

MISSISSIPPI DEPARTMENT OF TRANSPORTATION

Inter-Departmental Memorandum

TO: Design Team Leaders

DATE: June 15, 2005

FROM: Steven W. Reeves
Quality Control Engineer

SUBJECT OR PROJECT NO: SIDE DITCH TREATMENT
TABLE 8-1A

INFORMATION COPY TO:

COUNTY:

Roadway Design Division Engineer (Pickering)
Assistant Roadway Design Division Engineer (Purvis)
Assistant Chief Engineer - Pre-Construction (Foster)
Assistant Chief Engineer – Operations (Portera)
Assistant Chief Engineer – Operational Maintenance (McGrath)
Special Projects Engineer (Boteler)
Roadway Design Section Engineers
Construction Division (Lewis & Funchess)
District Engineers
FHWA
Active Consultants
Files

The table showing the criteria for side ditch treatment, Table 8-1A, in the Roadway Design Manual has been revised. Please find the new table attached. The change in the table is the removal of bituminous treated roving and the addition of soil reinforcing mat. Notes 3 and 4 have also been revised.

No changes to printed plans will be required. All present and future projects will show soil reinforcing mat but no bituminous treated roving.

If you have any questions, please advise.

SWR/swr
attachment

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Chapter 8

SPECIAL DESIGN ELEMENTS

This chapter discusses the design criteria, procedures and responsibilities for the special design elements that must be addressed by the highway designer. Proper design of these elements will contribute to highway safety and aesthetics and will improve the operational efficiency of the facility.

8-1.0 ROADSIDE DEVELOPMENT

8-1.01 Erosion Control

8-1.01.01 Vegetation

Most highway projects will require that certain erosion control measures be implemented (e.g., providing vegetation cover on disturbed and barren soil areas). This will prevent soil erosion and improve the appearance of the roadside. The "Vegetation Schedule" sheet that is prepared by the designer will specify the work items to be performed, the pay item numbers, the rates of application, the seasonal requirements and any special notes related to the project. The vegetation schedule may include the following items:

1. topsoil application,
2. ground preparation,
3. fertilizing,
4. seeding,
5. mulching,
6. solid sodding,
7. watering, and
8. insect pest control.

A typical vegetation schedule is illustrated in Figure 8-1A. Vegetation schedules are included with the detail sheets at contract plan assembly. Typical erosion control details are provided in the *Roadway Design Standard Drawings*.

8-1.01.02 Responsibility

The responsibility for erosion control design belongs to the design squad assigned to each project. The design squad will prepare a vegetation schedule sheet that will become a part of the contract plans. The squad leader will determine the disturbed area to be vegetated and will estimate quantities for each item listed on the vegetation schedule.

8-1.01.03 Estimating Quantities

The erosion control items should be included sequentially (i.e., by the pay item number) in the summary of quantities for the project. The procedures for estimating erosion control items are as follows:

1. Topsoil. Normally, the station limits requiring topsoil will be specified on the vegetation schedule. The total quantity of topsoil (cubic yards) is determined by multiplying each area (square feet) by its required topsoil thickness (feet) and dividing by 27 to convert to cubic yards. The cumulative sum of these calculations will yield the total quantity of topsoil required for the project. This value then should be multiplied by a factor of 1.25 to account for a 25% shrinkage in material. Topsoil that is furnished from within the right-of-way is paid for on a square yard basis for placement.

VEGETATION SCHEDULE						
EROSION CONTROL ITEMS		SEASONAL APPLICATIONS — RATES AND DATES				REQUIREMENTS
		SPRING & SUMMER		FALL & WINTER		
Pay Item No.	Items	Rates	Dates	Rates	Dates	
211-B	Topsoil for Slope Treatment (LVM)	4 in. thick	March 1 to September 1	4 in. thick	September 1 to March 1	Topsoil required on slope areas (sandy) at approximate station limits listed below or as directed by the engineer.
212-B	Standard Ground Preparation	per square yard	March 1 to September 1	per square yard	September 1 to March 1	Ground preparation required on areas to receive solid sodding or seeding, as applicable.
213-A⑥	Agricultural Limestone	3 tons/acre	March 1 to September 1	3 tons/acre	September 1 to March 1	Limestone shall be mechanically spread uniformly and incorporated into the soil prior to planting.
213-B	Combination Fertilizer (13-13-13)	1000 lbs/acre	March 1 to September 1	1000 lbs/acre	September 1 to March 1	Fertilizer shall be mechanically spread uniformly and incorporated into the soil prior to planting.
213-C①	Superphosphate	1000 lbs/acre (est.)	March 1 to December 1	—	—	Superphosphate (for bid item purposes).
214-A②	Seeding (bermudagrass)	20 lbs/acre	March 1 to September 1	20 lbs/acre	September 1 to March 1	Seed required on disturbed areas. Unhulled seed may be required during the dormant season as directed.
214-A②	Seeding (bahiagrass)	25 lbs/acre	March 1 to September 1	25 lbs/acre	September 1 to March 1	Seed required on disturbed areas.
214-A③	Seeding (tall fescue)	—	—	20 lbs/acre	August 1 to April 1	Seed required on disturbed areas.
214-A⑤	Seeding (sericea lespedeza)	25 lbs/acre	March 1 to September 1	25 lbs/acre	September 1 to March 1	See note ⑤ below.
214-A③	Seeding (crimson clover)	—	—	20 lbs/acre	August 1 to April 1	Seed required on disturbed areas.
215-A	Vegetative Material for Mulch	2 tons/acre (est.)	March 1 to September 1	2 tons/acre (est.)	September 1 to March 1	The engineer will designate the rates of application (see Subsection 215.03.3).
216-A	Solid Sodding	per square yard	March 1 to September 1	per square yard	September 1 to March 1	Solid sod required on areas specified in the contract or by the engineer.
219-A	Watering	20 gallons/square yd (est.)	March 1 to September 1	20 gallons/square yd (est.)	September 1 to March 1	To be used as directed in planting and establishing solid sod.
220-A④	Insect Pest Control	per acre	—	per acre	—	See Section 220.

2. Ground Preparation. The total area of ground preparation (square yards) may include seeding and/or solid sodding as specified on the vegetation schedule. The method of determining the disturbed area for standard ground preparation is employed by measuring from 10 ft outside the construction limits to the limits shown on the typical sections. Quantity measurements may be taken either from the slopes illustrated in the cross-sections or directly from the plan sheets. Areas measured along slopes will be increased by 25%. Areas measured from the plan sheets will be increased by 50%. This adjusted quantity will be used for the Standard Ground Preparation pay item.
3. Fertilizer. The quantity of fertilizer (tons) is determined by first converting the area of ground preparation (square yards) to an equivalent area in acres and then multiplying this value by the rate of application (tons per acre) for each fertilizer type (e.g., agricultural limestone, combination fertilizer and superphosphate).
4. Seeding. The quantity of seed (pounds) is determined by first subtracting the solid-sodding area from the ground-preparation area and converting the resulting area (square yards) to an equivalent area in acres. This value then is multiplied by the rate of application (pounds per acre) for each seed type. The estimated percent of the area to be seeded is provided on the vegetation schedule.
5. Mulching. The quantity of vegetative material for mulch (tons) is determined by first subtracting the solid-sodding area from the ground-preparation area and converting the resulting area (square yards) to an equivalent area in acres. This value then is multiplied by the rate of application (tons per acre) of mulch.
6. Watering. The quantity of water (gallons) is determined by first multiplying the area of required solid-sodding (square yards) by the rate of application (gallons per square yards) of water and then rounding this value to the nearest whole thousand gallons.

7. Insect Pest Control. The quantity of insect-pest-control area (acres) is determined by first converting the ground-preparation area (square yards) to an equivalent area in acres and then dividing the resulting value by two.

8-1.02 Special Side Ditch Treatment

8-1.02.01 Responsibility

Certain physical conditions (e.g., steep ditch gradients and large volumes of surface runoff) make it difficult to establish vegetation before erosion occurs. Under these conditions, special side ditch treatments may be necessary. The designer should conduct the analysis and design the appropriate side ditch treatment in accordance with the criteria and procedures found in the following sections. Before determining the erosion control ditch treatment, the erosion resistance of the soil (e.g., average, highly erosive) should be obtained from an authoritative source and recorded in the project file. Where unusual conditions exist, the designer may consult with the Hydraulics Section for guidance in the design of ditches, channels and other erosion control measures.

8-1.02.02 Design Criteria

The main factors affecting ditch design include:

1. type of soil,
2. ditch gradient,
3. surface runoff (drainage area), and
4. ditch side slopes.

The alternative side ditch treatments in order of increasing effectiveness for erosion control are as follows:

1. normal seeding and mulching,
2. ditch liners,
3. solid sod or bituminous treated roving,
4. soil reinforcing mats,
5. riprap, or
6. paved ditches.

8-1.02.03 Ditch Gradient

To analyze side ditch treatments, the designer should plot ditch grades on a working profile copy. The gradients should be plotted for all side ditches and for situations where the natural ground slopes toward the toe of fill. A close approximation from the cross sections will be sufficiently accurate. Notations should be made on the working profile copy to indicate where the side ditch flow is released and carried away by a natural drainage channel or intercepted by a drop inlet or cross drain culvert.

8-1.02.04 Drainage Areas

The drainage area should be outlined on the working plan copy to display the entire area that contributes surface runoff to the ditch. This area should include any portion of the pavement surface which is sloped toward the ditch, all construction slopes and any area beyond the construction limits that drains toward the ditch. Table 8-1A provides criteria for side ditch treatments based on the computed drainage area.

8-1.02.05 Ditch Treatment Design

The design of side ditch treatment normally will involve the following steps:

1. Select the proper columns in Table 8-1A.

2. Select the appropriate ditch grade (percent) in Table 8-1A.
3. Identify the maximum permissible area for each type of treatment.
4. Start the area determination process at the upstream end of the drainage area and continue until the area reaches the upper limit for normal seeding and mulching (no special treatment). The ditch liner treatment will begin at this location.
5. Continue the area determination method until the upper limit for ditch liner treatment is reached. The solid sod or bituminous treated roving will begin at this point.
6. Continue the area determination method until the upper limit for solid sod or bituminous treated roving is reached. Where soils permit, increase this upper limit by 25% and begin the soil reinforcing mat treatment until this new limit is reached. Otherwise, begin either riprap or paved ditch treatment and continue to the point of termination.
7. Where the ditch reaches an outlet, the designer should end the indicated ditch treatment and start the area determination method from a zero reading at the upstream end of the next drainage area. Ditch treatments are generally run to the nearest 25-ft interval.

Details of typical ditch treatments are provided in the *Roadway Design Standard Drawings*. When moderate capacity is required, the simple "V" shape ditch should be used. For situations involving relatively large volumes of surface runoff, a flat bottom ditch with the appropriate treatment should be considered.

Generally, concrete should be specified when paved ditches are required. Bituminous paving will be specified where unusual soil conditions may adversely affect concrete. The designer will be advised of these conditions by the District.

**Table 8-1A
CRITERIA FOR SIDE DITCH TREATMENT**

UPPER AREA LIMIT FOR SIDE DITCH TREATMENT (acres) ^{①②}													
Ditch Grade (%) ⑤	Foreslope — Backslope 6:1 — 6:1 10:1 — 3:1			Foreslope — Backslope 6:1 — 4:1 6:1 — 3:1			Foreslope — Backslope 4:1 — 4:1			Foreslope — Backslope 4:1 — 3:1			Ditch Grade (%) ⑤
	No Treatment	Ditch Liner	Soil Reinforcing ③ Mat ④	No Treatment	Ditch Liner	Soil Reinforcing ③ Mat ④	No Treatment	Ditch Liner	Soil Reinforcing ③ Mat ④	No Treatment	Ditch Liner	Soil Reinforcing ③ Mat ④	
0.2	1.73	3.14	7.39	1.43	2.62	6.15	1.14	2.08	4.87	0.99	1.83	4.22	0.2
0.3	1.73	3.56	9.07	1.46	2.97	7.51	1.16	2.37	5.98	1.01	2.05	5.19	0.3
0.4	1.83	3.98	10.45	1.51	3.24	8.65	1.21	2.62	6.87	1.04	2.27	5.98	0.4
0.5	1.75	4.00	10.67	1.46	3.31	8.87	1.16	2.64	7.02	1.01	2.30	6.10	0.5
0.6	1.53	3.51	9.49	1.26	2.92	7.86	1.01	2.32	6.25	0.89	2.03	5.46	0.6
0.7	1.33	3.14	8.55	1.09	2.57	7.02	0.89	2.08	5.61	0.77	1.80	4.87	0.7
0.8	1.24	2.87	7.81	1.04	2.40	6.45	0.82	1.90	5.14	0.72	1.66	4.45	0.8
0.9	1.14	2.64	7.19	0.94	2.20	5.98	0.74	1.73	4.74	0.67	1.53	4.13	0.9
1.0	1.04	2.45	6.72	0.84	2.03	5.56	0.69	1.63	4.42	0.59	1.41	3.85	1.0
1.5	0.77	1.88	5.19	0.62	1.53	4.30	0.49	1.24	3.41	0.44	1.09	2.97	1.5
2.0	0.62	1.56	4.37	0.52	1.28	3.61	0.40	1.01	2.89	0.37	0.91	2.50	2.0
2.5	0.52	1.36	3.83	0.42	1.11	3.16	0.35	0.89	2.52	0.30	0.77	2.20	2.5
3.0	0.44	1.16	3.36	0.40	0.99	2.79	0.30	0.79	2.22	0.27	0.69	1.93	3.0
3.5	0.42	1.09	3.09	0.35	0.91	2.57	0.27	0.72	2.03	0.25	0.62	1.78	3.5
4.0	0.37	0.96	2.72	0.30	0.79	2.25	0.25	0.64	1.79	0.22	0.54	1.56	4.0
4.5	0.35	0.89	2.52	0.27	0.74	2.10	0.22	0.59	1.66	0.20	0.49	1.46	4.5
5.0	0.30	0.82	2.35	0.27	0.69	1.98	0.20	0.54	1.58	0.17	0.47	1.36	5.0
5.5		0.57	2.25		0.47	1.85		0.37	1.48		0.32	1.28	5.5
6.0		0.49	2.03		0.42	1.71		0.32	1.33		0.30	1.16	6.0
7.0		0.44	1.80		0.37	1.48		0.30	1.21		0.27	1.04	7.0
8.0		0.37	1.51		0.32	1.26		0.25	0.99		0.22	0.86	8.0
9.0		0.32	1.26		0.27	1.06		0.20	0.84		0.20	0.74	9.0
10.0		0.25	1.01		0.22	0.84		0.17	0.67		0.15	0.59	10.0

Notes:

- ① Values in this table are the upper limits for each particular type of side ditch treatment. Riprap or paving is required beyond the limits of these values.
- ② Values in this table are for average erosion resistant soils. For highly-erosive soils, use only 60% of the upper area limit.
- ③ For solid sod, use 80% of the upper area limit.
- ④ Riprap or paving will begin beyond this limit.

⑤ *Ditch grades exceeding 3% require area reductions when definite drainage areas are unknown. Riprap or paving should begin where abrupt changes in ditch grades occur (e.g., 2.0%± to 6.0%±).*

The location and type of special ditch treatments should be provided on the plan sheets. Table 8-1B provides the plan sheet symbols and the unit of measure for each type of side ditch treatment. If plan sheet information (e.g., the topography, construction notes, survey data) causes the sheet to become difficult to read, the designer may omit the ditch treatment symbols and prepare an itemized list of quantities that will identify each type of treatment by stationing.

8-1.03 Other Erosion Control

8-1.03.01 Slope Paving

To prevent erosion, concrete slope paving should be provided underneath bridges at grade-separated structures. The details of slope paving are normally provided on the bridge sheets, and the quantities are included in the Bridge Summary of Quantities.

For typical rural projects, the slope paving is limited to the area beneath the bridge, extending 4 ft outside the vertical limits of the bridge as shown in “Illustration (A)” of Figure 8-1B. For urban areas, additional slope paving should be provided to wrap around the ends of the embankment as shown in “Illustration (B)” of Figure 8-1B. Details and quantities for the additional wrap around slope paving should be provided on the roadway plans. The portion of the slope paving that is 4 ft outside the vertical limits of the bridge is a roadway item and that portion beneath and within this 4-ft limit of the bridge is a bridge item.

For divided highways with 88 ft or less between the centerlines of the roadways, the slope paving is continuous between the two bridge ends as shown in “Illustration (C)” of Figure 8-1B. When the centerlines are separated by more than 88 ft, the slope paving should follow the limits of the single bridge examples.

**Table 8-1B
SYMBOLS AND UNIT OF MEASURE
FOR SIDE DITCH TREATMENTS**

Ditch Treatment	Plan Sheet Symbol	Unit of Measure
Ditch Liner		square yard
Solid Sod		square yard
Bituminous Treated Roving		square yard
Soil Reinforcing Mat		square yard
Riprap		ton
Paved Ditch (PC concrete)		cubic yard
Paved Ditch (bituminous)	varies	ton

Note: Press on tapes may be used for the plan sheet symbols.

SLOPE PAVING CUTBANKS AND BRIDGE STRUCTURES**8-1.03.02 Riprap**

To prevent excessive erosion, riprap may be required at various locations within the highway right-of-way. The designer may consult with the Hydraulics Section for guidance in the use of riprap. The following locations should be evaluated for riprap treatment:

1. culvert outfall and intake ends,
2. bends in stream channels,
3. abrupt flowline changes,
4. excessive flowline grades,
5. the point of confluence of two or more streams or channels, and
6. existing erosion problem areas.

8-1.04 Landscaping and Rest Area Development**8-1.04.01 Responsibilities**

Roadside development work may be specified during the project planning process. This work may include landscaping of the roadside or development of roadside rest areas. The architect in the Roadway Design Division is responsible for the design of these projects and the preparation of contract plans.

For landscaping work, the contract plans will normally include:

1. a title sheet and general layout,
2. a summary of quantities,
3. a vegetation schedule,
4. plan sheets showing individual plantings, and
5. the applicable *Roadway Design Standard Drawings* (e.g., Typical Planting Details for Trees and Shrubs).

For roadside rest areas, the contract plans should include additional details on:

1. site preparation,
2. buildings,
3. water and sewer installations, and
4. other facilities.

Site preparation for rest areas may be included in the contract plans for construction of the highway facility.

8-1.04.02 Safety Considerations

Adequate clearance between the travelway and roadside obstacles is an important safety consideration. The roadside clear zone must be free of any obstructions. The application of the clear zone criteria is presented in Section 9-2.0.

Large trees are potential hazards and should not be maintained within the required clear zone. The designer should consider removing or relocating trees from within the required clear zone. This is an especially important consideration at grade points, low fills, shallow cuts, diverging roadways and other locations where a vehicle is more likely to leave the roadway. In addition, the planting and maintenance of trees and shrubs, especially at intersections, interchanges and roadside parks, should be conducted so that a driver's line of sight to signs and decision points is not obscured and that the required sight distance is maintained.

8-2.0 ACCESSIBILITY FOR HANDICAPPED INDIVIDUALS

Many highway elements can affect the accessibility and mobility of handicapped individuals. These include sidewalks, parking lots, buildings at transportation facilities, overpasses and underpasses. The Department's accessibility criteria complies with the 1990 *Americans with Disabilities Act* (ADA) and the *ADA Accessibility Guidelines*

for Buildings and Facilities (ADA Guidelines). The following sections present accessibility criteria from the *ADA Guidelines* which specifically apply to highway-related facilities. Designers are required to meet the criteria presented in these sections. When other agencies or local codes contain accessibility standards which exceed the *ADA Guidelines*, then the stricter criteria may be required. This will be determined on a case-by-case basis.

8-2.01 Buildings

For interior accessibility criteria, the following will apply:

1. New. All new buildings, airport terminals, rest areas, weigh stations and transit stations (e.g., stations for rapid rail, light rail, commuter rail, intercity bus, intercity rail, high-speed rail and other fixed guideway systems) shall meet the accessibility criteria set forth in the *ADA Guidelines*. The designer should review the *ADA Guidelines* to determine the appropriate accessibility requirements for building interiors, including rest rooms, drinking fountains, elevators, telephones, etc.
2. Existing. In general, for alterations made to existing buildings or facilities, the designer must meet the accessibility requirements for the alteration made to the facility, unless it is prohibitively expensive to do so. The designer should review the *ADA Guidelines* to determine the appropriate criteria and, if required, the designer should identify where exceptions may be allowed by the *ADA Guidelines*.

8-2.02 Bus Stops

The following accessibility criteria apply to the construction of bus stops:

1. **Bus Stop Pads.** New bus stop pads constructed to be used in conjunction with a lift or ramp shall meet the following criteria:
 - a. A firm, stable surface must be provided.
 - b. It must have a minimum clear length of 96 in. (measured from the curb or roadway edge) and minimum clear width of 60 in. (measured parallel to the roadway) depending on the legal or site constraints.
 - c. It must be connected to streets, sidewalks or pedestrian paths by at least one accessible route.
 - d. The slope of the pad parallel to the roadway must be the same as the roadway to the maximum extent practical.
 - e. For drainage purposes, a maximum cross slope of 2% perpendicular to the roadway is allowable.
2. **Bus Shelters.** Where new or replaced bus shelters are provided, they must be installed or positioned to permit a wheelchair user to enter from the public way and reach a location within the shelter having a minimum clear floor area of 30 in. by 48 in. An accessible route shall be provided from the shelter to the boarding area.
3. **Signs.** All new bus route identification signs should be sized based on the maximum dimensions permitted by local, State or Federal regulations or ordinances. The signs shall have an eggshell, matte or other non-glare finish. The characters or symbols shall contrast with their background (i.e., light characters on a dark background or dark characters on a light background).

8-2.03 Parking

8-2.03.01 Off-Street Parking

The following criteria apply to off-street handicapped parking spaces:

1. **Minimum Number.** Table 8-2A provides the criteria for the minimum number of accessible spaces. A typical handicapped stall layout is shown in Figure 8-2A.

One out of every eight accessible spaces, but not less than one, shall have an access aisle 96 in. wide and must be designated as van accessible.
2. **Location.** Parking spaces for disabled individuals and accessible passenger loading zones that serve a particular building shall be the spaces or zones closest to the nearest accessible entrance on an accessible route. In separate parking structures or lots that do not serve a particular building, parking spaces for disabled individuals shall be located on the shortest possible circulation route to an accessible pedestrian entrance of the parking facility. In buildings with multiple access entrances with adjacent parking, accessible parking spaces shall be dispersed and located closest to the accessible entrances.
3. **Signing.** Parking spaces for the handicapped shall be designated by above-grade signs with white lettering against a blue background and shall bear the international symbol of access. The sign shall not be obscured by a vehicle parked in the space. Van-accessible spaces shall have an additional sign stating the space is "Van-Accessible" below the symbol of accessibility.
4. **Dimensions.** The parking spaces designated for the handicapped shall be at a minimum 96 in. wide with an additional 60 in. minimum access aisle or 96 in next to van-accessible spaces. Parking access aisles shall be part of an

January 2001

8-11

accessible route to the building or facility entrance. Parked vehicular

overhangs shall not reduce the clear width of an accessible circulation route.

**MINIMUM NUMBER OF ACCESSIBLE SPACES
FOR HANDICAPPED USERS**

Total No. of Parking Spaces	Minimum Number of Accessible Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2% of total
1001 and over	20 plus 1 for each 100 over 1000

Notes: a. If one or more passenger loading zones are provided, then at least one passenger loading zone shall comply with Comment #5 in Section 8-2.03.01.

b. Parking spaces for side-lift vans are accessible parking spaces and may be used to meet the requirements of this Section.

c. The total number of accessible parking spaces may be distributed among closely spaced parking lots, if greater accessibility is achieved.

Note: Two accessible parking spaces may share a common access aisle.

**HANDICAPPED PARKING STALL DIMENSIONS
(Off-Street Parking)**

Figure 8-2A