review.

103.1.3 Construction Drawing Requirements

A. General

Construction drawings for streets and storm drainage improvements shall be submitted as a single set of construction drawings titled as follows:

**Paving and Storm Drainage Improvements
for
(Name of Subdivision)
a Subdivision in Greene County, Missouri**

Construction drawings shall be bound in a set of consecutively numbered sheets bearing the standard Greene County title block shown in Figure 103.1.

Each drawing must be signed by both the County Highway Administrator *and* the Stormwater Engineer before the drawings are approved for construction.

Construction drawings shall clearly show the location and extent of proposed construction in relation to existing and proposed property lines, physical features, topography, and utilities, and shall include all details necessary to properly construct the proposed facilities. Linework and lettering shall be neat and clear. Original copies of the drawings shall be free from smudges, tears, folds, and other imperfections which affect the legibility of the drawing.

All construction drawings shall show the following:

- Title block, showing name of the proposed project, drawing title, and drawing number.
- Name, address, telephone and “fax” number of consultant.
- Seal of responsible design professional.
- A scale for each plan or detail.
- A north arrow for all full or partial site plans and maps.
- The Missouri One-Call utility locate symbol on all drawings involving earthwork.

B. Drawing Size

Unless otherwise approved in writing by the Highway Administrator and the Stormwater Engineer, original drawings shall be thirty-six inches (36") wide by twenty-four inches (24") high with a one-half inch ($\frac{1}{2}$ ") clear border on the top, bottom, and right sides of the drawing, and a one and one-half inch ($1 \frac{1}{2}$ ") clear border on the left side of the drawing.

Lettering shall be in a size large enough to allow reproduction of legible half-size drawings for use in the field.

C. Scale

Plans and details shall be drawn to definite, conventional scales, unless specifically noted and approved otherwise. Scales shall be in English units. Required scales for various plans are set forth in Paragraphs J. through P., below. Specified scales may be varied only with the written approval of the Highway Administrator and Stormwater Engineer.

D. Drafting Media

Construction drawings shall be drawn in ink on mylar, unless otherwise approved in writing by the County Highway Administrator and Stormwater Engineer.

E. Ownership and Possession of Drawings

Original drawings shall remain the property of the consultant. No other reproducible copies of the drawings shall be made or distributed until construction is complete and approved by the County (see Section 103.1.6, As-Built Drawings).

F. Required Information

The following information must be included in the construction drawings:

- General project information.
- Site boundary and dimensions.
- Grading plan.
- Plan of proposed storm drainage facilities.
- Sediment & Erosion Control Plan (SECP).
- Profiles for storm drainage improvements.
- Details of stormwater facilities.

Specific information required for each item listed above is described in Paragraphs J. through P., below.

It is not required that a separate drawing be prepared for each item listed above. The required information may be shown on the fewest number of drawings needed to present the information clearly and legibly, depending upon the size of the project and complexity of the proposed work.

Paving and drainage plans must also include street plan and profile drawings and street construction details. Requirements for these drawings are set forth in standards adopted by the Greene County Highway Department and are not described in detail in this section.

G. Benchmarks and Vertical Datum

Datum shall be mean sea level (MSL) as defined by the National Geodetic Vertical Datum of 1927, as required in Article IV, Section 5 of the Subdivision Regulations. Benchmark references shall be noted on the drawings. For sites within the Springfield Urban Services Area, two (2) City of Springfield benchmarks shall be referenced. For sites outside this area, one (1) U.S.G.S. benchmark shall be referenced.

H. Horizontal Control

The site boundary shall be tied to the Missouri State Plane Coordinate System, as required in Article IV, Section 10 of the Subdivision Regulations.

I. General Project Information

The following general information must be shown on the first sheet of the construction drawings:

- Location map at a scale of 1" = 2000' (one inch equals two thousand feet), showing streets and roads of collector or greater classification and municipal boundaries within one thousand feet (1000') of the site.
- General Notes, see Figure 103.2 for recommended General Notes.
- Name, address, telephone and "fax" number of developer.

- Index to drawings.
- Benchmark data.
- Legal description of property.
- Key to symbols used on the drawings.
- Location plan.

Where the proposed construction site consists of a phase of an approved preliminary plat, a location plan shall be shown on the first sheet, or the sheet immediately following the cover sheet of the drawings. The location plan shall show the entire area and boundary of the preliminary plat and the location and boundary of the proposed phase within the preliminary plat. Location plan scale shall not be smaller than 1" = 200' (one inch equals two hundred feet) unless otherwise approved by the Stormwater Engineer and Highway Administrator.

J. Site Boundary and Dimensions

The first or second drawing of the set must include a plan showing the site boundary and dimensions at a minimum scale of 1" = 100' (one inch equals one hundred feet), and the following information:

- North arrow & graphic scale.
- Site boundary with dimensions and bearings.
- Proposed rights-of-way and lot lines with dimensions and bearings.
- Property lines and owners' names for all properties adjoining the site (property lines for adjoining properties need only extend one inch (1") actual scale, outside the site boundary).
- Location and dimensions of existing and proposed easements.
- Street names.
- Existing and proposed floodplain boundaries.
- Boundaries of any other special districts as defined in the Zoning Regulations.
- Boundaries of cities and other political subdivisions.

K. Grading Plan

A grading plan for the entire site must be included in the drawings. The site boundary and dimension plan shall serve as the base for the grading plan.

The grading plan shall show the following:

- Existing topographic contours, at five foot (5') maximum intervals for subdivisions in the A-1, Agriculture and A-R, Agriculture Residence zoning districts and two foot (2') maximum intervals in all other districts. Each fifth contour shall be drawn as an index contour by using a heavier line weight. Index contours must be labeled.
- Existing streets, transportation facilities, utilities, and storm drainage facilities.

- Existing physical features including waterbodies and watercourses, sinkholes, springs, caves, faults, fracture trends, and photolineaments.
- Existing structures, pavements, sidewalks, tree masses, pavements, and fences.
- Proposed streets, transportation facilities, utilities, and storm drainage facilities.
- Proposed structures, sidewalks, and pavements.
- Proposed topographic contours. The line type used for proposed contours must be heavier than that used for existing grades, and must have a different line type. Proposed contours shall be shown at two foot (2') maximum intervals. Each fifth contour shall be drawn as an index contour by using a heavier line weight. Index contours must be labeled.

L. Plan of Proposed Storm Drainage Facilities

An overall plan of the site showing all proposed storm drainage facilities shall be provided. The site boundary and dimension plan shall serve as the base for this plan. This plan may be superimposed upon the site grading plan, depending upon the size and complexity of the project, provided that clarity and legibility can be maintained. The plan of storm drainage facilities shall show the location of the following items:

- Detention basins.
- Sediment basins.
- Storm drain piping.
- Inlets.
- Junction structures.
- Open channels and swales.
- Other components of the storm drainage system.
- Horizontal location of all components of the storm drainage system, dimensioned to easements, right-of-way, or property lines. Where all components of the system cannot be legibly dimensioned at the scale of the overall plan, enlarged plans of these areas shall be provided.
- Line numbers and structure reference numbers, as described below:

Beginning at each point of discharge from the site, the storm drainage system shall be organized into a system of "lines" for identification of profiles. Storm drainage lines shall be numbered in consecutive order, beginning with the number one (1). Inlets, outlets, junction structures, and other points of reference shall be designated by letters beginning at the downstream-most point in each line with the line number followed by the reference letter, beginning with the letter "A"; i.e., 1-A, 1-B, etc. Each line shall extend from the downstream point of discharge to the upstream-most element in the line, and shall include "non-constructed" elements, such as natural channels.

M. Sediment & Erosion Control Plan (SECP)

An overall plan of the site showing proposed sediment and erosion control measures shall be included in the construction drawings. The sediment and erosion control plan shall be superimposed upon the site dimension plan, grading plan and storm drainage facilities plan. The sediment and erosion control plan shall also show the following:

- General limits of the area to be stripped of vegetation or disturbed by construction activities shall be shaded or otherwise clearly delineated.
- A summary table showing the total site area and the total area estimated to be disturbed.
- Location of temporary construction entrance(s).
- Proposed sediment containment measures: vegetative filter areas, straw bale dikes, silt fences, temporary containment berms, diversion berms, inlet protection, etc.
- Site stabilization measures, showing the type of surface stabilization to be provided in various areas of the site, whether sod, erosion control blanket, mulch, riprap, concrete, etc. If more than one (1) type of erosion control blanket or mulch, is specified, the different areas should be distinguished by use of varying shading or symbols.
- Seeding and mulching specifications, and allowable seasons for temporary and permanent seeding.
- Temporary and permanent erosion control measures, such as outlet protection, channel linings, riprap or paved chutes, etc.
- General notes for sediment & erosion control. Recommended notes are shown in Figure 103.5.

N. Profiles

Profiles for all storm drainage lines shall be included in the construction drawings. Profiles may be drawn at horizontal scales of 1" = 10' (one inch equals ten feet) to 1" = 50' (one inch equals fifty feet), depending upon the length of line to be shown, and vertical scales of 1" = 2' (one inch equals two feet) to 1" = 5' (one inch equals five feet). Profiles shall be stationed starting at the downstream end with Station 0+00. Profiles shall be drawn continuously from the downstream to the upstream end, with breaks only as needed when the profile exceeds the drawing width. Profiles shall not be combined with street profiles. Wherever breaks are made, equation stations and elevations shall be called out. Profiles shall include the following:

- Reference grid lines showing elevations along the left or right vertical margin and stationing along the bottom margin.
- Existing grade at centerline with a dashed line, labeled "Existing Grade at Centerline".
- Proposed grade at centerline with a solid line, labeled "Proposed Grade at Centerline".

NOTE: Where the difference in grade between the centerline and the edge of the easement in which the proposed improvement is located is one foot (1') or more, additional existing grade and/or finish grade profile lines may also be required along the easement lines. Additional profile lines shall be labeled as to location.

- Existing and proposed utility crossings, labeled as to type: e.g. “Proposed 8” sanitary sewer”, etc.
- Existing and proposed pavements, riprap, concrete linings, structures, foundations, or other features which would affect the grade of the proposed storm drain or channel. Both the top and bottom surface of pavements, foundations, etc. must be shown, in order that clearance is apparent. It is preferred that a shading or pattern be used.
- Profile of the proposed storm drain or channel invert, and the interior top of pipe or top of channel bank. For reinforced concrete pipe and reinforced concrete box culverts, the exterior top and bottom shall also be shown in the profile.
- The station and structure number shall be called out at each structure. Stations shall also be called out at each change of direction in the centerline, at points of horizontal curvature and tangency, and at changes in grade.
- The pipe or channel length in feet, and pipe or channel slope in percent.
- Invert elevations shall be called out for each structure, and at points of horizontal curvature and tangency. Incoming and outgoing invert elevations shall be shown.
- Incoming lines at structures and tees shall be shown and invert elevations called out.
- Where the vertical clearance is less than the minimum required in Section 109 or Section 111, the actual clearance dimension shall be shown.
- Hydraulic grade line must be shown wherever storm drainage piping is under pressure flow conditions, and shall be labeled along with the return frequency of the storm for which the hydraulic grade line was calculated: e.g. “HGL25 for the 25-year storm”, etc.

O. Details

Enlarged plans and other details must be shown wherever necessary to clearly describe the location, dimensions, and grades for the proposed construction. Details shall be drawn in accordance with generally prevailing drafting standards. Details shall be drawn to conventional scales, unless noted as “Not to Scale”. Any scale distortions used for isometric or other views must be noted. Standard details included in these Design Standards may be referenced by note where available.

The following details will typically be required:

- Typical trench cross section for storm drain lines.
- Typical cross sections for drainage channels, showing side slopes, design depth or water surface, freeboard, and type of lining.
- Typical cross-sections of retaining walls.
- Plan and sections for detention and sediment basin outlet structures.
- Enlarged plans of inlets or junction structures, where incoming piping is thirty inches (30") or greater in diameter, or connection is made at other than 90 (ninety) degrees.

103.1.4 Calculations

Supporting calculations for storm drainage facilities must be included in the plan submittal. Supporting calculations shall include the following:

- Drainage area map meeting the requirements set forth in Paragraph A below.
- Summary table for inlet calculations (See Figure 103.3 for example format).
- Summary table for storm sewer and channel design (See Figure 103.4 for example format).
- Backwater computations for culverts and bridges in accordance with Section 110.3.
- Hydraulic data for drainage channels with uniform flow.
- Water surface profile computations for drainage channels with gradually or rapidly varied flow as set forth in Section 111.3.
- Calculations for detention facilities as set forth in Section 112.5.6.
- Calculations for sediment basins and other sediment and erosion control facilities specified on the Sediment & Erosion Control Plan, as set forth in Section 114.
- Where required, calculations for directly connected impervious area, water quality capture volume, and stormwater quality best management practices (BMPs) as set forth in Section 115.

A. Drainage Area Maps

Drainage area maps must be provided for both on-site areas and off-site areas. Due to the difference in area, it will typically be necessary to provide a larger scale map for on-site drainage areas, and a smaller scale map for off-site drainage areas.

Off-site drainage areas shall be shown on 1976 Springfield Planning Area Maps, where these maps are available, at a minimum scale of 1" = 600' (one inch equals six hundred feet). Where these maps are not available, U.S.G.S. 7 ½ minute quadrangle maps shall be used, at a minimum scale of 1" = 2000' (one inch equals two thousand feet). Where more detailed or more current topographic maps are available, they must be used.

On-site drainage area maps shall be shown superimposed upon the site plan, with existing and proposed topographic contours shown.

Drainage areas shall be clearly outlined on the map, and the identifying designation clearly shown. Drainage areas shall be given the same designation as the inlet or reference point to which they are tributary (i.e., drainage area 1-A is tributary to inlet 1-A).

The schematic plan of the proposed storm drainage improvements shall be shown on the drainage area map.

Both pre- and post-development drainage areas must be shown for each primary outfall from the site.

103.1.5 Revisions to Drawings

Prior to approval of the drawings by the Highway Administrator and Stormwater Engineer, drawings are considered preliminary and revisions shall not be noted. Revision notes made by the consultant for his own records prior to plan approval must be made outside the drawing border along the left margin of the drawing.

Any use of the construction drawings for bids or pricing which occurs prior to the plans being approved by the Highway Administrator and Stormwater Engineer, is solely at the risk of the developer.

Revisions made after the plans are signed must be noted in the revision block and must be initialed by the Stormwater Engineer and Highway Administrator prior to approval, or the drawing replotted and signed by the Stormwater Engineer and Highway Administrator.

When revisions are made, two (2) copies of the revised drawing must be submitted to the Stormwater Engineer and two (2) copies to the Highway Administrator for review. After the revision is approved, two (2) copies of the revised drawing shall be provided to the Stormwater Engineer. The Highway Administrator will specify the number of copies to be provided to the County Highway Department.

Revised areas must be clearly identified by clouding and noting with a symbol showing the revision number.

The final revision noted shall be the as-built drawings.

103.1.6 As-Built Surveys and Drawings

When construction of the improvements is completed, the Engineer shall perform surveys to determine that the location, dimension, and grade of the drainage improvements is in substantial conformance with the approved plans.

Location of improvements shall be checked by field survey to ensure that the improvements are completely located within the easements or rights-of-way which have been provided. The location of improvements which vary more than six inches (6") from the location shown on the

approved plans, must be approved in writing by the Stormwater Engineer (and Highway Administrator if on public road right-of-way) prior to approval.

Elevations and grades shall be verified at the following locations:

- Center of access manhole or grate for junction structures and inlets.
- Inlet entry for side opening inlets (except curb opening inlets).
- Pipe and culvert inverts. For box culverts greater than five feet (5') wide, invert elevation shall be checked at each side of the inlet and outlet.
- Detention basin and sediment basin outlet structures.
- Maximum intervals of one hundred feet (100') and at grade changes in drainage channels (excluding road side borrow ditches).
- Detention and sediment basins.

Elevations differing by more than one-tenth of a foot (0.1') from plan grades or five-hundredths of a foot (0.05') for detention basin outlet structures, must be approved in writing by the Stormwater Engineer (and Highway Administrator if located on public road right-of-way) prior to final approval.

Dimensions must be verified for the following:

- Pipe diameter for circular pipe.
- Height and width for elliptical or arch pipe, or box culverts.
- Drainage channel cross-sections at maximum intervals of two hundred feet (200').
- Riprap or other erosion protection at pipe outlets.
- Overflow spillways and outlet structures for detention and sediment basins.
- Detention and sediment basin volume.

As-built information shall be shown on the approved plans in the same manner that revisions are noted on the drawings. As-built information shall be clouded and noted with a symbol showing the revision number. Where the as-built dimension or elevation does not differ from the plan, the plan dimension or elevation shall be clouded to signify that it has been verified.

103.2 COMMERCIAL BUILDING PERMITS

103.2.1 Professional Qualifications

Construction drawings and calculations for storm drainage facilities and grading, sediment and erosion control plans associated with commercial buildings may be prepared by an engineer, architect, geologist, or landscape architect, all of which are required to be registered to practice in the State of Missouri provided the total drainage area served by the storm drainage facilities (on-site or off-site) does not exceed five (5) acres.

Where the total drainage area exceeds five (5) acres, drawings and calculations must be prepared

by an engineer registered to practice in the State of Missouri, having training and experience in the fundamentals of hydraulic engineering and storm drainage.

103.2.2 Submittal Requirements

Construction plans for storm drainage improvements must be completed and approved by the Stormwater Engineer before the building permit can be issued.

Storm drainage drawings and calculations shall be submitted to the Building Regulations Department along with the building plans. The following items must be submitted:

1. Two (2) sets of construction drawings.
2. Two (2) copies of the Drainage Area Map.
3. Two (2) copies of computation sheets.

Incomplete submittals will be returned without review.

103.2.3 Construction Drawing Requirements for Commercial Building Permits

A. General

Construction drawings for storm drainage improvements may be submitted as a separate set of construction drawings or included in the building plans.

Construction drawings shall clearly show the location and extent of proposed construction in relation to existing and proposed property lines, physical features, topography, and utilities, and shall include all details necessary to properly construct the proposed facilities. Linework and lettering shall be neat and clear. Original copies of the drawings shall be free from smudges, tears, folds, and other imperfections which affect the legibility of the drawing.

All construction drawings shall show the following:

- ◆ Title block, showing name of the proposed project, drawing title, and drawing number.
- ◆ Name, address, telephone and “fax” number of consultant.
- ◆ Seal of responsible design professional.
- ◆ A scale for each plan or detail.
- ◆ A north arrow for all full or partial site plans and maps.
- ◆ The Missouri One-Call utility locate symbol on all drawings showing plans or details involving earthwork.
- ◆ A block for approval signature by the Stormwater Engineer, located in the lower right area of each drawing.

B. Drawing Size - Commercial Building Permits

Original drawings may range in size from twenty-four inches wide by eighteen inches high (24" x 18") to forty-two inches wide by thirty-six inches high (42" x 36"). Drawings shall have a one-half inch (1/2") clear border on the top, bottom and right sides of the drawing, and a one and one-half inch (1 1/2") clear border on the left side of the drawing.

Lettering shall be of a large enough size to allow reproduction of legible half-size drawings for use in the field.

C. Scale - Commercial Building Permits

Plans and details shall be drawn to definite, conventional scales, unless specifically noted and approved otherwise. Scales shall be in English units.

D. Drafting Media - Commercial Building Permits

Construction drawings shall be drawn in ink or pencil, on vellum, mylar, paper or other suitable drafting medium from which clear copies can be reproduced.

E. Required Information - Commercial Building Permits

The following information must be included in the construction drawings:

- ◆ General project information (see Paragraph G. below).
- ◆ Site boundary and dimensions (see Paragraph H. below).
- ◆ Grading plan (see Paragraph I. below).
- ◆ Plan of proposed storm drainage facilities (see Section 103.1.3.M for requirements).
- ◆ Sediment & Erosion Control Plan (SECP) (see Section 103.1.3.N for requirements).
- ◆ Profiles for storm drainage improvements (see Section 103.1.3.O for requirements).
- ◆ Details of stormwater facilities (see Section 103.1.3.P for requirements).

It is not required that a separate drawing be prepared for each item listed above. The required information may be shown on the fewest number of drawings needed required to present the information clearly and legibly, depending upon the size of the project and complexity of the proposed work.

F. Benchmarks and Vertical Datum - Commercial Building Permits

It is preferred that mean sea level (MSL) as defined by the National Geodetic Vertical Datum of 1927 be used as datum for elevation information on the drawings. For sites within the Springfield

Urban Services Area, it is preferred that City of Springfield benchmarks shall be referenced. For sites outside this area, it is preferred that U.S.G.S. benchmarks be referenced. Assumed datum may be used provided that it is based upon assumed elevation of 100.0 (one hundred point zero), so as not to be confused with actual elevations from mean sea level. Benchmark references shall be noted on the drawings.

G. General Project Information - Commercial Building Permits

The following general information must be shown on the first sheet of the construction drawings:

- ◆ Location map at a scale of 1" = 2000' (one inch equals two thousand feet), showing streets and roads of collector or greater classification and municipal boundaries, within one thousand feet (1000') of the site.
- ◆ General notes.
- ◆ Name, address, telephone and "fax" number of owner or developer.
- ◆ Index to drawings.
- ◆ Benchmark data.
- ◆ Legal description of property.
- ◆ Key to symbols used on the drawings.

H. Site Plan - Commercial Building Permits

The drawings must include a plan showing the site boundary and dimensions, and existing and proposed utilities and improvements at a minimum scale of 1" = 100' (one inch equals one hundred feet), including the following information:

- ◆ North arrow & graphic scale.
- ◆ Site boundary with dimensions and bearings.
- ◆ Rights-of-way and names of streets adjoining the site.
- ◆ Property lines and owners' names for all properties adjoining the site (property lines for adjoining properties need only extend one inch (1"), actual scale, outside the site boundary).
- ◆ Location and dimensions of existing and proposed easements.
- ◆ Existing and proposed floodplain boundaries.
- ◆ Boundaries of any other special districts as defined in the Zoning Regulations.
- ◆ Boundaries of cities and other political subdivisions.
- ◆ Existing transportation facilities, utilities, and storm drainage facilities.
- ◆ Existing physical features including waterbodies and watercourses, sinkholes, springs, caves, faults, fracture trends, and photolineaments.
- ◆ Existing structures, pavements, sidewalks, tree masses, pavements, and fences
- ◆ Proposed transportation facilities, utilities, and storm drainage facilities.
- ◆ Proposed buildings, incidental structures, structures such as retaining walls, sidewalks, pavements and other proposed improvements.

I. Grading Plan - Commercial Building Permits

A grading plan for the entire site must be included in the drawings. The site plan shall serve as the base for the grading plan.

The grading plan shall show the following:

- ◆ Existing topographic contours at two foot (2') maximum intervals. Each fifth contour shall be drawn as an index contour by using a heavier line weight. Index contours must be labeled.
- ◆ Proposed topographic contours. The line type used for proposed contours must be heavier than that used for existing grades, and must have a different line type. Proposed contours shall be shown at two foot (2') maximum intervals. Each fifth contour shall be drawn as an index contour by using a heavier light weight. Index contours must be labeled.

103.2.4 Calculations - Commercial Building Permits

Requirements for calculations and drainage area map are set forth in Section 103.1.4.

103.2.5 Revisions to Drawings for Commercial Building Permits

Revisions made after the plans are signed must be noted in the a revision block and must be initialed by the Stormwater Engineer prior to approval.

When revisions are made, two (2) copies of the revised drawing must be submitted to the Stormwater Engineer for review. After the revision is approved, two (2) copies of the revised drawing shall be provided to the Stormwater Engineer.

Revised areas must be clearly identified by clouding and noting with a symbol showing the revision number.

The final revision noted shall be the as-built drawings.

103.2.6 As-Built Surveys and Drawings for Commercial Building Permits

When construction of the improvements is completed, the Engineer shall perform surveys to determine that the location, dimension, and grade of the drainage improvements is in substantial conformance with the approved plans.

Location of improvements shall be checked by field survey to ensure that the improvements are completely located within the easements or rights-of-way which have been provided. The location of improvements which vary more than six inches (6") from the location shown on the approved plans must be approved in writing by the Stormwater Engineer prior to approval.

Elevations and grades, and location and dimensions of improvements shall be verified and shown on as-built drawings as set forth in Section 103.1.6. As-built surveys must be approved prior to the final approval of the building and issuance of a temporary or permanent occupancy permit.

103.3 GRADING PERMITS

103.3.1 Professional Requirements

Professional qualifications required for preparation of drawings and calculations for grading, sediment and erosion control plans are set forth in Section 114.3.3.

103.3.2 Submittal Requirements

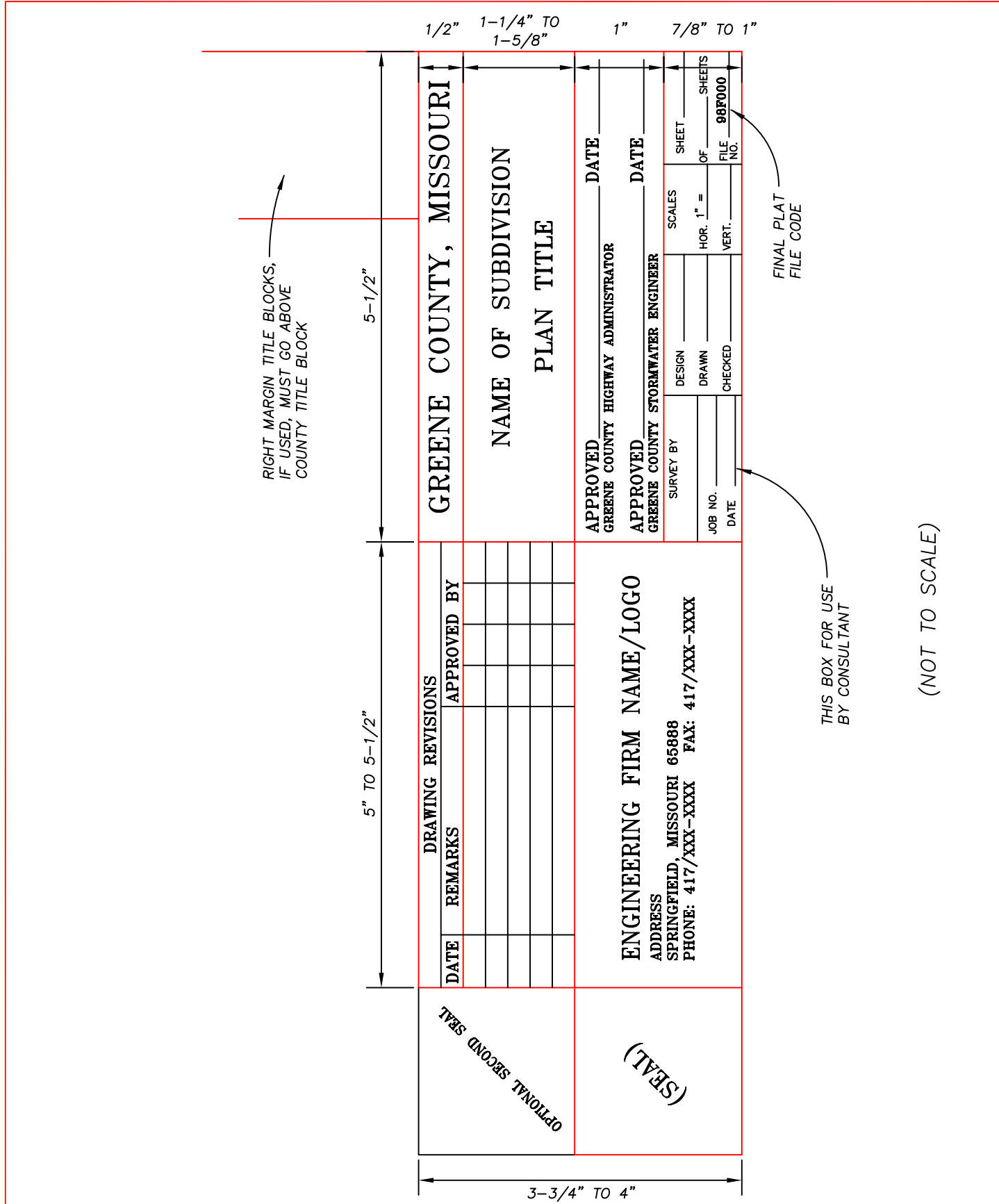
For sites upon which only grading and construction of utilities and/or drainage improvements are proposed, construction drawings shall meet the requirements set forth in Section 103.2. Drawings and calculations shall be submitted to the Stormwater Engineer. The following items must be submitted:

1. Two (2) sets of construction drawings.
2. Two (2) copies of the Drainage Area Map.
3. Two (2) copies of computation sheets.

103.3.3 County Road and Bridge Projects

Construction drawings for County road and bridge projects shall be submitted to the Highway Administrator, who shall then forward two (2) sets of the drawings and calculations to the Stormwater Engineer for review. Drawings and calculations shall meet the requirements set forth in Section 103.1.

m:\data\wp51.storm2\swregs\section 103.wpd



GREENE COUNTY MISSOURI - STORM WATER DESIGN STANDARDS

STANDARD TITLE BLOCK FOR SUBDIVISION PLANS

FIGURE 103.1

FILE: f10301.dwg
DATE: 04/05/99

RECOMMENDED GENERAL NOTES for Subdivision Plans

GENERAL NOTES

1. All construction shall be done in accordance with the latest addition of the “Design Standards for Public Improvements, Greene County, Missouri” and the “Missouri Standard Specifications for Highway Construction”, unless otherwise noted.
2. Prior to beginning construction, a pre-construction conference must be held at the Greene County Highway Department. It is the Developer’s responsibility to schedule this conference.
3. Prior to beginning construction, a grading permit must be obtained from the Greene County Planning Department. It is the Developer’s responsibility to obtain this permit.
4. For sites where 5 or more acres will be disturbed, a general permit for land disturbance activity must be obtained from the Missouri Department of Natural Resources before construction can begin. It is the Developer’s responsibility to obtain this permit.
5. Other permits may be required for this construction. It is the Contractor’s responsibility to determine which permits are applicable and to obtain any applicable permits not provided by the Developer.
6. If the Contractor’s operations require work on or access across private property, it is the Contractor’s responsibility to obtain written permission from the property owner to enter the property and to repair any damage to private property caused by his operations.
7. At the start of construction, or whenever work has been suspended, the Contractor shall contact the Greene County Highway Department (Phone 831-3591) at least 24 hours prior to working at the site. Failure to do so may result in rejection of any work completed prior to contact.
8. The Contractor shall keep the subdivision neat and orderly at all times while construction is in progress. Access streets to the development shall be kept clean of mud, debris, paper and waste material at all times.
9. Construction access to the site shall be limited to the approved temporary construction entrance(s) shown on the Sediment & Erosion Control Plan (SECP).
10. Existing underground utilities have been shown by the Engineer in approximate locations as determined by existing plans and surface observations. It is the Contractor’s responsibility to determine the exact horizontal and vertical location of existing underground facilities prior to beginning installation of new facilities. Contractor shall immediately contact the Engineer for instructions whenever any conflicts are discovered.
11. It is the Contractor’s responsibility to correct any damage to underground utilities or other facilities which is caused by his operations.
12. Manhole covers, valve boxes, and other utility appurtenances shall not encroach on sidewalks, curbs or pavement. Where conflicts are discovered, the Contractor shall contact the Engineer for instructions prior to proceeding.
13. All disturbed areas shall be stabilized in accordance with the approved Sediment & Erosion Control Plan (SECP).

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GREENE COUNTY MISSOURI – STORM WATER DESIGN STANDARDS

*SUGGESTED GENERAL NOTES FOR
SUBDIVISION PLANS*

FIGURE 103.2

FILE: f10302.dwg
DATE: 04/05/99

SUMMARY TABLE FOR STORM DRAIN PIPE & CHANNEL CALCULATIONS		PROJECT:	DATE:	BY:														
DESIGN STORM= _____YR (CHECK 100-YEAR STORM FOR PIPES BELOW SAG INLETS AND ALL CHANNELS)					Inlet/Ref. Point Number													
	upstream invert elevation																	
	downstream invert elevation																	
	Pipe/Channel																	
	Lining material																	
	Pipe/Channel length (ft)																	
	Pipe/Channel slope (%-percent)																	
	Manning's coefficient ("n")																	
	Contributing Drainage Area (Acres)																	
	Time of Concentration (Tc-minutes)																	
	Design Flow Rate (CFS)																	
	Minimum Allowable slope (%-percent)																	
	pipe friction loss (ft)																	
	Hydraulic Grade downstream (elev.-ft)																	
	Finish Grade Upstream (elev.- ft)																	
	Full flow velocity (feet/second)																	
	$V^2/2g$																	
	Structure head loss coefficient																	
	Head loss at structure (ft)																	
	Hydraulic Grade upstream (elev.- ft)																	
	Finish Grade Upstream (elev.- ft)																	

GREENE COUNTY MISSOURI – STORM WATER DESIGN STANDARDS

SUGGESTED CHART FOR SUMMARY TABLE FOR PIPE & CHANNEL CALCULATIONS

FIGURE 103.4

FILE: f10305.dwg
DATE: 02/05/08

RECOMMENDED NOTES FOR SEDIMENT & EROSION CONTROL PLAN

This plan shows the location and details for primary sediment controls to be constructed. The contractor is responsible for controlling erosion and discharge of sediment from the site at all times during construction. The contractor shall provide necessary measures during all phases of his operations regardless of whether they are specifically noted on this plan and shall maintain and replace controls as necessary during the course of his operations.

Temporary construction entrance(s) and silt fences, straw bale dikes or other initial sediment controls shown on this plan must be installed prior to any other work.

Sediment basins shown on this plan must be installed within 10 calendar days after construction begins or as soon as 2 or more acres are disturbed, whichever occurs first.

The contractor shall clean streets both interior and adjacent to the site, as needed after each rainfall, and at the end of construction.

The contractor is responsible for controlling dust during construction and shall water construction areas whenever conditions warrant.

The contractor is responsible for cleaning accumulated sediment from storm drains prior to approval of construction.

All disturbed areas not receiving other permanent stabilization such as pavement, roofs, sod, etc., shall be seeded and mulched, as specified below before temporary sediment controls can be removed and prior to final approval of construction.

- A minimum depth of 4" of topsoil (prior to compacting) shall be spread on areas to be seeded.
- After topsoil is spread, lime shall be spread at the rate of 800-900 pounds, effective neutralizing material (ENM) per acre.
- Fertilizer shall be spread at the rate of 400-500 pounds per acre, and shall be 13-13-13 nitrogen, phosphorus, and potassium.
- Seed mix shall consist of 60-80% Kentucky 31 tall fescue and 20-40% annual ryegrass (germination shall be at least 85%). Seed mix shall be spread at the rate of 400-500 pounds per acre.
- All areas to be seeded having slopes less than 4:1 shall be mulched with cereal grain mulch the rate of 100 pounds per 1000 square feet (4500 pounds per acre). Cereal grain mulch shall meet the requirements of Section 802 of the State Specifications for Type 1 mulch. Mulch may be applied by hand, however, it must be evenly spread. Type 1 mulch shall be thoroughly wetted immediately after application.
- Where slopes are 4:1 or greater Type 3 mulch ("hydromulch") meeting the requirements of Section 802 of the State Specifications shall be used. Type 3 mulch shall be applied at the rate of 2000 pounds per acre.
- Permanent seeding season runs from March 1st to June 1st and August 15th to November 1st. Seeding and mulching must be done whenever work is complete regardless of the season. Whenever seeding and mulch is installed outside of the permanent seeding season the contractor will be responsible for replanting and mulching any areas where growth has not become established during the next permanent seeding season.
- All areas must be maintained by the contractor until vegetation is firmly established. Vegetation will be considered firmly established when it has survived from the permanent seeding season in which it is placed, to the next permanent seeding season, and growth has been established on all eroded areas which have been noted for repair.
- Temporary seeding shall be at the same rates for seed, mulch and fertilizer specified above. Topsoil spreading is not required in areas designated to receive temporary seeding only.

GREENE COUNTY MISSOURI – STORM WATER DESIGN STANDARDS

SUGGESTED NOTES FOR
SEDIMENT & EROSION CONTROL PLAN

FIGURE 103.5

FILE: f10305.dwg
DATE: 04/05/99