

ARTICLE VII

GRADING, SEDIMENT & EROSION CONTROL

Section 701 Goals and Objectives

The goal of the regulation is to effectively minimize erosion and discharge of sediment by application of relatively simple and cost effective Best Management Practices. This goal can be attained by meeting the following objectives:

- A. Minimize the area disturbed by construction at any given time.
- B. Stabilize disturbed areas as soon as possible by re-establishing sod, other forms of landscaping, and completing proposed structures, pavements and storm drainage systems.
- C. Provide for containment of sediment until areas are stabilized.
- D. Provide permanent erosion controls.

Section 702 General Design Guidelines

The following items must be considered in preparing a sediment and erosion control plan:

702.1 Temporary vs. Permanent Controls. The greatest potential for soil erosion occurs during construction. Temporary controls are those that are provided for the purpose of controlling erosion and containing sediment until construction is complete. Temporary controls include straw or hay bale dikes, silt fences, erosion control blankets, etc. which are not needed after the area is stabilized. Permanent controls consist of riprap, concrete trickle channels, detention basins, etc., which will remain in place through the life of the development. It is possible for the same facility to serve both a temporary and permanent purpose. The difference between temporary and permanent erosion control should be clearly recognized in preparing a sediment and erosion control plan.

702.2 Sheet Flow vs. Concentrated Flow. In areas where runoff occurs primarily as sheet flow, containment of sediment is relatively simple. In these areas straw or hay bales, silt fences and vegetative filter areas can be very effective. Where concentrations of flow occur, containment of sediment becomes more difficult as the rate and volume of flow increase. In these areas, more sophisticated controls such as sedimentation basins must be provided.

- 702.3 **Slope.** Control of erosion becomes progressively more difficult as the slope of the ground increases. Areas with steeply sloping topography, and cut and fill slopes must be given special consideration.
- 702.4 **Soils and Geologic Setting.** Area soils and the geologic setting must be considered in preparing the plan and any special considerations deemed necessary for a particular site provided.
- 702.5 **Environmentally Sensitive Areas.** Where construction occurs within the vicinity of permanent streams, springs, sinkholes, lakes, or wetlands, special attention must be given to preventing discharge of sediment.

Section 703 Grading Permits

- 703.1 **Permit Requirements.** Grading permits are required for all construction sites with the following exceptions:
- A. Grading for single family or duplex residences constructed in subdivisions where approved sediment and erosion controls have been constructed.
 - B. Construction sites that have received an individual storm water discharge permit or water quality certification from the Missouri Department of Natural Resources in accordance with the Clean Water Act.
 - C. Emergency construction required to repair or replace roads, utilities, or other items affecting the general safety and well being of the public. For emergency construction sites which would otherwise be required to obtain a permit, and for which remedial construction will take more than fourteen (14) calendar days, application for the permit must be made within three (3) calendar days from the start of construction.
 - D. The following activities, provided that they are not located within twenty-five (25) feet of a spring, sinkhole, wetland, or watercourse:
 - 1. Gardening or landscaping normally associated with single family residences which cover less than one-half (1/2) acre.
 - 2. Grading and repair of existing roads or driveways.
 - 3. Cleaning and routine maintenance of roadside ditches or utilities.
 - 4. Utility construction where the actual trench width is two (2) feet or less.

- E. Sites that were graded prior to the effective date of this regulation, provided that they do not provide an imminent threat to the general health, safety, and welfare of the public in the opinion of the City.
- 703.2 **Permit Procedure.** The following items must be received by the City prior to issuance of a Grading Permit.
- A. Grading, sediment and erosion control plans shall be submitted to the City along with the plans for the proposed improvements, in conformance with the requirements of the *City of Branson West Regulations*.
 - B. The City will issue Grading Permits after approval of the plans for the improvements, in conformity with the requirements of the *City of Branson West Subdivision Regulations*.
- 703.3 **Plan Requirements.** Plans must be prepared by and bear the seal of an engineer registered to practice in the state of Missouri. Plans will not be required in the following cases:
- A. Grading associated solely with a single family residence and which is not exempt from the permit requirement.
 - B. Grading or filling of less than one (1) acre if located outside of allowable building areas and not located within twenty-five (25) feet of a spring, sinkhole, wetland, or watercourse. In these instances a Grading Permit can be issued provided that an inspection of the site by a representative of the City does not reveal any conditions that would warrant preparation of a detailed plan in the opinion of the City Engineer.

Section 704 Other Permits

- 704.1 **NPDES Storm Water Permit.** Construction sites where the area to be disturbed is five (5) acres or more must apply for a storm water discharge permit from the Missouri Department of Natural Resources.
- 704.2 **“404” and “401” Permit.** Pursuant to the Clean Water Act, grading activities in streams or wetlands may require an Army Corps of Engineers 404 permit and/or a Missouri Department of Natural Resources 401 certification.

Section 705 Design Standards & Criteria

705.1 Grading

- A. Maximum Grades: Cut or fill slopes shall not exceed 3:1. 4:1 slopes are preferred where possible.
- B. Maximum Height: Cut or fill slopes shall not exceed fifteen (15) feet in vertical height unless a horizontal bench area at least five (5) feet in width is provided for each fifteen (15) feet in vertical height.
- C. Minimum Slope: Slope in grassed areas shall not be less than 1%.
- D. Construction Specifications: Construction specifications stating requirements for stripping, materials, subgrade compaction, placement of fills, moisture and density control, preparation and maintenance of subgrade must be included or referenced on the plans or accompanying specifications submitted. Construction activities must also comply with the City's standard construction specifications, and the plans referenced accordingly.
- E. Spoil Areas
 - 1. Broken concrete, asphalt and other spoil materials may not be buried in fills within proposed building or pavement areas.
 - 2. Outside of proposed building and pavement areas, broken concrete or stone may be buried in fills, provided it is covered by a minimum of two (2) feet of earth.
 - 3. Burying of other materials in fills that are not suitable for the specific construction activity is prohibited.

705.2 Sediment Containment

- A. Existing Vegetative Filter Area: These areas may be used where:
 - 1. Unconcentrated sheet flow occurs.
 - 2. An area of existing vegetation a minimum of twenty-five (25) feet in width can be maintained between the area to be graded and a property line, watercourse, sinkhole, spring, wetland or classified lake.
 - 3. Existing ground slope is no greater than 5:1 (20%).

4. The existing vegetative growth is of sufficient density and in sufficiently good condition to provide for filtration of sediment.
- B. Hay/Straw Bale Dike, or Silt Fence: As a temporary measure, containment areas constructed of hay or straw bales, or silt fence may be provided in areas where:
1. Unconcentrated sheet flow occurs.
 2. An area of existing vegetation a minimum of twenty-five (25) feet in width can be maintained between the area to be graded and a property line, watercourse, sinkhole, spring, wetland or classified lake.
 3. Existing ground slope is no greater than 5:1 (20%).
 4. Concentrated flow from an area no greater than one (1) acre occurs and a minimum volume of 1000 cubic feet per acre is contained behind the dike.
- C. Temporary Containment Berms
1. Temporary containment berms may be provided where concentrated flow from areas greater than one (1) acre and less than five (5) acres occurs. Temporary containment berms must contain a volume of 1000 cubic feet per acre of drainage area.
 2. Temporary containment berms shall have a riprap outlet with a sediment filter, or a perforated pipe outlet.
 3. Temporary containment berms and accumulated sediment may be completely removed after the tributary area is stabilized, and must be removed prior to final acceptance.
- D. Sedimentation Basin: Sedimentation basins shall be provided for all areas where concentrated flow occurs from an area of five (5) or more acres. Sediment basins shall be designed to detain the runoff from one (1) inch of rainfall, for a period of at least 24 hours using the methods contained in Article VI. The basins shall be provided with an outflow structure consisting of:
1. A flow restriction device which provides for the required detention time.
 2. An outfall pipe sized to carry the maximum estimated outflow rate.

3. Protective structures at the pipe outlet to prevent crushing or damage of the end of the pipe, and to prevent blockage of the pipe with debris.
4. An overflow spillway capable of discharging the peak flow rate for the 4% annual probability (25-year) storm while maintaining a minimum freeboard of one (1) foot.
5. Erosion protection at the pipe and spillway outlet.

705.3 Erosion Protection

A. Seeding and Mulching

1. Seeding, fertilizer and mulching requirements shall comply with the City's standard construction specifications Section 02936.
2. Whenever grading operations are suspended for more than thirty (30) calendar days between permanent or seeding periods, all disturbed areas must be reseeded with temporary cover.
3. Maintain seeded areas for one year following permanent seeding.

B. Cut and Fill Slopes

1. Cut and fill slopes shall be protected from erosion by construction of straw or hay bale dikes, silt fences, diversion berms, or swales along the top of the slope. Diversions shall be maintained until permanent growth is firmly established on the slopes.
2. Where drainage must be carried down the slopes, pipe drains, concrete flumes, riprap chutes, or other impervious areas must be provided. Suitable erosion control measures such as riprap stilling basins, must be provided at the bottom of the slope.

C. Channels and Swales: Permanent channels and swales shall be provided with a stabilized invert consisting of one of the following materials:

1. Sod
 - a. Where the average velocity of flow is five (5) feet per second or less and there is no base flow, the channel shall be lined with sod.

- b. For channels with a bottom width less than fifteen (15) feet, sod shall extend up the side slope to a minimum height of six (6) inches above the toe.
 - c. Channels with a bottom width of fifteen (15) feet or greater, shall be lined with sod in the low flow area.
 - d. The remainder of the channel slopes shall be seeded and mulched as previously specified.
 2. Erosion Control Blanket: Commercial erosion control blankets may be used in lieu of sod provided that samples are submitted and approved by the City. The guaranteed maintenance period shall be one (1) year.
 3. Non-Erosive Lining
 - a. In grass channels where base flow occurs, a non-erosive low-flow channel of riprap must be provided. Low flow channels shall have a minimum capacity of five (5) cubic feet per second. Other suitable non-erosive materials may be approved by the City.
 - b. For channels which have an average velocity of five (5) feet per second or greater a non-erosive lining of riprap concrete or other approved material must be provided.
- D. Storm Sewer and Culvert Outlets
 1. Erosion protection shall be provided at storm sewer and culvert outlets. Minimum erosion protection shall consist of a concrete toe wall and non-erosive lining.
 2. Flared end sections and headwalls are not required, but may be provided at the discretion of the designer to meet grading or aesthetic requirements. Where headwalls or flared end sections are specified, toewalls must be provided at the downstream end. The required length of non-erosive lining will not be decreased where flared end sections or headwalls are provided unless calculations and data to support the decrease in length are submitted and approved.
 3. Non-erosive lining shall consist of riprap, unless otherwise specified and approved. Field stone, gabions, or riprap shall extend to the point at which average channel velocity for the peak

flow rate from the minor (5-year) storm has decreased to five (5) feet per second maximum.

- E. Curb Openings: Where drainage flows from paved areas to grass areas through curb openings, erosion protection shall be provided.
- F. Ditch Checks and Drop Structures: In grass channels, grades and velocities may be controlled by use of ditch checks and drop structures. Riprap ditch checks may be required in natural channels where average velocity for the peak flow rate from the 5-year storm exceeds five (5) feet per second for post-development conditions.
- G. Spillways: Erosion protection must be provided at spillways and outlet structures for detention ponds. Protection shall extend to the point where flow has stabilized and average velocity in the outlet channel is five (5) feet per second or less.

705.4 Temporary Construction Entrance

- A. A minimum of one (1) temporary construction entrance is required at each site. Additional temporary entrances may be provided if approved. The location of each construction entrance shall be shown on the plan.
- B. Only construction entrances designated on the sediment and erosion control plan may be used. Barricades shall be maintained if necessary to prevent access at other points until construction is complete.
- C. Construction entrances shall be constructed of crushed limestone meeting the following specifications:
 - 1. Construction entrances shall be a minimum of twenty-five (25) feet wide and fifty (50) feet long.
 - 2. Minimum thickness of crushed limestone surface shall be six (6) inches. Additional two (2) inch lifts of crushed limestone shall be added at the discretion of the City if the surface of the initial drive deteriorates or becomes too muddy to be effective.
 - 3. In locations where an existing drive or street extends at least fifty (50) feet into the site, the existing drive may be designated as the construction entrance, and construction of a new gravel entrance is not required unless job conditions warrant.

705.5 Cleaning Streets. Streets both interior and adjacent to the site shall be completely cleaned of sediment at the end of construction.

- 705.6 **Damage to Streets.** Any damage conducted to streets as a result of development shall be repaired by the developer to the satisfaction of the City.
- 705.7 **Dust Control.** The contractor will be required to use water trucks to water haul roads and construction areas to minimize dust leaving the site when conditions warrant.
- 705.8 **Sequencing and Scheduling.** Costs of sediment and erosion control can be minimized if proper consideration is given to sequencing and scheduling construction. Any special sequencing and scheduling considerations should be noted in the grading plan.