MO650.0703 Design Process, State Supplement

(a) Soil Erodibility Category

One of the important variables used in the design of grassed waterways is the soil erodibility category. The following soil properties can be used to determine the appropriate soil erosion category:

- Unified Soil Classification System (USCS)
- Void Ratio (e)
- Plasticity Index (PI)
- D75 particle size diameter in inches

Values for these properties are published in the Soil Survey and may be used if supplemented with a site specific field investigation to determine if the soil materials that will be placed on the surface of the constructed channel are typical of the Soil Survey values. If the values are not typical, then appropriate adjustments shall be made to the Erosion Category based upon the actual USCS classification, estimated plasticity Index, D75 diameter, and void ratio. Refer to Table 7-1 for allowable effective stress for each of the four categories of soil Erodibility. Figure 7-6 can be used to determine the basic allowable stress for the waterway soil based on the plasticity index and USC System.

(b) Vegetal Cover Factor

The terms cover factor and vegetal cover factor are used interchangeably throughout this chapter and the Waterway Design Tool in the Engineering Field Tools. Table 7-3 provides cover factors and stem densities for a few common grasses used throughout the United States.

(c) Vegetal Retardance Factor

The vegetation retardance factors used in designing grassed waterways reflect the expected condition of the vegetation after the grass is established in the channel. Generally, for stability design, a “D” retardance value is selected. This reflects a condition in which the grass has just been mowed and is the worst case or most erodible condition that is expected after grass establishment. For capacity design, the designer must consider how the waterway will be managed. If the producer plans to mow the waterway several times a year, it is reasonable to use a “C” retardance value. If the waterway will not be mowed, or possibly only mowed once in the spring and once in the fall after harvest, a “B” retardance value should be used. In all cases, the selection of the retardance values to use in design is a site specific critical decision which the designer must make.

MO650.0705 Layout and Construction, State Supplement

(a) Sub-surface Drainage of Waterways

Many grassed waterways are constructed in areas where geologic or hydrologic conditions result in seepage or prolonged base flow. This results in the loss of vegetation and an impediment to traffic. To alleviate this situation, designers should consider installing perforated subsurface drain tile to remove excess water. Careful consideration must be given to the drainage effects of the sub surface tile line when the waterway is located adjacent to wetlands.

The minimum size tile that may be used is 4” in diameter. The subsurface drain shall be sized to handle the expected flows. Allowable Earthfill Cover depths for pipes as shown in the Missouri supplement to EFH Chapter 14 should be followed in designing and installing subsurface drains or as determined using NEH Part 636 Structural Design of Flexible Conduits. In no case should the drain be installed with less than 2 feet of cover over the pipe. Practice Standard 606 and Construction Specifications shall be used for subsurface tile design and installation. Subsurface drains should parallel the center of the vegetated waterway but be offset from the centerline at least one-fourth of the top width of the waterway for parabolic shaped channels or at least 4 feet beyond the channel bottom edge (in the side slope) for trapezoidal shaped channels. Two drains may be required in some cases, one on each side of the waterway centerline. Subsurface drains may outlet through a drop structure at the end of the waterway or through a standard pipe outlet.

(b) Structural Checks in Grassed Waterways

Details shown in Standard Drawing 29-L-86 may be used for designing and installing rock/straw bale/geotextile checks for stabilization of grassed lined waterways where required/desired to minimize erosion.