

**WEST VIRGINIA**  
**DIVISION OF HIGHWAYS**

**DIVISION 200**  
**EARTHWORK**

**CONSTRUCTION**  
**MANUAL**

**2002**







### Table of Contents

<u>Section</u>	<u>Page</u>
201 <u>CLEARING AND GRUBBING</u> .....	201(1)
201.1 GENERAL .....	201(1)
201.1.1 <u>Description of Work</u> .....	201(1)
201.1.2 <u>Protection and Preservation of Property</u> .....	201(1)
201.1.3 <u>Plans-In-Hand Meeting</u> .....	201(1)
201.1.4 <u>Off-Site Property Agreements</u> .....	201(2)
201.1.5 <u>Utilities</u> .....	201(2)
201.1.6 <u>On- and Off-Site Drainage</u> .....	201(3)
201.1.7 <u>Erosion and Sediment Control</u> .....	201(3)
201.1.8 <u>Materials and Equipment</u> .....	201(3)
201.2 HAZARDS .....	201(3)
201.2.1 <u>Public Safety</u> .....	201(3)
201.2.2 <u>Use of Explosives</u> .....	201(4)
201.2.3 <u>Tall Timbered Regions</u> .....	201(4)
201.2.4 <u>Fire Hazards</u> .....	201(4)
201.2.5 <u>Poisonous Plants</u> .....	201(5)
201.3 EXCAVATION AREAS .....	201(5)
201.3.1 <u>Clearing and Grubbing in Excavation Areas</u> .....	201(5)
201.3.2 <u>Extent of Removal</u> .....	201(5)
201.3.3 <u>Selective Clearing and Thinning</u> .....	201(6)
201.4 EMBANKMENT AREAS .....	201(6)
201.4.1 <u>Clearing and Grubbing in Embankment Areas</u> .....	201(6)
201.4.2 <u>Maintenance of Ground Surface</u> .....	201(7)
201.5 DISPOSAL OF MATERIALS .....	201(7)
201.5.1 <u>Merchantable Timber</u> .....	201(7)
201.5.2 <u>Combustible Material Disposal On Right-of-Way</u> .....	201(7)
201.5.2.1 Burning .....	201(7)
201.5.2.2 Burying .....	201(8)
201.5.2.3 Chipping .....	201(8)
201.5.3 <u>Non-Combustible Material Disposal On-Right-of-Way</u> .....	201(8)
201.5.4 <u>Material Disposal Off Right-of-Way</u> .....	201(9)



**Table of Contents**

(Continued)

<b><u>Section</u></b>	<b><u>Page</u></b>
201.6 RECORDS AND DAILY REPORTS .....	201(9)
201.7 MEASUREMENT FOR PAYMENT .....	201(10)
202 <u>BUILDING DEMOLITION</u> .....	202(1)
202.1 GENERAL .....	202(1)
202.1.1 <u>Description of Work</u> .....	202(1)
202.1.2 <u>Utilities</u> .....	202(1)
202.1.3 <u>Asbestos Survey</u> .....	202(1)
202.1.4 <u>Historic and Archeological Findings</u> .....	202(1)
202.1.5 <u>Materials and Equipment</u> .....	202(1)
202.2 HAZARDS .....	202(1)
202.3 EXTENT OF REMOVAL .....	202(2)
202.4 RODENT AND INSECT CONTROL .....	202(2)
202.5 DISPOSAL OF MATERIALS .....	202(2)
202.6 RECORDS AND DAILY REPORTS .....	202(3)
202.7 MEASUREMENT FOR PAYMENT .....	202(3)
203 <u>DISMANTLING STRUCTURES</u> .....	203(1)
203.1 GENERAL .....	203(1)
203.1.1 <u>Description of Work</u> .....	203(1)
203.1.2 <u>Bridge Demolition/Dismantling Plan</u> .....	203(1)
203.1.3 <u>Materials and Equipment</u> .....	203(1)
203.2 HAZARDS .....	203(1)
203.3 DISPOSAL OF MATERIALS .....	203(2)
203.4 RECORDS AND DAILY REPORTS .....	203(2)
203.5 MEASUREMENT FOR PAYMENT .....	203(2)
204 <u>MOBILIZATION</u> .....	204(1)
204.1 GENERAL .....	204(1)
204.1.1 <u>Description of Work</u> .....	204(1)
204.1.2 <u>Materials and Equipment</u> .....	204(1)
204.2 RECORDS AND DAILY REPORTS .....	204(1)
204.3 MEASUREMENT FOR PAYMENT .....	204(1)
204.3.1 <u>Description</u> .....	204(1)
204.3.2 <u>Partial Payment Procedures</u> .....	204(1)



**Table of Contents**

(Continued)

<b><u>Section</u></b>	<b><u>Page</u></b>
204.3.3 <u>Partial Payment Example #1</u> .....	204(2)
204.3.4 <u>Partial Payment Example #2</u> .....	204(3)
205 – 206 <u>RESERVED</u>	
207 <u>EXCAVATION AND EMBANKMENT</u> .....	207(1)
207.1 <u>GENERAL</u> .....	207(1)
207.1.1 <u>Description of Work</u> .....	207(1)
207.1.2 <u>Protection and Preservation of Property</u> .....	207(1)
207.1.3 <u>On- and Off-Site Drainage</u> .....	207(2)
207.1.4 <u>Erosion and Sediment Control</u> .....	207(2)
207.1.5 <u>Dust Control</u> .....	207(3)
207.1.6 <u>Hauling Considerations</u> .....	207(3)
207.1.6.1 <u>Haul Roads</u> .....	207(3)
207.1.6.2 <u>Protection of Curtain Walls</u> .....	207(3)
207.1.7 <u>Controlled Blasting Plan</u> .....	207(3)
207.1.8 <u>Historic and Archeological Findings</u> .....	207(4)
207.1.9 <u>Materials and Equipment</u> .....	207(4)
207.1.9.1 <u>Quality Control Plan</u> .....	207(4)
207.1.9.2 <u>Quality Control Testing</u> .....	207(4)
207.2 <u>HAZARDS</u> .....	207(4)
207.2.1 <u>Public Safety</u> .....	207(4)
207.2.2 <u>Use of Explosives</u> .....	207(4)
207.2.3 <u>Slide and Trench Areas</u> .....	207(6)
207.3 <u>ROADWAY EXCAVATION</u> .....	207(6)
207.3.1 <u>General</u> .....	207(6)
207.3.2 <u>Pre-Wetting</u> .....	207(6)
207.3.3 <u>Controlled Blasting</u> .....	207(6)
207.3.4 <u>Benches and Transition Points</u> .....	207(7)
207.3.5 <u>Slides and Slipouts</u> .....	207(8)
207.3.6 <u>Conduit</u> .....	207(9)
207.4 <u>DISPOSAL OF MATERIALS</u> .....	207(9)
207.4.1 <u>Suitable Material</u> .....	207(9)
207.4.2 <u>Salvaging Topsoil</u> .....	207(9)



**Table of Contents**

(Continued)

<b><u>Section</u></b>	<b><u>Page</u></b>
207.4.3 <u>Unsuitable Material</u> .....	207(10)
207.4.4 <u>Waste and Waste Sites</u> .....	207(10)
207.4.5 <u>Surplus Material</u> .....	207(11)
207.5 EARTH EMBANKMENT .....	207(12)
207.5.1 <u>General</u> .....	207(12)
207.5.2 <u>Embankment Foundation Preparation</u> .....	207(12)
207.5.3 <u>Uniformity of Material</u> .....	207(13)
207.5.4 <u>Hauling and Placement</u> .....	207(13)
207.5.4.1 General .....	207(13)
207.5.4.2 Lift Thickness .....	207(15)
207.5.4.3 Moisture Content .....	207(16)
207.5.5 <u>Compaction</u> .....	207(16)
207.5.5.1 Stability of Embankment .....	207(16)
207.5.5.2 Control of Compaction .....	207(17)
207.5.5.3 Compaction Equipment .....	207(17)
207.6 ROCK EMBANKMENT .....	207(17)
207.6.1 <u>Placement</u> .....	207(17)
207.6.2 <u>Compaction</u> .....	207(18)
207.7 SELECT MATERIAL EMBANKMENT .....	207(18)
207.8 FINISHING EARTHWORK .....	207(18)
207.8.1 <u>Earth Roads</u> .....	207(18)
207.8.2 <u>Subgrade</u> .....	207(19)
207.8.3 <u>Slopes, Shoulders, Ditches</u> .....	207(19)
207.8.3.1 Slopes .....	207(19)
207.8.3.2 Flattening Slopes .....	207(20)
207.8.3.3 Shoulders .....	207(20)
207.8.3.4 Ditches .....	207(21)
207.8.4 <u>Engineer Fabric</u> .....	207(21)
207.8.5 <u>Temporary Surcharge</u> .....	207(22)
207.9 RECORDS AND DAILY REPORTS .....	207(22)
207.10 MEASUREMENT FOR PAYMENT .....	207(23)



**Table of Contents**

(Continued)

<b><u>Section</u></b>	<b><u>Page</u></b>
208 – 210 <u>RESERVED</u>	
211 <u>BORROW EXCAVATION</u> .....	211(1)
211.1 GENERAL .....	211(1)
211.1.1 <u>Description of Work</u> .....	211(1)
211.1.2 <u>Protection and Preservation of Property</u> .....	211(1)
211.1.3 <u>Clearing and Grubbing</u> .....	211(1)
211.1.4 <u>Drainage</u> .....	211(1)
211.1.5 <u>Erosion and Sediment Control</u> .....	211(1)
211.1.6 <u>Dust Control</u> .....	211(1)
211.1.7 <u>Blasting Considerations</u> .....	211(2)
211.1.8 <u>Hauling Considerations</u> .....	211(2)
211.1.9 <u>Site Restoration</u> .....	211(2)
211.1.10 <u>Historic and Archeological Findings</u> .....	211(2)
211.1.11 <u>Materials and Equipment</u> .....	211(2)
211.2 HAZARDS .....	211(2)
211.3 BORROW EXCAVATION .....	211(2)
211.3.1 <u>Justification and Approval</u> .....	211(2)
211.3.2 <u>Site Selection and Approval</u> .....	211(2)
211.3.3 <u>Classification, Placement, and Compaction</u> .....	211(4)
211.4 RECORDS AND DAILY REPORTS .....	211(4)
211.5 MEASUREMENT FOR PAYMENT .....	211(4)
212 <u>STRUCTURE, ROCK, AND WET EXCAVATION</u> .....	212(1)
212.1 GENERAL .....	212(1)
212.1.1 <u>Description of Work</u> .....	212(1)
212.1.2 <u>Protection and Preservation of Property</u> .....	212(1)
212.1.3 <u>Shoring, Bracing and Cofferdams</u> .....	212(1)
212.1.3.1 Cofferdams .....	212(1)
212.1.3.2 Construction Plans .....	212(2)
212.1.3.3 Pumping .....	212(2)
212.1.4 <u>Drainage</u> .....	212(2)
212.1.5 <u>Erosion and Sediment Control</u> .....	212(2)
212.1.6 <u>Blasting Considerations</u> .....	212(3)
212.1.7 <u>Materials and Equipment</u> .....	212(3)



**Table of Contents**

(Continued)

<b><u>Section</u></b>	<b><u>Page</u></b>
212.2 HAZARDS .....	212(3)
212.3 EXCAVATION FOR FOOTINGS .....	212(3)
212.3.1 <u>Footing Elevation</u> .....	212(3)
212.3.2 <u>Foundation Surface Preparation</u> .....	212(3)
212.3.3 <u>Backfilling Around Structures</u> .....	212(4)
212.4 DISPOSAL OF MATERIALS .....	212(5)
212.5 RECORDS AND DAILY REPORTS .....	212(6)
212.6 MEASUREMENT FOR PAYMENT .....	212(6)
213 – 217 <u>RESERVED</u>	
218 <u>SLOPE AND FOUNDATION PROTECTION</u> .....	218(1)
218.1 GENERAL .....	218(1)
218.1.1 <u>Description of Work</u> .....	218(1)
218.1.2 <u>Materials and Equipment</u> .....	218(1)
218.2 SLOPE PROTECTION .....	218(1)
218.2.1 <u>General</u> .....	218(1)
218.2.2 <u>Riprap/Grouted Riprap</u> .....	218(1)
218.2.3 <u>Gabions</u> .....	218(2)
218.2.4 <u>Crushed Rock</u> .....	218(2)
218.2.5 <u>Concrete</u> .....	218(2)
218.2.6 <u>Engineering Fabric</u> .....	218(3)
218.3 FOUNDATION PROTECTION .....	218(3)
218.4 RECORDS AND DAILY REPORTS .....	218(3)
218.5 MEASUREMENT FOR PAYMENT .....	218(3)
219 <u>CONTROLLED LOW-STRENGTH MATERIAL</u> .....	219(1)
219.1 GENERAL .....	219(1)
219.1.1 <u>Description of Work</u> .....	219(1)
219.1.2 <u>Materials and Equipment</u> .....	219(1)
219.1.2.1 <u>Quality Control</u> .....	219(1)
219.1.2.2 <u>Mix Design</u> .....	219(1)



**Table of Contents**

(Continued)

<b><u>Section</u></b>	<b><u>Page</u></b>
219.2 PLACEMENT .....	219(1)
219.3 RECORDS AND DAILY REPORTS .....	219(2)
219.4 MEASUREMENT FOR PAYMENT.....	219(2)
220 – 227 <u>RESERVED</u>	
228 <u>SUBGRADE PREPARATION</u> .....	228(1)
228.1 GENERAL .....	228(1)
228.1.1 <u>Description of Work</u> .....	228(1)
228.1.2 <u>Materials and Equipment</u> .....	228(1)
228.2 SUBGRADE PREPARATION.....	228(1)
228.3 RECORDS AND DAILY REPORTS .....	228(1)
228.4 MEASUREMENT FOR PAYMENT.....	228(1)
229 <u>SHOULDERS AND DITCHES</u> .....	229(1)
229.1 GENERAL .....	229(1)
229.1.1 <u>Description of Work</u> .....	229(1)
229.1.2 <u>Materials and Equipment</u> .....	229(1)
229.2 PUBLIC SAFETY HAZARDS .....	229(1)
229.3 SHOULDERS AND DITCHES .....	229(1)
229.4 RECORDS AND DAILY REPORTS .....	229(2)
229.5 MEASUREMENT FOR PAYMENT.....	229(2)
230 – 239 <u>RESERVED</u>	
240 <u>CLEANING CULVERTS, INLETS, AND MANHOLES</u> .....	240(1)
240.1 GENERAL .....	240(1)
240.1.1 <u>Description of Work</u> .....	240(1)
240.1.2 <u>Materials and Equipment</u> .....	240(1)
240.2 PUBLIC SAFETY HAZARDS .....	240(1)
240.3 CLEANING CULVERTS, INLETS, AND MANHOLES .....	240(1)
240.4 RECORDS AND DAILY REPORTS .....	240(1)
240.5 MEASUREMENT FOR PAYMENT.....	240(2)







## Section 201

# CLEARING AND GRUBBING

### 201.1 GENERAL

#### 201.1.1 Description of Work

To prepare the right-of-way for grading, the Contractor usually will perform a clearing and grubbing operation. Within the construction and easement limits and in designated areas within the right-of-way, the Contractor will selectively remove and dispose of natural and manmade objects that are not designated by WVDOT to remain in place (e.g., vegetative undergrowth, trees, stumps, debris, buildings, foundations, abandoned utilities, drainage structures). The Contractor also will clear and grub any needed borrow and waste sites. The contract plans and specifications designate the areas to be cleared and grubbed. Field operations and other factors may require the Contractor to clear and grub additional areas not designated on the plans. The Project Engineer/Supervisor is responsible for informing the Contractor of the desired disposition of any such additional areas.

#### 201.1.2 Protection and Preservation of Property

The Contractor must protect and preserve not only the designated items and areas within the right-of-way but also the natural growth and man-made improvements on adjacent properties. Where damage occurs, the Contractor is solely responsible for correcting the damage. The Contractor will determine the method in which to protect and preserve designated items and areas. Do not direct the Contractor how to accomplish this task unless specifically covered in the plans and specifications and as long as the method is reasonable and consistent with good construction practice.

#### 201.1.3 Plans-In-Hand Meeting

Before the Contractor begins work, the Project Engineer/Supervisor and all Inspectors should review and become familiar with the contract plans, specifications, permits, and agreements. Meet with the Contractor and travel the job site to discuss the general nature of the work to be performed and any special details that are specified in the contract. Ensure the work area and the items to be preserved and protected are clearly marked and communicated to the Contractor. During the meeting, specifically note and discuss the following:

1. work boundaries, plan limits, and field stakes;
2. selective thinning areas designated on the plans and any additional clearing and grubbing areas;
3. roadway alignment and typical sections;
4. soil profile, embankment and cut slopes, and shrink/swell factors;
5. blasting requirements, plans, and permits;
6. existing and proposed drainage profiles;
7. erosion and sediment control requirements plans, and in-place treatments;
8. wetland areas, unusual soil and moisture conditions (e.g., springs, seeps, swamps);
9. buildings, utilities, railroads, fences, and other obstructions to be demolished, relocated, or protected;
10. requirements, plans, and permits for demolition/dismantling structures;



11. private property boundaries, restricted areas, and off-site property agreements;
12. trees, shrubs, survey monuments, historical markers, and other physical features to be protected, preserved, or relocated;
13. historical and archaeological sites and related SHPO permits;
14. borrow sources, waste sites, hazardous material removal and disposal plans, and related DEP permits;
15. haul roads, access points to the construction site and adjacent properties, drainage, and any restoration and seeding requirements;
16. in-place traffic control measures and plans for maintenance and protection of traffic during construction;
17. subgrade and embankment stabilization requirements;
18. right-of-way infringements and unresolved right-of-way agreements; and
19. any materials issues including sampling frequencies, testing procedures, laboratory numbers, approved materials list, and Quality Control Plan requirements for the requisite work of the contract.

Emphasize to the Contractor to protect and preserve all alignment stakes, grade stakes, guard stakes, boundary markers, benchmarks, tie points, and other similar items during construction. The Project Engineer/Supervisor will determine when such items are no longer needed and inform the Contractor when they may be removed or destroyed.

#### **201.1.4 Off-Site Property Agreements**

The Contractor may have to temporarily use private properties or adjacent lands outside the right-of-way for purposes such as staging areas,

construction yards, stockpile areas, project access, and/or construction offices. The Contractor should have a written agreement with the property owner before using property off the right-of-way. The agreement primarily serves as written permission from the owner to the Contractor for using the land for an intended purpose. The terms and conditions of the agreement typically define acceptable and unacceptable uses of the property and any required evidence that the owner is satisfied with the Contractor's restoration and cleanup. Representatives of the Contractor and the property owner, not WVDOH personnel, sign the agreement.

#### **201.1.5 Utilities**

The Contractor is responsible for locating, protecting, and/or adjusting all existing utility facilities. Consider the following guidelines:

1. Miss Utility. The Contractor is responsible for contacting Miss Utility and coordinating with the affected utility companies.
2. Plans-In-Hand-Meeting. Ensure that representatives of affected utility companies are present during the plans-in-hand meeting to assist in establishing and marking the location and depth of all underground facilities within the right-of-way.
3. Utility Agreements. Before beginning the clearing and grubbing operation, check that the Contractor has, in hand, properly executed utility agreements and that all existing underground utility locations are established and adequately marked.
4. Damages. Any damage to existing utilities is solely the Contractor's responsibility. Visually check and report in the Daily Report any damaged utilities.
5. Utility Adjustments. Utility adjustments within the right-of-way may need to be scheduled in a particular sequence with other construction operations. In such cases,



check to make certain the Contractor understands the required sequence of events and the operations are implemented accordingly.

6. Abandoned Utility Poles. The Project Engineer/Supervisor is responsible for marking abandoned utility poles to be removed. Visually inspect the area to check that the Contractor removes the abandoned utility poles marked within the limits of the right-of-way and that the poles are properly disposed of (see Section 201.5).

#### **201.1.6 On- and Off-Site Drainage**

The Contractor is responsible for maintaining adequate drainage within the right-of-way. Check existing and proposed drainage profiles on the plans to make sure existing drainage has not changed, proposed drainage will not flow onto adjacent properties, and natural drainage will not be altered to impact landowners or structures in either upstream or downstream direction. Impacts can extend a considerable distance from the point of disturbance. Carefully monitor areas near streams and other natural bodies of water for erosion and sedimentation. Inspect the drainage of lands adjacent to the roadway to make certain all drainage structures, inlets, outlets, channels, and dikes are functioning and/or properly located.

#### **201.1.7 Erosion and Sediment Control**

Roadway construction projects disturb large areas of natural vegetation that can accelerate the rate of soil erosion and sedimentation. Before allowing the clearing and grubbing operation to begin, check that the Contractor has an approved Erosion and Sediment Control Plan, and visually inspect that the Contractor has satisfactorily implemented Phase I of the Plan. See the WVDOT **Erosion and Sediment Control Manual** for additional information. The Contractor should clear an area sufficient to allow grading operations to progress without

interruption; however, do not allow the Contractor to expose an area of erodible soil that exceeds the limits of the contract plans and specifications. Frequently inspect construction operations to check that the Contractor logically sequences activities to minimize potential damage to earthwork during heavy rains. See Section 207.1.4 for additional information on erosion and sediment control and Section 107.4.9 for information on NPDES permits.

#### **201.1.8 Materials and Equipment**

Project materials must conform to the contract specifications and be delivered with appropriate laboratory numbers. Contact the Materials Control, Soils and Testing Division for a copy of the Division's approved materials list. Ensure the Contractor submits for approval a Quality Control Plan of sampling and testing methods (see MP 717.04.21) and that the Contractor is operating within that Plan. See Division 700 for information on control of materials. Do not direct the Contractor regarding equipment type or usage. Inform the Contractor of any equipment that violates the specifications. Visually inspect equipment that does not perform satisfactorily. Notify the Contractor of any equipment or operation that is an apparent or obvious safety violation. Do not dictate a method of operation unless it specifically violates the specifications or safety requirements and as long as it is reasonable and consistent with good construction practice.

#### **201.2 HAZARDS**

##### **201.2.1 Public Safety**

Public and private roadways and intersections may be affected by the Contractor's construction activities. The Contractor is responsible for maintaining these facilities in a safe and passable condition. Perform daily visual checks to ensure the Contractor is adequately cleaning and sweeping mud, oil, debris, and any other objectionable materials from the traveled way.



Do not allow the Contractor to place any equipment or materials that would be an obvious hazard to vehicular or pedestrian traffic. Check that the Contractor has an approved plan for maintaining and protecting traffic during construction. Visually inspect that the Contractor is performing this task in accordance with the governing contract specifications and note the observations in the Daily Report. See the WVDOH publication **Traffic Control for Street and Highway Construction and Maintenance Operations** for additional information. Do not allow the Contractor to engage in any operation that would steepen the slopes of embankments.

### **201.2.2 Use of Explosives**

Although infrequent, the Contractor may need to use explosives during clearing and grubbing activities (e.g., use of Primacord to fell trees). The transport, storage, handling, and detonation of explosives pose extreme and potentially hazardous conditions to workers and the general public. Such operations always should be conducted under the careful, competent supervision of licensed personnel to prevent injury to persons and damage to adjacent properties. Inform the Contractor of any apparent or obvious safety violations or acts that do not comply with the contract specifications. See Sections 207.1.7, 207.2.2, and 207.3.3 for additional information on explosives and acceptable blasting operations.

### **201.2.3 Tall Timbered Regions**

Clearing and grubbing operations, particularly in dense, tall timbered regions, can be very hazardous. All project personnel should be especially careful in the vicinity of clearing such areas. Immediately inform the Contractor if clearing tall timber endangers personnel, poses a potential hazard to the general public, or damages existing facilities in or adjacent to the right-of-way. The Contractor typically will use

specialized methods and equipment to safely and effectively fell extremely tall timber.

### **201.2.4 Fire Hazards**

If permitted, the Contractor frequently will elect to burn combustible waste materials on the project right-of-way (see Section 201.5.2.1). The Contractor is solely responsible for the careful control of such operations. Left unattended or performed improperly, open-air burning of combustible materials can quickly develop into wildfires outside the right-of-way. Consider the following guidelines:

1. Legal Issues. Check that the Contractor's burning operation is performed in accordance with the contract specifications and the applicable laws, ordinances, regulations, and provisions of the West Virginia Air Pollution Control Commission.
2. Fire Fighting Equipment. Check to make sure the Contractor has adequate fire fighting equipment readily available.
3. Watchmen. Check that the Contractor provides adequate watchmen to control the spread of fire.
4. Location. Visually inspect that the Contractor is burning debris on the right-of-way and in a location that will prevent the spread of fire to adjacent timber or other combustible materials.
5. Utilities. Do not allow the Contractor to burn materials anywhere near overhead utility lines. Also, give consideration to the type and depth of existing underground utility facilities (e.g., gas lines).
6. Preparation of Area. Inspect the burning operation to make sure the Contractor properly prepares and cleans the surrounding area of combustible debris.



7. Pile Size. Where it is apparently advisable for better control, inform the Contractor to use chippers to reduce the size of burn piles.
8. Unfavorable Conditions. In high winds or very dry conditions, halt burning operations in lieu of more favorable weather and ground moisture conditions. Verify that the Contractor douses smoldering embers to prevent rekindling by high winds.

### **201.2.5 Poisonous Plants**

All project personnel should use caution when working in areas known to have poison oak and poison ivy. The oils from these common poisonous plants cause an irritable rash when contact is made with the skin. In addition, the smoke from burning these poisonous plants can cause an equally serious condition, both internal and external. Those individuals with severe allergic reaction to such exposure will require immediate medical assistance.

## **201.3 EXCAVATION AREAS**

### **201.3.1 Clearing and Grubbing in Excavation Areas**

The Contractor is responsible for clearing and grubbing all trees, undergrowth, stumps, etc. except for those trees and shrubs that are designated in the plans and specifications to remain in place. As long as the method and equipment used by the Contractor is satisfactory, allow the Contractor to carry out this task without intervention. Inform the Contractor if the specifications or common sense dictates otherwise. Timber clearing methods vary from simply sawing and felling a tree to using heavy equipment to topple the tree and completely remove its stump and attached roots. Very effective machinery exists to perform this task. If explosives are used, the Contractor should use them in a safe and controlled manner (see Section 201.2.2). The Inspector is responsible

only for checking that the Contractor performs the work satisfactorily with the contract.

### **201.3.2 Extent of Removal**

The Contractor will remove trees, stumps and large roots from excavation areas (e.g., roadway, channel) to a depth that will satisfy the contract plans and specifications and prevent such objectionable items from being mixed with embankment material. In excavation areas, use the following guidelines to inspect the Contractor's clearing and grubbing operation:

1. Construction Limits/Selective Areas. In areas marked on the plans that are not within the construction limits or selective clearing areas, visually check that all stumps are grubbed or cut flush with the ground and that all brush, shrubs, felled timber, rotten wood, rubbish, and other objectionable objects and vegetation are cleared.
2. Backslope Area. Where stumps are located in the backslope area, especially where the cut section is rounded, check that the Contractor cuts tree stumps flush with or below the final grade line.
3. Scalping and Root Raking. The Contractor normally will scalp the area to remove small bushes, vegetation, rubbish, and other objectionable material. In addition, areas with heavy timber, undergrowth, and small trees normally will require root raking to remove roots that remain after clearing.
4. Root Damage. Check the extent of root damage to standing trees to remain near cut slopes and consider the need to remove these trees. The excavation operation may have damaged the roots sufficiently to kill the tree or cause the tree to fall later.



### **201.3.3 Selective Clearing and Thinning**

Trees and shrubs in certain areas that will not interfere with the highway or its drainage system often are selected to remain in place for their scenic, horticulture, historic, or other salvage value. WVDOT primarily uses selective clearing and thinning in wetland areas. Consider the following guidelines:

1. Contract Plans. The Environmental Section of the Engineering Division will designate on the plans the selective clearing and thinning areas and those trees and shrubs to remain in place. The contract plans will denote a name and phone number for contact purposes.
2. Advance Notice and Authorization. The Contractor will notify the Project Engineer/Supervisor at least two weeks in advance of performing clearing and thinning so that the trees and shrubs can be properly marked. The Project Engineer/Supervisor will notify the Contractor when to begin the clearing and thinning operation. The Contractor must not begin until such notification is given.
3. Marking, Protection, and Damage. Ensure that designated trees and shrubs are clearly marked and that the Contractor takes precautionary measures to protect them from injury. Designated trees and shrubs must remain in place without damage. The Contractor is solely responsible for correcting any damage. Check that the Contractor carefully repairs any damages or injuries in accordance with the contract specifications. Note this on the IDR.
4. Ground Preservation. In areas where trees and shrubs are to remain, do not allow the Contractor to unduly disturb or compact the ground surface. As practical in these areas, direct the Contractor to preserve the existing ground cover and maintain the area in a condition that is consistent with natural surroundings. Unless specifically authorized by the Project Engineer/Supervisor, do not

allow the Contractor to use tractors, cranes, winches, and any other heavy equipment in areas to be selectively thinned.

5. Extent of Removal. Check that the Contractor removes dead and diseased trees and shrubs, junk, trash, litter, uprooted stumps, and the branches, tops, trunks, and dead wood from woodcutting operations. Visually inspect that all stumps, new or old, are cut to a maximum height of 6 in (150 mm) above the surrounding ground or as otherwise directed by the Project Engineer/Supervisor. Visually inspect the right-of-way line and inform the Contractor to cut any undesirable trees that lean over the right-of-way from adjacent property. Under this situation, contact the Right-of-Way Division to ensure that an agreement is made with the property owner (e.g., temporary construction easement).
6. Pruning. Visually inspect that the Contractor prunes low hanging, dead, diseased, and unsightly limbs from those trees that are to remain. Check that the Contractor trims tree branches that extend over the roadbed to provide a clear height of 20 ft (6 m) above the roadbed surface. The Project Engineer/Supervisor also may direct the Contractor to prune certain trees or clear certain areas to improve sight distance, increase overhead clearance, open vistas, remove shade hazards, and improve the general appearance of the site. The Contractor must prune trees and shrubs in a manner that will not damage the plant. Check that skilled workmen use good tree surgery practice to prune trees in accordance with the contract specifications.

## **201.4 EMBANKMENT AREAS**

### **201.4.1 Clearing and Grubbing in Embankment Areas**

Unless otherwise designated on the plans, the Contractor will clear and grub all trees and undergrowth in embankment areas. The general



requirements for excavation areas will apply to the areas being prepared for embankment. Use the following additional criteria to inspect the Contractor's clearing and grubbing operations in embankment areas:

1. Embankment Depth < 5 ft (1.5 m). In areas where the proposed embankment is less than 5 ft (1.5 m) in depth, check that the Contractor completely grubs all trees, stumps, roots, bushes, and/or hedge fences.
2. Embankment Depth ≥ 5 ft (1.5 m). In areas where the proposed embankment is 5 ft (1.5 m) or more in depth, measured below the subgrade, check that the Contractor cuts all stumps off as close as practical to the ground. In these areas, do not allow stumps to exceed 6 in (150 mm) above the ground surface as measured at the base of the stump. Stumps that have not been loosened by clearing and grubbing operations and non-perishable solid objects need not be grubbed or removed provided they do not protrude more than 6 in (150 mm) above the original ground surface.
3. Toe Areas. Near the toe of embankment slopes, do not permit stumps to extend higher than 1 ft (300 mm) beneath the embankment slope surface.

#### **201.4.2 Maintenance of Ground Surface**

To prevent ponding of water, check that the Contractor fills all holes, ruts, and other similar surface deformations after the clearing and grubbing operation. As needed, direct the Contractor to blade the area to improve drainage. Note that backfilling and blading may not be necessary if excavation or embankment work is to begin immediately after the area is cleared and grubbed. Once an area has been cleared and grubbed, double check the effectiveness of the Contractor's erosion and sediment control measures. Ensure that the Contractor is fulfilling the requirements of the Erosion and Sediment Control Plan and the

contract specifications. See Section 201.1.7 for additional information on erosion and sediment control.

### **201.5 DISPOSAL OF MATERIALS**

#### **201.5.1 Merchantable Timber**

Timber removed from the construction site may be, all or in part, of merchantable quality. Merchantable timber is not distinguished from other timber and becomes the property of the Contractor unless otherwise specified.

#### **201.5.2 Combustible Material Disposal On Right-of-Way**

##### **201.5.2.1 Burning**

In areas where burning is permitted, the Contractor usually will burn combustible waste materials on the project right-of-way. Check that the Contractor burns the materials within the right-of-way limits under the constant care of competent watchmen and that the action does not jeopardize items to remain in place and the surrounding timber and grasslands of adjacent properties. Consider the following guidelines:

1. Urban Areas. Federal, State, and local laws, ordinances, and regulations may prohibit the burning of combustible waste materials. This is especially true in urban areas. Unless the Project Engineer/Supervisor approves the burning of selected vegetation, do not allow the Contractor to burn materials in urban areas.
2. Fire and Smoke Hazards. The Project Engineer/Supervisor may prohibit the Contractor from burning materials in areas where it is apparent or obvious that fire and smoke will present a hazard to the health, safety, comfort, and property of the peoples in the vicinity of the project. See Section 201.2.4 for additional information on fire hazards.



3. Time Limits. Check that the Contractor burns timber and vegetation to promote combustion and minimize smoke and that the burning operation takes place between sunup and sundown. The Contractor must extinguish all fires before sundown.
4. Incinerators. Incinerators, including air curtain burners, may be used provided the West Virginia Air Pollution Control Commission approves their use.
5. Legal Issues. Inform the Contractor if burning is not in compliance with the contract specifications or with any applicable laws, ordinances, regulations, or provisions of the West Virginia Air Pollution Control Commission.
6. Damages. The Contractor is solely responsible for damages. Visually inspect any damage to trees, shrubs, fences, or other objects to remain and make sure that the Contractor adequately repairs or replaces the damaged items. Note this in the IDR.
7. Cleanup and Restoration. Check to make certain that the Contractor removes and disposes of burned materials and seeds the burned areas in an acceptable manner.

#### **201.5.2.2 Burying**

In general, do not allow the Contractor to bury combustible materials within the right-of-way unless such disposal areas are clearly marked on the plans or otherwise approved by the Project Engineer/Supervisor. Under no circumstance allow the Contractor to bury timber or other combustible materials in embankment areas. If permitted to bury combustible clearing debris on the right-of-way, constantly monitor Contractor operations for unacceptable practice and examine embankment areas (e.g., ravine bottoms) to ensure that they are kept clean and ready to receive embankment material. See Section 207.4.4 for additional information.

#### **201.5.2.3 Chipping**

The Contractor may elect to reduce combustible material to chips and then place the chips, as a substitute for straw mulch, in areas where erosion control is required. Inspect the Contractor's operations to make certain chipping operations are in conformance with the governing contract specifications and that the use of the chips complies with the Contractor's approved Erosion and Sediment Control Plan (see Section 201.1.7). As approved in areas designated by the Project Engineer/Supervisor, the Contractor also may dispose of chips between the construction limits and the right-of-way lines.

#### **201.5.3 Non-Combustible Material Disposal On Right-of-Way**

The Project Engineer/Supervisor may allow the Contractor to dispose on the right-of-way non-combustible construction and demolition waste materials consisting of concrete, asphalt, crushed stone, bricks and blocks. Check to make sure that the Contractor covers such waste materials with a minimum of 2 ft (600 mm) of soil and that the area is well drained and seeded. The Contractor may dispose of such waste in embankment areas provided that the material is broken into pieces not exceeding 2 ft (600 mm) in any dimension. Do not allow the Contractor to dispose of such material within 2 ft (600 mm) of the subgrade 1½ ft (450 mm) from the top of the side slopes. Do not allow the Contractor to dispose in any portion of an embankment material such as wood, steel, and broken concrete matted together by steel reinforcement. Do not allow the Contractor to create any temporary disposal sites on the right-of-way and check to make sure that construction and demolition waste is disposed in accordance with the contract specifications.



**201.5.4 Material Disposal Off Right-of-Way**

The Contractor may elect or otherwise be required to dispose of all, or part, of construction and demolition waste material, including clearing and grubbing debris, outside the project right-of-way. Under such cases, consider the following guidelines during inspection:

1. Construction/Demolition Waste. Waste from construction and demolition operations includes, but is not limited to, clearing and grubbing waste, pavement materials, wood, plaster, metals, asphaltic substances, bricks, blocks, concrete, crushed stone, and masonry materials.
2. Hazardous Materials. Construction and demolition waste does not include asbestos and other hazardous materials (e.g., lead-based paint, chemicals, fuel oil). Hazardous waste will be disposed of in an approved area for that particular material. Periodically check the Contractor's landfill receipts to ensure that hazardous materials are being disposed of properly.
3. Off-Site Property Agreements. The Contractor must have a written agreement with the owner of the proposed disposal site (see Section 201.1.4). The agreement may involve the application for a DEP permit. Before the Contractor disposes of materials outside the right-of-way, check that the Contractor has a written agreement with the property owner and any requisite permits.
4. Director Approval. The Director of the Contract Administration Division must approve the use of a proposed disposal sites adjacent to the right-of-way. Although the property owner may grant permission for waste disposal, WVDOH may disapprove the site because it could become a potential roadside nuisance, natural drainage obstruction, or maintenance problem (e.g., debris sliding into the right-of-way).

5. Division of Environmental Protection. The West Virginia Division of Environmental Protection (DEP) controls the disposal of construction and demolition waste material outside the right-of-way. The Contractor may dispose of construction and demolition waste material provided the waste is taken to a DEP approved commercial landfill or the Contractor or property owner obtains a DEP permit. The Contractor or landowner must apply for and receive DEP approval for all construction and demolition waste disposal except under the following conditions:

- a. Clearing and Disposal on Same Parcel. The disposal of trees, stumps, wood-chips, and yard waste that is generated from land clearing where generation and disposal occur on the same property is exempt from the requirements of DEP approval.
- b. Grade Improvements. A landowner using construction and demolition waste material to improve the grade of the land is exempt from the requirements of DEP approval provided that the area of the land does not exceed one-half acre (0.2 ha) and the landowner or Contractor does not fill wetlands, adheres to best management practices for construction, and maintains cover over the material.
- c. Multiple Sites on Same Parcel. The construction and demolition waste material exemption for landowners does not apply to multiple one-half acre (0.2 ha) sites on the same parcel of land.

**201.6 RECORDS AND DAILY REPORTS**

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports all information and measurements necessary to adequately document the prosecution and progress of the work that will justify payment to the Contractor and protect the Division from any future claims.



Consider the following during clearing and grubbing operations:

1. the limits in which work was accomplished for that day;
2. the type and number of pieces of equipment used in the work;
3. the number and classifications of labor used;
4. discussion of project prosecution with the Contractor which are of an unusual nature and any specific recommendations or instructions to the Contractor;
5. weather, for the purpose of determine a working day;
6. any damage to private property caused by the Contractor's equipment or operations and the actions taken;
7. the final disposition of salvable materials (e.g., merchantable timber); and
8. any other records directly related to the basis of payment.

#### **201.7 MEASUREMENT FOR PAYMENT**

The quantity of work performed will be on a lump sum basis. In general, maintain project records in such a manner that all pay items and partial progress and final payments can be easily and clearly supported by recorded data (e.g., when the work was completed, measurements and calculations to support the quantity and quality allowed). Initial all records, calculations and measurements. Use the governing contract specifications for the basis of paying for clearing and grubbing operations.



## Section 202

# BUILDING DEMOLITION

### 202.1 GENERAL

#### 202.1.1 Description of Work

Buildings and other man-made improvements located on the right-of-way that are not of an historic, archeological, or other salvable value usually will need to be removed. The Contractor is responsible for demolishing buildings and appurtenances that are specifically designated on the plans for removal. Typically, this work consists of surveying the building for asbestos, disconnecting utilities, salvaging and disposing of the resulting materials, and rodent control, as specified in the contract. The duty of the Inspector is to make sure that the Contractor's work conforms to the plans and specifications.

#### 202.1.2 Utilities

The Contractor is responsible for contacting Miss Utility and coordinating with all affected utility companies and municipalities to locate, interrupt, disconnect, or otherwise alter public utility services such as gas, water, sewage, electricity, and telephone. See Section 201.1.5 for additional information on utilities. Before allowing the Contractor to begin demolition work, check that the Contractor has contacted Miss Utility and satisfactorily coordinated with the affected companies to mark and determine the required disposition of all existing utilities.

#### 202.1.3 Asbestos Survey

Before beginning building demolition work, the Division is responsible for performing an asbestos survey of each building and its appurtenances. The Division will supply the Contractor with a report of its findings. The Contractor will prepare a plan for the proper

removal and disposal of any asbestos waste material and submit this plan to DEP for review and permit 10 days before demolition. See Section 107.26 of the **Supplemental Specifications** issued July 1, 2000. Check that the Contractor is in receipt of the DEP permit. Hazardous waste will be disposed of in an approved area for that particular material (see Section 201.5.4).

#### 202.1.4 Historic and Archeological Findings

During demolition operations, historic or archeological artifacts may be uncovered. In such cases, immediately inform the Contractor to halt operations and notify the Project Engineer/Supervisor. It usually will be necessary to coordinate with the District Office and the State Historic Preservation Officer (SHPO).

#### 202.1.5 Materials and Equipment

See Section 201.1.8 for general inspection guidelines regarding the Contractor's use of materials and equipment.

### 202.2 HAZARDS

The Contractor is solely responsible for performing the demolition work in a manner that will not jeopardize the health and safety of project personnel or the general public. Check that the work is being performed in accordance with the Contractor's Safety Plan, as applicable, and the contract specifications. Notify the Contractor of any apparent or obvious health or safety violations regarding the use of heavy machinery, explosives, or the handling of or exposure to asbestos, lead-based paint, rat poisons, or other hazardous chemicals. See



Section 201.2 for additional information on hazards during construction operations.

### 202.3 EXTENT OF REMOVAL

Use the following guidelines when inspecting building demolition operations:

1. Buildings and Appurtenances. Check that the Contractor removes buildings and appurtenances to the existing ground level, including any concrete slabs or floors resting upon the ground.
2. Basements. Visually inspect that the Contractor clears all debris and other obstructions from the basement so that only the foundation walls and basement floor remain. Before backfilling, check that the foundation walls and basement floor are shattered sufficiently to promote drainage.
3. Backfilling and Compaction. All pits, trenches, holes, and basements that will not be eliminated during subsequent excavation operations will be backfilled and compacted. Use the following guidelines:
  - a. Inside the Roadway Prism. Check that all backfill within the roadway prism is placed and compacted in accordance with the requirements of the contract specifications.
  - b. Outside the Roadway Prism. Inspect the compaction of backfill outside the roadway prism to check that it is compacted to obtain a minimum density equal to that of the surrounding ground.
4. Water Wells. Water wells serving buildings to be demolished will be abandoned to prevent aquifer contamination in accordance with the contract specifications. Before the Contractor initiates work, check that the Contractor has obtained a permit from the County Sanitarian and follows all procedures prescribed in the permit. Check that

the Contractor abandons any natural gas and oil wells as specified in the contract.

5. Septic Tanks. Septic tanks serving buildings to be demolished will be abandoned in accordance with the governing contract specifications. Check that the Contractor uses a licensed septic tank cleaner to remove the contents of the tank and that the tank is removed and disposed of at an approved landfill. Periodically check the Contractor's landfill receipts to ensure that materials are disposed of properly. The Contractor will backfill and compact the excavation made to remove the tank. Use the guidelines presented in Item 3 to inspect this work.

### 202.4 RODENT AND INSECT CONTROL

When specified in the contract, the Contractor will be responsible for the control of rats and insects. The Contractor will furnish and place in and around marked buildings insecticide and suitably prepared baits containing rodenticide. Visually inspect the type and placement of rodenticide and insecticide to check that they comply with the contract specifications. Baiting and insecticide dusting should continue until all buildings and rubble are removed from the area. Inspect the area to see that the Contractor erects warning signs on treated buildings. Check the sign size, legend and mounting locations for conformance with the contract specifications.

### 202.5 DISPOSAL OF MATERIALS

See Section 201.5 for general guidance on the proper disposal of materials. Specifically, the Contractor will dispose of construction and demolition waste materials in a DEP approved landfill. See Section 201.5.4 for additional information on the disposal of construction and demolition waste materials outside the right-of-way. Use the following additional guidelines when inspecting the Contractor's building demolition operations:



1. Hazardous Waste. Pay particular attention to how the Contractor handles and disposes of hazardous waste materials. Construction and demolition waste does not include asbestos and other hazardous materials (e.g., lead-based paint, chemicals, fuel oil). Such hazardous waste must be disposed of in an approved area for that particular material. Check the Contractor's landfill receipts to ensure that materials are being disposed of properly. See Section 202.1.3 for information on asbestos material.
2. Dead Rats. Check that dead rodents are removed from the building demolition area daily and buried at a minimum depth of 2 ft (600 mm). The Contractor will provide a disposal area to be approved by the Project Engineer/Supervisor.
3. Salvable Materials. Unless otherwise specified in the contract, all salvable materials are the property of the Contractor. DOH personnel are prohibited from removing material from the demolition area.
4. Field Discoveries. Any excavation work has the potential of uncovering unknown entities (e.g., underground storage containers with unknown contents, archeological artifacts, utilities). In these cases, immediately inform the Contractor to halt the operation and inform the Project Engineer/Supervisor, who will contact the appropriate personnel and provide further guidance.

Supervisor will maintain the project's Supervisor's Daily Reports. Specifically include the final disposition of any salvable materials and other records directly related to measurement for payment.

## 202.7 MEASUREMENT FOR PAYMENT

The quantity of work performed will be on a lump sum basis for each building to be demolished and removed and each water well and septic tank to be abandoned. Note that payment for backfill related to building demolition is included as part of the building demolition pay item. In general, maintain project records in such a manner that all pay items and partial progress and final payments can be easily and clearly supported by recorded data (e.g., when the work was completed, measurements and calculations to support the quantity and quality allowed). Initial all records, calculations and measurements. Use the governing contract specifications for the basis of payment for building demolition operations.

## 202.6 RECORDS AND DAILY REPORTS

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports all information and measurements necessary to adequately document the prosecution and progress of the work that will justify payment to the Contractor and protect the Division from any future claims. The Inspector in charge of the work will maintain a daily record of events in the Inspector's Daily Report. The Project Engineer/







## Section 203

# DISMANTLING STRUCTURES

### 203.1 GENERAL

#### 203.1.1 Description of Work

If specified, the objective of this work is to remove the structure from its existing location. Depending on the desired disposition of the structure, the Contractor may be required to dismantle the structure and carefully handle, matchmark, and store the structural elements for reassembly in a different location or to demolish the structure, remove the debris, and dispose of and/or salvage the materials. Various methods may be used to perform this work including, but not limited to, a combination of hand tools (e.g., air wrenches, air hammers, saws, cutting torches), heavy equipment, (e.g., cranes, barges), and/or controlled blasting techniques. The Inspector is responsible for checking that the Contractor is performing the work in accordance with the contract plans and specifications. Emphasize the intended disposition of the structure with regard to ownership (i.e., Department or Contractor) and the required handling, storage, and/or disposal of materials. Inspect the operation to check that the Contractor backfills and compacts any demolished concrete substructure (e.g., piers, abutments) according to plan and to the density requirements of the contract specifications.

#### 203.1.2 Bridge Demolition/Dismantling Plan

The Contractor is responsible for determining the structure's condition and employing safe and efficient demolition/dismantling methods and procedures. At least seven calendar days before the demolition/dismantling work begins, ensure that the Contractor has provided the Project Engineer/Supervisor with a copy of the Demolition/Dismantling Plan. Check that the Plan has been prepared and sealed by a

Professional Engineer registered in the State of West Virginia with experience in structural analysis of bridges. The Plan will include a complete structural analysis for all phases of demolition/dismantling work with regard to the existing condition of the structure at the time the work is performed. Note that it is not the responsibility of WVDOH to review or approve the Plan. The Inspector is only responsible for ensuring that the Project Engineer/Supervisor is in receipt of the Plan as described above and that the Contractor is operating within the Plan and the contract specifications. The Contractor is solely responsible for the safe and satisfactory removal of the structure. See Section 202.1.3 for information on asbestos material removal.

#### 203.1.3 Materials and Equipment

See Section 201.1.8 for general inspection guidelines regarding the Contractor's use of materials and equipment.

### 203.2 HAZARDS

Demolition/dismantling work can pose potentially hazardous conditions. The Contractor will submit and operate within a Safety Plan as specified in the contract. The work must be performed in a manner to ensure the health and safety of all peoples. The structure may contain lead-based paint, and the Contractor will provide protection from exposure to meet Federal requirements and the contract specifications. Notify the Contractor of any apparent or obvious health or safety violations regarding the use of heavy machinery, hazardous materials (i.e., lead-based paint, cutting of galvanized metals), or explosives. See Section 201.2 for additional information on hazards.



### 203.3 DISPOSAL OF MATERIALS

Section 201.5 provides guidance on the proper disposal of construction and demolition waste materials on and off the right-of-way. Use the following additional guidelines when inspecting the Contractor's demolition/dismantling work:

1. Hazardous Waste. Construction and demolition waste does not include asbestos and other hazardous materials (e.g., lead-based paint, galvanized metals). Such hazardous waste must be disposed of in an approved area for that particular material. Pay particular attention to how such materials are handled at the site and check the Contractor's landfill receipts to ensure that materials are being disposed of properly. See the WVDOT publication **Best Management Practice for Containment and Disposal of Waste Materials Generated in Painting Bridges** for additional information. See Section 202.1.3 for information on asbestos material removal.
2. Salvable Materials. Unless otherwise specified in the contract, salvable materials are the property of the Contractor. Emphasize the intended disposition of the structure with regard to ownership (i.e., Department or Contractor) and pay particular attention to how salvable materials are handled. DOT personnel are prohibited from removing material from the demolition area.

### 203.4 RECORDS AND DAILY REPORTS

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports all information and measurements necessary to adequately document the prosecution and progress of the work that will justify payment to the Contractor and protect the Division from any future claims. The Inspector in charge of the work will maintain a daily record of events in the Inspector's Daily Report. The Project Engineer/Supervisor will maintain the project's Super-

visor's Daily Reports. Specifically include the final disposition of any salvable materials and other records directly related to measurement for payment.

### 203.5 MEASUREMENT FOR PAYMENT

The quantity of work performed will be on a lump sum basis for complete execution of the work (e.g., demolition and dismantling, material handling and storage, removal and disposition of falsework, debris and refuse disposal, restoration and cleanup). Note that payment for backfill and compaction related to this work is included as part of the bridge demolition/dismantling pay item. In general, maintain project records in such a manner that all pay items and partial progress and final payments can be easily and clearly supported by recorded data (e.g., when the work was completed, measurements and calculations to support the quantity and quality allowed). Initial all records, calculations and measurements. Use the governing contract specifications for the basis of payment for demolition/dismantling structures.



## Section 204

# MOBILIZATION

### 204.1 GENERAL

#### 204.1.1 Description of Work

Mobilization is a contract pay item used to compensate the Contractor for preparatory construction operations and includes the movement of personnel and equipment to the project site and the establishment of construction offices, buildings, and other facilities necessary to begin work on a substantial phase of the contract.

#### 204.1.2 Materials and Equipment

See Section 201.1.8 for general inspection guidelines regarding the Contractor's use materials and equipment.

### 204.2 RECORDS AND DAILY REPORTS

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports all information and measurements necessary to adequately document the prosecution and progress of the work that will justify payment to the Contractor and protect the Division from any future claims. The Inspector in charge of the work will maintain a daily record of events in the Inspector's Daily Report. The Project Engineer/Supervisor will maintain the project's Supervisor's Daily Reports. Specifically record information on the construction offices, buildings, and facilities provided (e.g., number, type, how they are equipped), the times that various types of machinery and equipment arrive and depart the job site, and any other documentation directly related to the basis of payment. Be diligent in recording the arrival and departure times of the Contractor's machinery

and equipment, especially departure times. This information will become very important in resolving disputes if the Contractor falls behind schedule or files a claim.

### 204.3 MEASUREMENT FOR PAYMENT

#### 204.3.1 Description

The quantity of work performed will be on a lump sum basis for mobilization. Note that when mobilization is not a separate bid item in the contract, the cost of mobilization is included in the unit bid price of the related bid item. Use the governing contract specifications for the basis of payment for mobilization. To better understand the procedures for estimating partial payments, use the guidelines in the following sections:

#### 204.3.2 Partial Payment Procedures

A maximum total of two partial payments will be made for mobilization: the first partial payment will be made not less than 15 days after the start of work at the project site; and the second partial payment will be made 30 days after the first partial payment. The final payment for any amount due for mobilization, if not already paid in full with partial payments, will be made upon completion of all work on the project. Carefully check partial payments to ensure they do not exceed the total limits set forth in the contract specifications. Use the following procedures to pay for the mobilization bid item as the work progresses:

1. Total Limit for Partial Payments (TL). The Total Limit for Partial Payments (TL) is a maximum upper dollar limit the Division will pay in total for either the first partial payment or the sum of both the first and the



second partial payment. Calculate TL based on the Total Original Contract Amount (TC). Note that TC also will include the Total Mobilization Amount (TM) of the contract. Use the following criteria to calculate TL:

- a. If  $TC \leq \$100,000$ , use:

$$TL = 0.10(TC).$$

- b. If  $\$100,000 < TC \leq \$500,000$ , use:

$$TL = 10,000 + 0.03(TC - 100,000).$$

- c. If  $\$500,000 < TC \leq \$1,500,000$ , use:

$$TL = 22,000 + 0.02(TC - 500,000).$$

- d. If  $TC > \$1,500,000$ , use:

$$TL = 42,000 + 0.01(TC - 1,500,000).$$

2. First Partial Payment (PP1). Calculate and pay the First Partial Payment (PP1) as follows:

- a. Pay Schedule. Pay PP1 not less than 15 days after the start of work at the project site.

- b. Determine Amount. PP1 will be the lesser of the following dollar amounts:

- 1)  $0.015(TC)$ ,
- 2)  $0.50(TM)$ , or
- 3) TL.

3. Payable Amount for Mobilization (PM). Calculate what is left to pay for mobilization on the contract after paying PP1. PM is the new amount the Division now owes the Contractor for mobilization. PM is the Total Mobilization Amount (TM) bid in the contract less the First Partial Payment (PP1) as follows:

$$PM = TM - PP1.$$

4. Second Partial Payment (PP2). Calculate and pay the Second Partial Payment (PP2) as follows:

- a. Pay Schedule. Pay PP2 30 days after PP1 is paid.

- b. Determine Amount. PP2 will be the lesser of the following dollar amounts:

- 1)  $0.015(TC)$ ,
- 2)  $0.50(TM)$ ,
- 3) PM, or
- 4)  $(TL - PP1)$ .

5. Final Payment (FP). If not already paid in full, calculate and pay the Final Payment (FP) for mobilization as follows:

- a. Pay Schedule. Pay FP upon completion of all work on the project.

- b. Calculate Amount. FP is the final amount the Division now owes the Contractor for mobilization and is the Total Mobilization Amount (TM) bid in the contract less the sum of the First Partial Payment (PP1) and the Second Partial Payment (PP2) as follows:

$$FP = TM - (PP1 + PP2).$$

To better clarify, study the examples in the following sections.

### **204.3.3 Partial Payment Example #1**

This example demonstrates partial payments for mobilization when the controlling factor is 50% of the Total Mobilization Amount (TM). Determine the pay schedule.

Total Original Contract Amount:

$$TC = \$3,240,000$$

Total Mobilization Amount:

$$TM = \$48,446$$



1. Determine TL. Because  $TC > \$1,500,000$ , TL is calculated as follows:

$$\begin{aligned} TL &= 42,000 + 0.01(TC - 1,500,000) \\ TL &= 42,000 + 0.01(3,240,000 - 1,500,000) \\ TL &= \$59,400 \end{aligned}$$

2. Determine (PP1). PP1 will be the lesser of the following dollar amounts:

- 1)  $0.015(TC)$   
 $0.015(\$3,240,000)$   
\$48,600
- 2)  $0.50(TM)$
- 3)  $0.50(\$48,446)$   
\$24,223 (*lesser amount*)
- 4) TL  
\$59,400

3. Pay PP1. Pay \$24,223 not less than 15 days after the start of work at the project site.

4. Calculate PM. Calculate PM as follows:

$$\begin{aligned} PM &= TM - PP1 \\ PM &= \$48,446 - \$24,223 \\ PM &= \$24,223 \end{aligned}$$

5. Calculate PP2. PP2 will be the lesser of the following amounts:

- 1)  $0.015(TC)$   
 $0.015(\$3,240,000)$   
\$48,600
- 2)  $0.50(TM)$   
 $0.50(\$48,446)$   
\$24,223 (*lesser amount*)
- 3) PM  
\$24,223 (*lesser and remaining amount*)
- 4)  $TL - PP1$   
 $\$59,400 - \$24,223$   
\$35,177

6. Pay PP2. Pay \$24,223 30 days after PP1 is paid.

7. Calculate FP. Calculate FP as follows:

$$\begin{aligned} FP &= TM - (PP1 + PP2) \\ FP &= \$48,446 - (\$24,223 + \$24,223) \\ FP &= \$0 \end{aligned}$$

8. Pay FP. Mobilization has been paid in full with PP2. There is no need to pay FP upon completion of all work on the project.

See Section 204.3.4 for an example that demonstrates how to calculate and pay partial payments for mobilization when the controlling factor is the Total Limit for Partial Payments (TL) as specified in the contract.

#### **204.3.4 Partial Payment Example #2**

This example demonstrates partial payments for mobilization when the controlling factor is the Total Limit for Partial Payments (TL) as specified in the contract. Determine the pay schedule.

Total Original Contract Amount:  
 $TC = \$1,400,000$

Total Mobilization Amount:  
 $TM = \$180,000$

1. Determine TL. Because  $\$500,000 < TC \leq \$1,500,000$ , TL is calculated as follows:

$$\begin{aligned} TL &= 22,000 + 0.02(TC - 500,000) \\ TL &= 22,000 + 0.02(1,400,000 - 500,000) \\ TL &= \$40,000 \end{aligned}$$

2. Determine (PP1). PP1 will be the lesser of the following dollar amounts:

- 1)  $0.015(TC)$   
 $0.015(\$1,400,000)$   
\$21,000 (*lesser amount*)



- 2)  $0.50(TM)$   
 $0.50(\$180,000)$   
 $\$90,000$
  - 3) TL  
 $\$40,000$
3. Pay PP1. Pay \$21,000 not less than 15 days after the start of work at the project site.
4. Calculate PM. Calculate PM as follows:  
$$PM = TM - PP1$$
$$PM = 180,000 - \$21,000$$
$$PM = \$159,000$$
5. Calculate PP2. PP2 will be the lesser of the following amounts:
  - 1)  $0.015(TC)$   
 $0.015(\$1,400,000)$   
 $\$21,000$
  - 2)  $0.50(TM)$   
 $0.50(\$180,000)$   
 $\$90,000$
  - 3) PM  
 $\$159,000$
  - 4)  $TL - PP1$   
 $\$40,000 - \$21,000$   
 $19,000$  (*lesser amount*)
6. Pay PP2. Pay \$19,000 30 days after PP1 is paid.
7. Calculate FP. Calculate FP as follows:  
$$FP = TM - (PP1 + PP2)$$
$$FP = \$180,000 - (\$21,000 + \$19,000)$$
$$FP = \$140,000$$
8. Pay FP. Pay \$140,000 upon completion of all work on the project.



## Section 207

# EXCAVATION AND EMBANKMENT

### 207.1 GENERAL

#### 207.1.1 Description of Work

The construction of a graded roadbed, upon which the base and wearing courses will be placed, is generally referred to as earthwork. Excavation refers to that part of earthwork that is excavated, hauled, and placed to form the embankment. Roadway excavation material is soil, solid rock, loose rock, or any combination of these materials obtained from within the right-of-way. Where there is insufficient suitable roadway excavation, including suitable excess material from channel and structural excavation, to construct the roadbed embankment to the required line and grade (i.e., the “cut” and “fill” do not balance), borrow excavation material will be imported (see Section 211). Roadway excavation/embankment construction, including excavation for channel changes, includes:

1. removing and hauling all material not removed under some other contract item;
2. preparing areas upon which embankments are to be placed;
3. placing and compacting excavated material to construct embankments;
4. disposing of unsuitable and surplus materials;
5. preparing the subgrade;
6. finishing shoulders, slopes, ditches, and drains; and
7. constructing benches and removing slides as required;

The Inspector is responsible for checking the Contractor’s operations to ensure that the work complies with the contract specifications and that the earthwork reasonably conforms to the lines, grades, thickness, and cross section that are shown on the plans or as otherwise directed by the Project Engineer/Supervisor.

#### 207.1.2 Protection and Preservation of Property

During excavation and subsequent embankment construction, the Contractor must continue the property protection and preservation practices that were used during right-of-way preparation. Because the right-of-way already will have been cleared and grubbed, as discussed in Section 201, there will be less restriction to the movement of equipment; however, the Contractor must continue to protect and preserve the overhead and underground utilities, trees, survey control points, etc., that are to remain in place. The adjacent private property also must be continually protected from damage by the Contractor’s equipment.

Pay particular attention to urban projects. Inspect the operations to make sure the Contractor keeps business entrances open and minimizes disruption to utilities and services. On large urban projects, consider discussing this matter weekly with the Contractor. Prior to beginning the excavation and embankment operation, again emphasize to the Contractor the importance of protection and preservation of property. See Section 201.1 for information on other related considerations.



### 207.1.3 On- and Off-Site Drainage

The Contractor is responsible for maintaining adequate drainage within the right-of-way to protect project earthwork, adjacent properties, and natural drainage. See Section 201.1.6 for additional information on drainage. If the Contractor must suspend grading, subgrading, shoulder, base, or pavement work because of unsuitable weather conditions or other reasons, make sure the Contractor provides sufficient temporary drains and side ditches to adequately drain the grade, subgrade, and shoulders. Visually inspect these temporary facilities to see that they are kept open and free of debris during the suspension period. Upon completion of the subgrade and shoulders and before any base or pavement is placed, the Contractor will provide permanent subgrade drains and/or weeps as designated on the plans or as otherwise directed by the Project Engineer/Supervisor.

### 207.1.4 Erosion and Sediment Control

Roadway excavation and embankment construction operations disturb large areas of erodible soil that can accelerate the rate of soil erosion and sedimentation. Use the following guidelines during inspection:

1. Erosion and Sediment Control Plan. Before allowing excavation and embankment operations to begin, check that the Contractor has satisfactorily implemented the temporary erosion and sediment control measures for this phase of work. The Contractor's Erosion and Sediment Control Plan will document a multi-phased plan for erosion and sediment control. See the WVDOH **Erosion and Sediment Control Manual** for additional information.
2. Temporary Control Devices. Visually inspect the Contractor's temporary control measures for this phase of work. This may include devices such as berms, dikes, dams, sediment basins, silt fences, netting, gravel, mulches, wood chips, grasses, slope drains, ditches, channels, riprap, and fiber mats. Check to see that the Contractor takes every practical measure to install and maintain these devices operational until permanent controls are installed and become effective.
3. As-Needed Basis. Where temporary erosion and sediment control features are not included in the plans, the Project Engineer/Supervisor will coordinate with the Contractor as the work progresses to anticipate potential erosion and sedimentation problems and provide timely and adequate controls to prevent or at least minimize impacts on the environment.
4. Early Treatment. Emphasize to the Contractor that the most effective method of controlling erosion and sedimentation is the early treatment of cut and fill slopes. Treat cut slopes as soon as practical as excavation progresses and fill slopes as soon as practical as embankment construction proceeds.
5. Slope Treatment. Slope treatment varies but generally consists of seeding and mulching. Check that all slopes are stabilized as directed. If the Contractor fails to sufficiently protect slopes to prevent pollution, coordinate with the Project Engineer/Supervisor to limit the surface area of erodible material exposed. The Contractor must repair all damaged slopes as soon as practical. Check to make sure the Contractor has the necessary materials and equipment on hand to provide early slope stabilization and correct slope damage. The contractor should operate all equipment and perform all construction operations so as to minimize pollution.
6. Sequence Operations. Frequently inspect construction operations to check that the Contractor logically sequences activities to minimize potential damage to earthwork during heavy rains.
7. Maintenance and Damage. During the operation, continually inspect all installed



devices, both permanent and temporary, to ensure that they are maintained in an operating condition to perform as intended. This may require the Contractor to clean out deposited material and debris, replace component parts, and rebuild as needed.

### **207.1.5 Dust Control**

During the excavation and embankment operation, dust generation can become a significant problem to the general public and adjacent residents, especially in urban areas. The Contractor is responsible for dust control. Check to make sure that the Contractor takes practical measures to control the generation of dust. Any use of dust palliatives will be in accordance with the contract specifications.

### **207.1.6 Hauling Considerations**

#### **207.1.6.1 Haul Roads**

The Contractor normally constructs haul roads to access the work site. Where haul roads are constructed within the planned roadway limits, all construction will comply with the contract specifications for embankment construction. Do not allow the Contractor to use the finished grade of the roadbed as a haul road. Pay particular attention to the drainage of haul roads that extend beyond the limits of the right-of-way. Particularly inspect the drainage of haul roads to any borrow or waste sites. Check the slope-stability of all haul road construction. Give special attention to haul roads that involve the traveling public (e.g., placement of construction and advanced warning signs, flag personnel). At intersections with public roadways, check for adequate lane transitions and sight distances. All haul roads will be site graded and seeded at the Contractor's expense to the satisfaction of the Project Engineer/Supervisor when the haul roads are no longer needed.

#### **207.1.6.2 Protection of Curtain Walls**

Where the Contractor hauls over bridges that do not have approach slabs yet constructed, check that the Contractor brings the pavement notch of the curtain walls up to final grade to minimize the possibility of damage to the curtain walls. Generally, timber is an acceptable material to perform this task.

### **207.1.7 Controlled Blasting Plan**

Contractors typically use controlled blasting techniques (e.g., pre-splitting, pre-shearing) during excavation, especially in rocky areas. Prior to blasting, the Contractor will typically prepare a Controlled Blasting Plan containing the following minimum requirements:

1. method of transporting blasting agent;
2. type of blasting agent and stem material;
3. size, depth, and angle of drill holes;
4. size and loads of blast pattern;
5. ignition source and type of firing device;
6. method of on-site storage;
7. procedures in case of misfire;
8. type of security planned;
9. name of blasting company;
10. permits, certification, and licenses, including issuing agency;
11. method of notifying the public in the immediate vicinity;
12. insurance and liability proofs; and
13. advance warning signing.



It is extremely important that the Project Engineer/Supervisor enforce the provisions of the contract specifications, including permits and allowable hours for blasting. See Section 207.2.2 for information on the hazards of using explosives and Section 207.3.3 for information on blasting techniques.

### **207.1.8 Historic and Archeological Findings**

During the excavation, the Contractor may encounter the remains of prehistoric peoples' dwelling sites or artifacts of historic or archeological significance. In such cases, immediately inform the Contractor to temporarily halt operations in the vicinity of the find and notify the Project Engineer/Supervisor. The Project Engineer/Supervisor will contact the appropriate authorities (e.g., the State Historic Preservation Officer) to determine the desired disposition of the find. The Project Engineer/Supervisor may direct the Contractor to excavate the site to preserve and remove the artifacts for delivery to the custody of the proper State authorities. Such work will follow the procedures for and be paid as extra work (see Division 100).

### **207.1.9 Materials and Equipment**

Check to ensure that the Contractor's embankment materials, test methods, and quality control requirements conform to the applicable provisions of the contract specifications. See Section 201.1.8 for general guidelines regarding the Contractor's use of materials and equipment. See Division 700 for additional information on control of materials and quality control. The following Sections discuss the Contractor's quality control requirements.

#### **207.1.9.1 Quality Control Plan**

The Contractor is responsible for submitting to the Division for approval a Quality Control Plan that details the sampling and testing methods by

which the quality control program will be conducted. The Plan will be prepared in accordance with the guidelines presented in MP 717.04.21. The Division will review the Plan to ensure it conforms to the contract documents. Before work begins, check that the Contractor has a Division-approved Plan and inspect operations frequently to enforce the requirements of the Plan and the provisions of the contract specifications.

#### **207.1.9.2 Quality Control Testing**

Inspect Contractor operations to check that embankment and subgrade material, placement, and compaction conform to the Contractor's Division-approved Quality Control Plan and enforce the contract specifications. Check that the Contractor provides Division-qualified Compaction Inspectors to control the placement and compaction of embankment and subgrade materials. See Division 700 for additional information. The Contractor will notify the Project Engineer/Supervisor before constructing the test strip required by MP 700.00.24. Check that the Contractor records compaction test data on the correct forms and that the Project Engineer/Supervisor receives the completed forms after the test.

## **207.2 HAZARDS**

### **207.2.1 Public Safety**

Public and private roadways and intersections may be affected by the Contractor's construction activities. The Contractor is responsible for maintaining these facilities in a safe and passable condition. See Section 201.2.1 for additional information.

### **207.2.2 Use of Explosives**

Contractors frequently use explosives to excavate rocky areas. The transport, storage, handling, and detonation of explosives pose



extreme and hazardous conditions and should be conducted under the careful, competent supervision of licensed personnel to prevent injury to persons and damage to adjacent properties. Enforce the contract specifications. Inform the Contractor of any apparent or obvious safety violations or acts that do not comply with the specifications. See Section 207.1.7 for information on controlled blasting plans and 207.3.3 for information on controlled blasting techniques. Consider the following additional guidelines:

1. Electromagnetic Fields. Radio frequency (RF) transmitters, cellular phones, television, and radar create powerful electromagnetic fields. If in a strong RF field (e.g., near a transmitter), the unshielded leg wires will act similar to an antenna. The RF field may induce sufficient current to detonate the explosives. Commercial AM transmitters potentially are the most dangerous. FM and TV transmitters are unlikely to be a hazard. The Contractor should inspect the area for RF transmitters.
2. CB Radios. Mobile CB radio transmitters are potentially hazardous because:
  - a. they can move directly through the area;
  - b. the frequency range is considered the worst for typical blasting circuits; and
  - c. illegal linear amplifiers can increase power output.

Check that “Blasting Ahead – Turn Off 2-Way Radios and Cellular Phones” signs are posted a minimum of 1000 ft (300 m) in advance of the area. Emphasize caution when inspection personnel use two-way radios to enhance communications.

3. Static Electricity. Thunderstorms create static electricity and produce lightning. When a thunderstorm is approaching, the Contractor should halt operations and take adequate precautionary measures (e.g.,

short-circuiting lead wires). Note that short-circuiting lead wires is a safeguard and may not prevent detonation if struck directly by lightning. During such periods, all personnel should move to a safe distance.

4. Advance Warning (“Fire-in-the-Hole”). Before blasting, the Contractor should inform local law enforcement agencies and adjacent businesses and residential neighbors. The Contractor should adequately secure and cordon off the area.
5. Overshooting. Accidents may occur if poor blasting techniques are used (e.g., overshooting). Overshooting will not be tolerated. If more explosives are used than needed, flying rocks and boulders, shattered windows, etc. may result. The Contractor should take every practical precautionary measure to protect people and property near the site. Consider the following:
  - a. Railroad Tracks. If overshooting is witnessed and railroad tracks are near the site, the Contractor should visually inspect the tracks for any rail movement. If rail movement is suspected, immediately notify the Project Engineer/Supervisor. It may be necessary to halt operations and contact the Chief Engineer of the railroad for further direction.
  - b. Falling Rocks. After blasting, pay particular attention to areas near the bottom of rock faces. If overshoot, the face may have been fractured sufficiently to loosen a significant number of large boulders.
  - c. Cover Material. Where horizontal bedrock is being blasted, especially in urban areas, the Contractor should employ suitable cover material to minimize flying rock and reduce the peak noise level. Earth and commercial blanket materials are commonly used for this purpose.



6. Misfire. Because pre-splitting techniques typically employ uniform drill hole patterns, it is relatively easy to visually inspect a rock face for a hole loaded with explosives that did not detonate. If visually evident, inform the Contractor and make sure that personnel follow the misfire procedures documented in the Contractor's Controlled Blasting Plan.

### **207.2.3 Slide and Trench Areas**

Where slides or slipouts occur or are suspected, all construction personnel should use extreme caution when traversing in and around the area. Under some conditions (e.g., oversaturation), failures in potential slide areas can occur swiftly and without warning. See Section 207.3.5 for additional information on slides. To prevent or at least minimize the potential for slides and slipouts, check that the Contractor takes precautions by benching (see Section 207.3.4) or other methods as designated in the plans or as directed by the Project Engineer/Supervisor. Where trenches are constructed for drainage purposes, visually inspect the operation to make sure the Contractor shores the trenches in accordance with OSHA requirements and the contract specifications.

## **207.3 ROADWAY EXCAVATION**

### **207.3.1 General**

Excavation involves the loosening, digging, loading, hauling, and disposal of materials obtained from roadway cuts, channel changes, ditches, fill bench excavation, grading transitions, undercuts, and borrow pits. The Contractor will dispose of the material by either incorporation in embankments, flattening side slopes, or wasting. Roadway excavation includes constructing, shaping, and finishing all earthwork within the construction limits for the entire length of the roadway, including approaches, to conform with the required lines, grades, typical sections, and the contract specifications. Unclassified excavation includes

all materials encountered within the construction limits regardless of nature or manner of removal.

### **207.3.2 Pre-Wetting**

Near optimum moisture in embankment areas must be present at the time of compaction. To achieve this goal, Contractors commonly sprinkle the embankment area with additional water. Pay particular attention to the weather conditions before and during compaction (e.g., spring brings significant rain, summer brings sunny and dry conditions). Extreme conditions may make it difficult to control moisture content. There are advantages, however, to adding the needed water at the excavation area or borrow source. The practicality of sprinkling, flooding, or irrigating such areas will depend on the soil type and the availability of water. This method will usually achieve a more uniform distribution of moisture in the soil and will minimize additional machine manipulation of the soil on the roadbed. Contact the Project Engineer/Supervisor for guidance if there is uncertainty as to the method the Contractor should be using under extreme weather conditions.

### **207.3.3 Controlled Blasting**

Controlled blasting techniques can materially lower the Contractor's cost while producing specified rock material under relatively safe conditions. Consider the following guidelines during blasting operations:

1. Controlled Blasting Plan. Before blasting, ensure that the operation is in conformance with the contract specifications. Although the Division is not responsible for the Contractor's methods and procedures, the Project Engineer/Supervisor and Inspectors should become familiar with the proposed blasting method (e.g., pre-split or production), the drilling plan, and the properties, uses, and precautions of the explosives, detonators, and initiation type.



2. Safety Issues. Blasting operations always should be conducted under the supervision of licensed and competent personnel to prevent injury to persons and damage to adjacent property. See Section 207.2.2 for additional information on the use of explosives.
3. Pre-Splitting Technique. Except for fill bench construction and where slopes flatter than 1:1 are specified, check that the Contractor uses the pre-splitting technique. Pre-splitting is used to prevent over-breakage and produce a reasonably smooth slope face. The Contractor will drill and load a single row of holes along the neat excavation line and fire the pre-split charges before the adjacent primary charges. The collision of shock waves between the pre-split holes will fracture the rock and produces a narrow shear plane. The shear plane will reflect most of the energy generated by the subsequent primary blast preventing it from being transmitted to the finished rock face, thus minimizing over-breakage. Depending on the rock type, the holes will be spaced on center from 2 ft (600 mm) to 5 ft (1.5 m) as determined by field demonstration. Check the drilling operation to make sure the holes are along the slope line. The Contractor should string load explosives as recommended by the manufacturer. The Contractor typically will fire pre-split holes during the primary blast; however, the primary charges will be delayed sufficiently to allow the production of the shear plane in the rock.
4. Overshooting. The Division will not tolerate overshooting because it is hazardous and can produce rock fractures beyond the intended line and grade, jagged slopes, uneven ditch grades, and potential slide areas. Pay particular attention to the site bench slope behind the ditch line. Overshooting in this area will create jagged slopes. Also, carefully monitor pipe trench areas. Overshooting trenches may cause future drainage problems due to pipe settlement.
5. Undershooting. Undershooting the primary blast can fail to sufficiently shatter the rock. Oversize rock material is unsuitable, cannot be economically hauled, and will require additional drilling and blasting or breaking with hoe ram or drop ball. The Contractor is responsible for the expense of such corrective actions.
6. Records. Record the blasting location and time in the IDR. The Contractor should maintain complete records in the Inspector's Daily Report (e.g., location and time; pre-split or production operation; location, depth, size, direction, and pattern of holes; type of explosive and detonator; loading rates; type of initiation; comments on the results of the blast). Particularly note observations of rock being thrown outside the slopes, evidence of over-breakage, damages, etc. These records are very useful when resolving disputes about over-breakage and alleged changed conditions or damages. In urban areas, the Contractor should inspect the surrounding properties prior to blasting to assist in verifying any claimed damages. Consider the benefits of using still or video cameras.

#### **207.3.4 Benches and Transition Points**

Benches will be used, either above or below the profile grade, as designated on the plans or as directed by the Project Engineer/Supervisor to minimize embankment slides. Inspect bench locations, types, and dimensions for compliance with the contract plans. Transition points are the points of change from cuts to fills. Inadequate embankment foundation preparation at transition points of sizable excavation and embankment sections may produce roughness in the base and surface courses due to settlement. Transition benches are used to minimize this settlement



problem by providing a gradual change in embankment foundation support from a cut section in rock or hard shale to a deep fill section. The use of transition benches also ensures that the embankment material at transition points is constructed of adequately compacted material. Transition benches may be cut just before completing the embankment fill or after completing the embankment fill. If cut after the embankment fill is completed, establish the locations of the transition benches by plotting and staking the excavation limits. The use of transition benches will key the embankment into the natural ground, thus reducing subsurface movement. Check the profile sheets for required locations of transition benches and make sure the benches are constructed as shown on the miscellaneous detail sheets. The work will be paid for as additional unclassified excavation. The Project Engineer/Supervisor must ensure that cross sections are taken and recorded in the survey files and noted in the Daily Reports before the Contractor begins placing embankment material.

### **207.3.5 Slides and Slipouts**

Watch for potential slide and slipout areas. If a slide or slipout is observed, immediately contact the Project Engineer/Supervisor. Use the following procedures to expedite slide correction approval:

1. If a slide condition is observed, the Project Engineer/Supervisor should immediately notify the District Construction Engineer. The District Construction Engineer will inspect the problem as soon as practical.
2. The Project Engineer/Supervisor will review the plans to ascertain that the slide limits are within the original ground cross-sections.
3. The District will notify the Contract Administration Division by telephone and confirm the notification by letter.
4. If the slide is minor, the Regional Engineer will notify the Federal Highway Administration (on Federal-Aid projects) and advise the District of an appropriate action. Normally, the District will assume responsibility for correcting the problem. If slide removal is the obvious solution and no additional right-of-way is required, the Regional Engineer may instruct the District to proceed. Before slide correction begins, the Regional Engineer will notify the Federal Highway Administration.
5. If the slide is major, the Regional Engineer usually will visit the site to appraise the problem. The Engineering Division will request the Materials Control, Soils and Testing Division to investigate the slide, take any needed borings, and furnish recommendations for slide correction.
6. The Contract Administration Division will review the recommendations of the Materials Control, Soils and Testing Division. The Contract Administration Division will forward the recommendations to the Engineering Division. The Engineering Division will:
  - a. revise the plans to show the recommended slide correction and any needed additional right-of-way;
  - b. obtain Federal Highway Administration approval, if required, on the recommended correction method and any needed additional right-of-way;
  - c. furnish the Contract Administration Division with a revised set of plans; and
  - d. if additional right-of-way is involved, furnish the Right-of-Way Division with a revised set of plans.
7. The Contract Administration Division will forward a set of revised plans to the District with instructions on how to proceed and a



request that the District submit a Change Order, if required.

8. The District will forward to the Contractor a copy of the revised plans, including cross-sections, and request that the Contractor submit a price to perform the work.
9. Upon receipt of the Contractor's cost analysis, the District will submit a Change Order to the Contract Administration Division for processing and approval. On Federal-Aid projects, the Contract Administration Division will submit the Change Order to the Federal Highway Administration for approval. See Division 100 for information on Change Orders.

Check that the Contractor excavates the problem materials to the designated lines and slopes in the revised plans including any material that has come into the roadway or ditch or that has slipped out of embankments. Such materials will be excavated by benching or as otherwise designated in the revised plans or as directed by the Project Engineer/Supervisor. Check Contractor operations to make sure the material is disposed of as directed (e.g., in embankment construction, to flatten slopes, wasted). Note that erosion, to any extent, will not be considered a slide or a slipout.

#### **207.3.6 Conduit**

As directed, check that the Contractor removes and stores without damage any conduit to be salvaged. Make sure that the Contractor places the salvaged conduit as designated on the plans. Record in the Daily Reports any damage to salvable conduit. The Contractor is responsible for such damages.

### **207.4 DISPOSAL OF MATERIALS**

#### **207.4.1 Suitable Material**

Check Contractor operations to make certain that suitable excavation is used, as practical, in embankment construction and that such materials comply with the governing contract specifications. Suitable excavation typically is used for roadway, ramp, and approach embankments, subgrade and shoulder construction, and for fill around structures and buildings. Random materials (i.e., soil, granular material, soft slate), where encountered, typically are considered suitable for embankment construction; however, the Division prefers the use of granular soils with greater dry weights, greater percentages of coarse and fine aggregate, and lower liquid limits.

#### **207.4.2 Salvaging Topsoil**

The material excavated from the deeper soil layers usually is not conducive to good plant growth. The upper soil layer of roadway cut areas, embankment foundation areas, and borrow areas can be stripped before excavation work begins. This topsoil can be stockpiled and used later to cover completed cut slopes, embankment slopes, and other disturbed areas where re-vegetation is desirable. As designated on the plans, check that the Contractor strips and stockpiles salvable topsoil. Give more than a casual inspection to the stripping operation. Although it is usually not necessary to measure the quantity for payment, the quantity stockpiled and the manner in which it is excavated is important. Excavating too deep will result in a greater quantity, but the quality of the topsoil will be reduced. Shallow stripping will waste topsoil and the estimated yield will not be obtained. Check to ensure topsoil is stockpiled in an area that will minimize the haul involved but not interfere with or delay other construction operations. Maintain records of the quantity stockpiled (e.g., truck load counts) to ensure that sufficient topsoil will be available for the intended use. Do not direct the Contractor to



stockpile topsoil unless designated in the plans or directed by the Project Engineer/Supervisor.

#### **207.4.3 Unsuitable Material**

During excavation, unsuitable materials will be encountered due to their natural composition or moisture content. It is essential to use this material wherever practical. The Division will pay for replacing unsuitable material unless it has a high moisture content and can be reused by drying. Many soils, considered unsuitable only because of excessive moisture content, will respond favorably to drainage improvements and mechanical manipulation. If treated to meet the specified acceptance criteria, the Contractor may, at its own expense, dry excessively moist excavation material (e.g., aeration). However, if the Contractor wastes rather than dries the material, the Contractor will furnish borrow material (see Section 211), at its own expense. Do not allow the Contractor to use unsuitable materials (e.g., sod, trash, organic material, muck) because they cannot be satisfactorily placed and compacted to a stable and durable condition. Such materials can cause instability in embankments and should be wasted. Record in the Daily Report the disposition and amount of all unsuitable materials.

#### **207.4.4 Waste and Waste Sites**

Except for sites specifically designated on the plans, the Contractor is responsible for locating and furnishing all sites off the right-of-way for the disposal of waste materials. Do not allow the Contractor to waste material at other than approved sites. Use the following guidelines:

1. Large Quantities. For quantities of waste exceeding 300 yd<sup>3</sup> (230 m<sup>3</sup>) to be disposed of outside the right-of-way, unless otherwise exempt, the Contractor must prepare a Waste Plan showing the limits and details of the waste site. The Contractor will submit the Plan to the Project Engineer/Supervisor for review and approval. Before waste

operations begin, check that the Project Engineer/Supervisor is in receipt and has approved the Contractor's Plan and that the Contractor operates within that plan.

2. Small Quantities. For quantities of waste not exceeding 300 yd<sup>3</sup> (230 m<sup>3</sup>) to be disposed of outside the right-of-way, the Contractor is exempt from the requirements of preparing a Waste Plan. Engineer/Supervisor. Inform the Contractor if it is observed that the waste operation does not comply with the criteria presented in Section 201.5. The Contractor is responsible for meeting all applicable provisions of Federal, State, and local laws.
3. Construction/Demolition Waste. For any quantity of construction/demolition waste to be disposed of, the Contractor will waste such material in accordance with Section 201.5.4 except that Portland cement concrete (PCC) and hot-mix asphalt (HMA) may be disposed of under the following conditions:
  - a. the PCC and HMA material will meet the material and placement requirements for embankment lifts as designated for rock in the specifications (See Section 207.5.4.3 for additional information);
  - b. all PCC and HMA will be covered with a minimum of 2 ft (600 mm) of soil;
  - c. the waste plan originally approved by the Project Engineer/Supervisor, or subsequently approved supplement, will show specific disposition and location of PCC and HMA materials to be wasted;
  - d. the disposal area for HMA will be limited to a maximum area of 2 acres (0.8 ha) and may be located within a waste site covering more than 2 acres (0.8 ha);
  - e. PCC and other masonry type material will not count against the 2 acre (0.8 ha) maximum area if all reinforcing steel



- and/or wire mesh is removed cut off flush at the outer edges;
- f. the PCC and HMA disposal will be completed and covered with 180 days; and
  - g. the PCC and HMA disposal site will not be located within 300 ft (91 m) of a wetland, perennial stream, or within the 100-year floodplain.
  - h. disposal of trees and other degradable material should not be located in waste areas where it could promote sliding or affect stability.
4. Disposal Above Road Grade. Do not allow the Contractor to waste material above the established grade unless written authorization is received.
  5. Erosion and Sediment Control. Inspect waste operations to ensure the Contractor wastes materials to minimize pollution and sedimentation to rivers, streams, lakes, ponds, and other bodies of water. See Section 201.1.7 for additional information.
  6. Cleanup and Restoration. Check that the Contractor neatly trims and drains all waste sites and disposes of debris and spoil in accordance with the Waste Plan. Check that the Contractor grades, fertilizes, seeds, and mulches all waste sites.
1. Shrink/Swell Factors. The amount of surplus material will depend primarily on the accuracy of the shrink/swell factors. Shrink/swell factors are based either on field tests or on previous experience. The Contractor should perform field checks to substantiate the accuracy of the shrink/swell factors that are noted on the plans. Emphasize the earthwork balance points and, as the work progresses, perform frequent checks to ascertain the accuracy of the shrink/swell factors. Embankments should be completed before any surplus material is wasted. However, if the Contractor cannot meet this objective, continue to check the validity of the shrink/swell factors as the work progresses to ensure that the remaining excavation is sufficient to complete the embankments.
  2. Applications. Before the Contractor wastes surplus material, check with the Project Engineer/Supervisor to determine where the Contractor can use the surplus material to uniformly flatten embankment slopes or widen shoulders. Under no circumstance allow the Contractor to engage in operations that would steepen embankment slopes.
  3. Waste and Waste Sites. Inform the Contractor that any wasting of surplus material that is needed to complete embankment construction will be wasted and subsequently replaced at the Contractor's expense. Except for disposal sites designated on the plans, the Contractor will locate and furnish all sites for wasting surplus material according to the criteria presented in Section 207.4.4.
  4. Cross-Sectioning. Ensure that the Contractor submits complete original cross-sections of disposal sites before wasting the surplus material. This is very important for the purpose of determining payment. The base line from which cross-sections are taken must be permanently referenced so that the base line can be later re-established when

#### **207.4.5 Surplus Material**

During project plan development, it is desirable to balance material excavation with embankment material needs. However, it may be determined during either planning or construction that the required excavation will yield more suitable material (i.e. surplus material) than that actually needed for embankments. Consider the following guidelines:



taking final cross-sections at the conclusion of the waste operation.

## **207.5 EARTH EMBANKMENT**

### **207.5.1 General**

Emphasize uniform embankment construction. Practical methods that ensure uniform materials, layer thickness, moisture content, and compactive effort must be used. Check all embankments for reasonable conformance to the plan lines and grades and the Contractor's Quality Control Plan. Where measurements are taken for inspection purposes, the roadbed width must conform to the plan width. For other measurements in the horizontal plane, a construction tolerance of  $\pm 1$  ft (300 mm) is permitted. Slope rates may vary only by approval of the Project Engineer/Supervisor. Visually inspect embankments to see that they present a neat and uniform surface free of hollows and protrusions and that the tops of all slopes are rounded as shown in the plans.

### **207.5.2 Embankment Foundation Preparation**

Frequently, the plan cross-sections specify the placement of embankment foundation material. This blanket of material is very important to the structural integrity of the embankment. Document the type of material and the final elevation of the embankment foundation in the Inspector's Daily Report. Before beginning the construction of an embankment, carefully inspect the area to serve as the foundation. Use the following guidelines to inspect the foundation preparation:

1. Excessive Moisture. Give special attention to any location of questionable supporting capacity and notify the Project Engineer/Supervisor for an appropriate action. The presence of soft or excessively moist material may require:
  - a. removal of unsuitable materials;
  - b. installation of underdrains to remove spring or seepage water; or
  - c. aeration and drying of materials saturated due to poor surface drainage.
2. Fills  $\leq 5$  ft (1.5 m). Where embankments are 5 ft (1.5 m) or less in depth, check that the Contractor strips the topsoil and sod to the specified depth and that the top 8 in (200 mm) of the embankment foundation is scarified and compacted to the density requirements of Quality Control Plan. If the specified foundation density cannot be obtained (e.g., excessive moisture, organic material), the Project Engineer/Supervisor will direct the Contractor to remove and waste the material to a specified depth and/or place an initial layer of rock, hard shale, or granular material before embankment construction.
3. Embankments  $\leq 3$  ft (1 m) on PCC. Where embankments of 3 ft (1 m) or less in depth are placed on old concrete pavement or a pavement with concrete base, check that the Contractor removes and disposes of the concrete according to the criteria presented in Section 207.4.4 or as otherwise directed by the Project Engineer/Supervisor.
4. Embankments  $> 3$  ft (1 m) on PCC. Where embankments greater than 3 ft (1 m) in depth are placed on old concrete pavements, check that the Contractor breaks the concrete pavement up into pieces that do not exceed 1 ft<sup>2</sup> (90 000 mm<sup>2</sup>). This material may remain under the new embankment, unless otherwise directed by the Project Engineer/Supervisor.
5. Embankments on Non-Rigid Pavements. Where an embankment is placed on other than a rigid type of pavement, check that the Contractor scarifies the pavement to its full depth and re-compacts the material to meet



the density requirements of the contract specifications.

6. Slopes. For existing slopes, other than rock slopes, where embankment material will be placed, check that the Contractor plows and/or deeply scarifies the existing slope so as to blend the in-place material with the new embankment material. If designated on the plans or as directed by the Project Engineer/Supervisor, check that the Contractor benches the slopes according to the specified dimensions. Give particular attention to embankment areas on steep slopes. It is critical to obtain good interlock between the sloping foundation and the new embankment material. The contract plans will specify any special treatments. Hard surface areas usually are benched prior to placing embankment material. This method of keying is also employed when widening or raising the grade of old embankments.
7. Salvable Topsoil. Prior to excavation and embankment work, if designated on the plans or as directed by the Project Engineer/Supervisor, make sure the Contractor salvages and stockpiles the existing topsoil. See Section 207.4.2 for additional information.
8. Swamp and Marsh Areas. Carefully inspect that the Contractor's operations conform to the contract plans and specifications where embankment foundations are prepared in swamp, marsh, and old lakebed areas. Special designs and construction methods are usually specified in the contract plans for such areas.

### **207.5.3 Uniformity of Material**

To achieve proper embankment consolidation, it is essential that the Contractor breaks down clods and blends the embankment material. Most soils will allow the Contractor to use disc plows, blade graders, and similar equipment to achieve the desired results. Where different types of

material are blended in the same embankment layer, pay particular attention the Contractor's equipment and method of blending. A uniform material must be achieved. The result should be a blend of material that can be adequately and uniformly compacted with a uniform application of moisture. Where practical, use poorer suitable materials in the lower lifts of the embankment.

### **207.5.4 Hauling and Placement**

#### **207.5.4.1 General**

Consider the following guidelines when inspecting embankment hauling and placement operations:

1. Construction Stakes. Prior to beginning the construction of an embankment, ensure that the location of the construction is clearly marked by construction stakes. Spot check any staking performed by the Contractor. Have the Contractor immediately reset any stakes that are disturbed or destroyed. This method of checks will minimize the need to correct deficiencies in embankment slopes or widths after construction of the embankment has advanced to a point where corrective measures are difficult and costly.
2. Foundation Check. Check the foundation area to see that washes, holes, and other low areas in the embankment foundation are filled and compacted prior to beginning the construction of the first lift of embankment.
3. Frozen and Unsuitable Material. Do not allow the Contractor to place any embankment material on frozen ground. Embankment material will be free of stumps and spongy or frozen soil. Do not permit the amount of organic material to exceed that amount specified in the contract specifications. Such soil will be disposed of as described in Section 207.4.4. Unconsolidated soil and random material will be removed, replaced, and compacted before



the Contractor places and compacts embankment material.

4. Drainage. Ensure that the Contractor maintains the roadway in a well-drained condition at all times during the placement of embankment. Make frequent checks to see that all drainage facilities are open. Also check that the embankment site is in a condition to provide runoff.
5. Erosion and Sediment Control. Inspect hauling and placement operations to make sure the Contractor minimizes pollution and sedimentation to rivers, streams, lakes, ponds, and other bodies of water. Check that the Contractor's temporary erosion and sediment control devices are in place and functioning in accordance with the Contractor's approved Erosion and Sediment Control Plan. See Section 201.1.7 for additional information.
6. Equipment Considerations. The selection of the equipment used to haul the embankment materials is usually the Contractor's option; however, do not permit the Contractor to operate the equipment in such manner that it will be harmful to any section of the completed roadway. Construction hauling over embankment areas should not be confined to the same path but should be spread out over the entire width of the embankment to avoid ruts and non-uniform compaction.
7. Lift Placement. Check that the Contractor starts depositing and compacting embankment lifts as follows:
  - a. at the lowest point of the fill below grade;
  - b. at the bottom of ravines; and
  - c. at the foot of slopes on side hills.

Check operations to ensure that lifts are placed approximately parallel with the

finished grade. Before each lift, check that the lift is leveled and smoothed by means of graders, dozers, or other suitable equipment (e.g., weight, capacity, power). Unless otherwise authorized, check that lifts are extended across the entire fill at the level of deposition and that each lift will be compacted before the next lift is placed. See Section 207.5.4.2 for additional information on lift thickness.

8. Structures and Predrilling. Unless specified otherwise, check to make certain that embankments near bridge abutments are free of rock in the areas where piles will be driven. Where rock is required for the entire embankment at bridge abutments, the Contractor will predrill the piles. Predrilling also may be required for other embankments based on the depth, density, and negative skin friction of the material. Check the plans for any special predrilling requirements and monitor the Contractor's operations accordingly. Where embankment is formed around structures, carefully monitor the operation so make certain the material is placed on both sides of the structure in approximately level layers. See Section 212 for additional information.
9. Rock Material. Where rock is obtained from excavation or borrow, check the plan and sequence of operation to ensure that the Contractor will make use of all the rock obtained as follows:
  - a. General Applications. Rock obtained from the excavation may be placed to:
    - 1) form the base for embankments;
    - 2) form select embankment layers;
    - 3) form drainage systems; the outer edges of embankments under construction; or
    - 4) to widen previously constructed embankments.



- b. Size Distribution. In all rock slopes, check that the Contractor places the large rocks at the outer face and the smaller rocks and spalls near the center.
- c. Dumping. Do not permit the Contractor to dump the rock without proper distribution. Remind the Contractor that the rock will be distributed and placed the full width of the lift being formed by blading or dozing in a manner to assure proper placement in the final position in the embankment.
- d. Voids. Check that the larger rock is well distributed to minimize voids, pockets, bridging, and deformation but still permit drainage where required. Material that is too wet to be properly compacted will not be used to fill the voids of previously placed rock. To the extent that it is available and needed, inform the Contractor to reserve sufficient suitable material from the unclassified excavation for use in filling voids in the top of the rock fill.
- e. Insufficient Material. Where there is insufficient material, other than rock, encountered in the excavation to permit the other material to be properly compacted in lifts, the other material will be reserved to be used as directed by the Project Engineer/Supervisor.
- f. Random Material. It is permissible to allow the Contractor to blend random material, meeting the specified moisture requirements, with rock in embankment lifts as permitted in the contract specifications.
- g. Top Slope. Where rock is placed on an embankment of other material, check that it is placed on top of the other material from the center to the sides at a rate of approximately 4%.

#### 207.5.4.2 Lift Thickness

More uniform compaction is obtained when embankment layers are placed in a uniform thickness. Use the following guidelines to check lift thickness:

1. Random Material. Where random material consisting of soil, granular material and soft shale is used for embankment, check that the Contractor places the material in successive lifts not to exceed 6 in (150 mm) in thickness after compaction.
2. Hard Shale. Where suitable random material is to be mixed with hard shale, check that the Contractor places the material as follows (Note that all material percentages may be determined by visual inspection):
  - a. Random Material > 65%. Mixtures with greater than 65% of suitable random material will be placed in lifts not to exceed 6 in (150 mm) in thickness after compaction.
  - b. Random Material 35% to 65%. Mixtures with 35% to 65% of suitable random material will be placed in lifts not to exceed 12 in (300 mm) before compaction.
  - c. Random Material < 35%. Mixtures with less than 35% of suitable random material will be placed in lifts not to exceed 24 in (600 mm). The lift thickness will be as thin as the excavated material will permit.
3. Rock Mixtures. See Section 207.6 for information on placing and compacting lifts of rock mixtures.
4. Swampy Areas. Where embankments are constructed across low swampy ground that will not support hauling equipment, allow the Contractor to construct the lower part of the fill by dumping successive vehicle loads of rock, hard shale, or granular material in a



uniformly distributed layer. Do not permit the thickness of the layer to exceed that necessary to support the equipment placing the subsequent layers.

5. Inaccessible Locations. In locations inaccessible to a roller, such as adjacent to culverts, retaining walls and other structures, check that the Contractor places fill material in 6 in (150 mm) maximum compacted layers with approved tampers.
6. Checking and Documentation Procedures. An excellent method of checking lift thickness is by using stakes approximately 7 ft (2 m) long, a cloth tape, and a hand level. Elevations can be quickly taken before and after each lift is placed by using the following procedures:
  - a. At several random locations along the edge of shoulder, drive stakes into the ground.
  - b. Measure and make a mark on each stake approximately 5 ft (1.5 m) above the ground.
  - c. Measure points 15 ft (4.5 m), 30 ft (9 m), and 45 ft (14 m) across the embankment from each stake.
  - d. Using a hand level and rule, at each point across the embankment from each stake, measure and record the vertical distance from the top of the embankment to a point that is level with the 5 ft (1.5 m) mark on the stake.
  - e. Repeat Steps c. and d. after each lift is compacted and determine the lift thickness by subtracting corresponding readings.

The Contractor is responsible for controlling lift thickness and for documenting the lift thickness and type of material used. The Inspector is responsible for confirming the work by checking. The frequency and number of lift

thickness measurements will be indicated in the Contractor's approved Quality Control Plan. Visual inspection is necessary but not as reliable as the use of a hand level, cloth tape, and stakes.

#### **207.5.4.3 Moisture Content**

The success of compaction operations depends mainly on proper moisture control. If the proper amount of moisture is uniform throughout the embankment layer, it will rarely be difficult for the Contractor to obtain the compactive effort necessary to achieve the density required by the contract specifications. Prior to compaction, the moisture content of the soil for earth embankment should not vary from +3% to -4% of optimum moisture. Check that the embankment material is thoroughly mixed and blended with the proper amount of water. To ensure a uniform moist condition where it is necessary to mix and blend moisture into the embankment material, make sure the Contractor breaks down large clods and lumps by machine manipulation (e.g., plowing and turning). Water may be applied with a suitable sprinkling device. When adding water to a layer of embankment material, closely observe how the Contractor performs this task. Care must be taken to avoid overlapping or gapping between successive passes of the sprinkling device. Wet or dry streaks are unacceptable and should be avoided. If this condition is observed, instruct the equipment operator to begin applying water on one side of the embankment and work progressively across the embankment to the other side thus avoiding wet and dry streaks in the center of the embankment. Emphasize the importance of making several light applications of water rather than one heavy application.

#### **207.5.5 Compaction**

##### **207.5.5.1 Stability of Embankment**

Embankment material must be compacted to the density specified in the contract specifications. This will provide adequate stability under traffic



loads. Normally, non-plastic and moderately plastic soils will be compacted to the highest practical density and near the optimum moisture content. If it is not practical to confine expansive soils to the lower lifts of large embankments, control of over-compaction and under-compaction may be justified. With these soils, high densities obtained at low moisture contents are not desirable because swelling, loss of stability, and roughening of the finished pavement may occur after construction

### **207.5.5.2 Control of Compaction**

The Contractor is responsible for controlling the compaction (i.e., the density) of embankment and subgrade materials. The Contractor must prepare the Quality Control Plan in accordance with MP 717.04.21 and submit the Plan for Division approval to the Construction Engineer at the Pre-Construction Conference. Before the Contractor begins any embankment or subgrade work, check to make sure the requirements of the Quality Control Plan have been satisfied. During compaction operations, check that the Contractor is operating within the Quality Control Plan. See Division 700 for additional information on the control of materials. Perform in-place density tests for checking compaction using the specified equipment and in accordance with the specified test procedures. See Sections 704 and 707, respectively, for information on aggregates and density tests (in-place) for embankment and backfill. The Division will accept the compaction of embankment and subgrade materials based on the criteria presented in MP 700.00.50 and the governing contract specifications.

### **207.5.5.3 Compaction Equipment**

Check to make sure the Contractor has sufficient leveling and compaction equipment to perform the work without delay after the material has been deposited. Pay particular attention to any loss of moisture during the delay. If the leveling and compaction operation cannot keep up with

the rate of material being deposited, have the Contractor adjust the placement operation with that of the leveling and compaction operation. Do not allow the Contractor to place multiple fills if the number of rollers on hand cannot keep pace with placement of the fills. Balance the operation accordingly. Check that the Contractor uses vibratory compactors (e.g., grid, paddle-foot, vibratory rollers) for fills that are predominantly rock or hard shale. For areas inaccessible to rollers, pneumatic or power driven backfill tampers will be used. Check to make sure that all equipment conforms to the Contractor's Quality Control Plan and the governing contract specifications.

## **207.6 ROCK EMBANKMENT**

### **207.6.1 Placement**

The construction methods for placing embankment material consisting principally of rock will depend on the size of the rocks and the amount of rock present. Rock embankments will be placed in level layers of uniform thickness over the full width of the roadway. In general, do not allow rock material to be dumped and roll into place. Oversized rock material that is not suitable for placement can be broken down to proper dimensions or moved for placement in larger rock embankments as required by the contract plans. See Item 9 of Section 207.5.4.1 for additional information on the handling and placement of rock materials. Where rock mixtures as defined in the contract specifications are used for embankment, check that the Contractor places the material as follows (Note that all material percentages may be determined by visual inspection):

1. Random Material > 65%. Rock mixtures that contain 66% or more of suitable random material will be placed in lifts not to exceed 6 in (150 mm) after compaction.
2. Random Material 35% to 65%. Rock mixtures that contain 35% to 65% of suitable



random material will be placed in lifts not to exceed 12 in (300 mm) before compaction.

3. Random Material < 35%. Rock mixtures that contain less than 35% of suitable random material will be placed in lifts not to exceed 36 in (900 mm) except for the 2 ft (600 mm) underlying the subgrade will be placed in lifts not exceeding 24 in (600 mm). The lift thickness will be as thin as the excavated material will permit, except that the rock for the upper 2 ft (600 mm) of the embankment will not be greater in dimension than 18 in (450 mm).
4. Rock Lifts for Select Embankment. See Section 207.7 for information on placing and compacting rock mixtures for select embankment.
5. Drainage Channels. Where rock is specified for use in lining drainage channels, check that it is placed to the thickness called for on the plans or cross sections. The dimensions of the rock may be as large as the thickness of the blanket will permit.

#### **207.6.2 Compaction**

Compaction of rock embankments will be in accordance with the Contractor's approved Quality Control Plan and the applicable provisions of the contract specifications. See Division 700 for additional information on the control of materials and compaction. If the embankment material has 40% or more particles retained on the  $\frac{3}{4}$  in. (19 mm) sieve and either a non-uniform gradation or particles larger than a nominal 10 in (250 mm) top size, check to make sure the Contractor proof rolls the embankment with a pneumatic tire roller having an effective weight of 50 tons (45.5 Mg) in accordance with MP 717.04.21.

#### **207.7 SELECT MATERIAL EMBANKMENT**

The Project Engineer/Supervisor has discretionary authority and responsibility over the construction of select material embankments. Closely monitor the construction operations and use the following guidelines during inspection:

1. Material Integrity. Visually inspect that the select embankment material contains not more than 15% of other suitable material. The dominant rock size should be 6 in (150 mm); however, the rock should not be greater than 36 in (900 mm). During excavation and handling, check that the select material does not get contaminated.
2. Lift Thickness. Rock for select embankment will be placed in approximately level lift of uniform thickness. The lift thickness will not exceed 36 in (900 mm).
3. Wasting. Rock for select embankment will be reserved from the excavation up to the plan quantity required. If select embankment from the excavation is wasted prior to meeting the plan quantities, the Contractor is responsible for the expense of replacing the material wasted up to the plan quantity.
4. Records. Document the quality of material used in the Daily Report. Specifically document the area and thickness of material placed by taking cross-sections. Generally, three lift thickness measurements per lift will suffice. Also, take elevations on top of the select material embankment. These notes are necessary to settle any disputes.

#### **207.8 FINISHING EARTHWORK**

##### **207.8.1 Earth Roads**

Where the plans do not specify a pavement or surfacing, the roadway, shoulders, and superelevated curves will be constructed simultaneously to the required cross-section and



grade. Check that the Contractor uses an approved power grader and that the earth road is maintained in a condition suitable for traffic until final acceptance.

### **207.8.2 Subgrade**

Use the following guidelines when inspecting the placement of subgrade:

1. Earthwork. Before beginning subgrade work, carefully inspect the entire roadway to check that the earthwork conforms to the required cross-section and grade within the accuracy of tolerances established by the contract specifications.
2. Unsuitable Materials. Inspect the roadbed and inform the Contractor to treat unsuitable materials and soft areas by aeration or removal and replacement. Ensure that any areas of solid formations (e.g., rock, hard shale, boulders, coal) and any isolated outcrops of ledge-rock or large boulders are excavated to at least 6 in (150 mm) below the subgrade for the full cross-section width of the roadway between the ditches. Other unsuitable materials will be removed to a depth of 12 in (300 mm) and replaced with suitable material. Cuts below grade and low areas will be backfilled with suitable material and graded to eliminate undrained pockets before placing subgrade material.
3. Seeps. Inspect areas that appear to be excessively wet for seeps and other sources of water. If such conditions are found, notify the Project Engineer/Supervisor for corrective measures.
4. Scarification. After removing and replacing unsuitable materials, ensure that the Contractor scarifies the subgrade to remove all deleterious material. Check for large stones and have the Contractor break them down or remove them from the top portion of the subgrade.
5. Subgrade Material. Check the subgrade material to ensure it is granular material free of particles larger than 3 in (75 mm).
6. Lift Thickness. Check the operations to see that the Contractor achieves a 6 in (150 mm) compacted thickness for all embankment and excavation sections.
7. Compaction. Inspect the compaction operation to see that the subgrade layer is moistened or dried to uniform moisture content and compacted to a firm unyielding condition. See Division 700 for information on control of materials and compaction.
8. Drainage. Carefully monitor the drainage of the subgrade. The Contractor will maintain the subgrade in a condition that will drain at all times. Where trenching is performed for narrow base widening, check that ditches of an adequate depth are constructed across the shoulders at sufficient intervals to permit the free drainage of water.
9. Equipment Considerations. Do not permit equipment to travel in a single track to form ruts in the subgrade. Any ruts or irregularities formed in the subgrade will be scarified and re-compacted.
10. Engineering Fabric. Engineering fabric for subgrade stabilization will be used as specified in the plans. See Section 207.8.4 for additional information.

### **207.8.3 Slopes, Shoulders, and Ditches**

#### **207.8.3.1 Slopes**

The finished earthwork should have a pleasing contour and be reasonably smooth in all respects. A slight rounding effect at the top of slopes will give a pleasing appearance and reduce erosion. Where excess excavation is available and conditions permit, it is desirable to round the toe of fill slopes to increase the stability of the embankment and reduce erosion.



Any slope transitions should be gradual. Abrupt changes in slopes at intersections of cuts and fills should be avoided as practical. The finished slope should have a uniform appearance. Carefully inspect the slope lines to check that the lines and grades conform to the plans within allowable tolerances. Use the following guidelines to inspect slopes:

1. Measurements and Tolerances. For all slopes back of the ditch line, a tolerance of  $\pm 1$  ft (300 mm), as measured in the horizontal plane, is acceptable when taking measurements.
2. Width. The width, grade, and dimension of the roadway ditch must conform to the plan dimensions.
3. Slopes. If the slope varies, check with the Project Engineer/Supervisor for approval.
4. Trimming. Slopes will be trimmed neatly to present a uniform surface, free from hollows, protrusions, and loose or overhanging rocks.
5. Undercutting. Check for any undercutting of slopes. Slopes will not be undercut.
6. Rounding. The tops of all slopes, except where the material is of solid rock, will be rounded as designated in the plans.
7. Benching. To prevent slides and slipouts, the Contractor will take precautions by benching or as otherwise directed. See Section 207.3.4 for additional information.

### 207.8.3.2 Flattening Slopes

The additional flattening of slopes, where practical, will provide additional opportunity for errant vehicles to safely recover. Roadside slopes and clear zones are established during the design phase to meet specific criteria for the roadway facility. The clear zone is the total roadside border area, starting at the edge of the

traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope and/or a clear run-out area. The desired width is dependent upon several factors (e.g., traffic volumes, speed, geometry). Where quantities of surplus and waste materials will permit, carefully consider the opportunity to flatten side slopes. The amount saved by eliminating guardrail in such areas may offset the cost of extending the pipe culverts. Give this issue consideration as soon as practical to facilitate ordering the proper length of pipe, establishing the proper clearing and grubbing area, etc. Where additional embankment material is needed to meet plan width, consider flattening the cut slopes in lieu of borrow excavation. Minor changes can be made without an undue increase in documentation, especially where no additional right-of-way is required. Slope flattening involving substantial quantities of additional excavation or substantial increases in drainage cost may require the approval of plan revisions and change orders. Any change from plan slope must have proper authorization.

### 207.8.3.3 Shoulders

Neat and uniform shoulder lines generally should be maintained, as practical, during all phases of roadbed construction. Unless specifically waived by the Project Engineer/Supervisor (e.g., where concrete base or pavement is constructed, where shoulders are constructed of stabilized material), check that shoulders are constructed to full width and substantially to the line, grade, and depth required by the plans and specifications. This will ensure adequate side support. Check the compaction operation to make sure the Contractor uses at least a 10 ton (9 Mg) roller. After placing the pavement surface, the Contractor will shape, dress, and compact the shoulder to plan dimensions and specification requirements. Visually inspect the shoulder to ensure that stone, exceeding 3 in (75 mm) in maximum dimension, is not within 3 in (75 mm) of the surface. Check that the outer edge of the



shoulder is trimmed to a neat line parallel with the centerline of the roadway and that the entire surface is rolled to within 12 in (300 mm) of the outside edge. Have the Contractor refill and compact any depressions that develop in the shoulder.

#### **207.8.3.4 Ditches**

At the completion of the shoulder work, ditches and back slopes will be finally cleaned and trimmed to plan line and grade. Check to make sure that ditches conform to plan dimensions and are maintained free from material and debris.

#### **207.8.4 Engineering Fabric**

Typical applications of engineer fabric include stabilization, slope protection, erosion and sediment control, subsurface drainage, and layer separation. Where specified in the plans, engineering fabric must conform to the requirements of the contract specifications and be selected from the Division's approved materials list. Consider the following guidelines:

1. Subgrade Stabilization. Before engineering fabric is installed for subgrade stabilization applications, check the site to make sure the application area is relatively smooth and free of sharp protrusions, depressions, and debris. Check that the Contractor places the fabric with the machine direction of the fabric parallel with the alignment. Ensure that the fabric is placed relatively smooth and free of creases. Fabric joints may be either sewn or overlapped. Sewing may be performed either in the field or by portable machine. If overlapped, check to make sure the overlap is a minimum of 3 ft (900 mm) or as otherwise directed by the Project Engineer/Supervisor. Once the fabric is placed, check that the Contractor dumps and spreads cover material with equipment that exerts the minimum ground pressure possible. Do not allow construction equipment to operate directly on the fabric.
2. Subsurface Drainage/Layer Separation. Where the plans require engineering fabric for subsurface drainage or layer separation, the fabric will be placed similarly to that for stabilization except that the minimum criteria for overlaps is 2 ft (600 mm). Construction equipment is permitted on the fabric provided all damage is repaired. Where fabric is used for layer separation, check that the fabric is placed on a prepared grade extending the full width of the subbase layer that is to be protected. The fabric should be placed in a loose and unstretched condition to minimize shifting, tearing, or puncturing. If excessive slippage occurs, secure the fabric with steel pins. The operation of construction equipment on the fabric should be discouraged to minimize the chance of tearing. The fabric should be covered by subbase material within 2 weeks to minimize exposure.
3. Structural Backfill. Where fabric is placed in structural backfill applications, such as bridge abutments, the orientation of the fabric will be as directed by the Project Engineer/Supervisor Engineer.
4. Slope Protection. Where fabric is used for slope protection, it should be placed on areas that are smooth and free from protrusions such as vegetation, large stones, and other debris that can tear or puncture the fabric. Place the fabric in a loose unstretched manner with the machine direction of the fabric placed in the direction of the water flow. A 3 ft (900 mm) minimum overlap should be used. The fabric should be covered in a direction from the downslope side to the upslope side. Use caution when placing the cover material to prevent tearing, especially with riprap. Dropping heavy granular stones on the fabric from greater than 1 ft (300 mm) is not acceptable. A layer



of sand or gravel may use used to cushion the fabric as long as the additional material does not inhibit drainage. Minimize operation of construction equipment directly on the fabric.

#### **207.8.5 Temporary Surcharge**

Check that temporary surcharge is placed to comply with the location limits and elevations on the plans or as otherwise directed by the Project/Engineer Supervisor. Where temporary surcharge is placed, visually inspect that it is composed of suitable compacted unclassified excavation or unclassified borrow excavation material. The first 5 ft (1.5 m) of the material will be placed and compacted as earth embankment (see Section 207.5). However, the remaining surcharge will be compacted to meet a target dry density of 90%. Ensure that the temporary surcharge is maintained for the period indicated on the plans or as otherwise directed by the Project Engineer/Supervisor.

#### **207.9 RECORDS AND DAILY REPORTS**

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports the activities of the excavation and embankment work. Pay particular attention to keeping accurate and up-to-date records of all the work. Separate the men, equipment, and time worked for each excavation and embankment operation in the Inspector's Daily Report. This documentation will be valuable in the event that the Contractor files a claim for work performed on the project. Consider the need to document the following items in the Project Records (e.g., field notes, IDRs, cross sections) during the life of the project:

1. Locations of actual balance points and notes concerning cross-haul that may have occurred, including reasons for cross-hauling and the quantities involved.
2. Measurements and notes to substantiate classification and quantity of various materials encountered in the excavation.
3. Records of dimensions, weights, and calibrations that may be required by the contract specifications for water distribution and compaction equipment.
4. Measurements of excavation below grade necessary for the removal of unsuitable materials.
5. Daily records of events, including:
  - a. limits in which work was performed during the day;
  - b. type and number of pieces of equipment used;
  - c. number and classifications of labor used; and
  - d. notes regarding discussions of an unusual nature with the Contractor and any issuance of specific recommendations or instructions.
6. Density and proof rolling tests made to determine acceptability of embankment with remarks to explain corrective actions at locations where tests fail and reasons for not testing at other locations.
7. Records of equipment, labor, and materials used in an operation that is, or may later be, determined as extra work.
8. Notes regarding damage to private property caused by the Contractor's equipment and/or operations.
9. Records of the final disposition of salvable materials.
10. Weather conditions and their effect on quality and workability of earthwork.



**207.10 MEASUREMENT FOR PAYMENT**

Excavation and embankment quantities are measured to compare actual quantities with those in the plans and to balance earthwork as the work progresses. Where borrow is utilized, measurement of embankment also provides a check for “fat fills.” The quantity of work performed will be measured and paid as prescribed in the contract specifications. In general, maintain project records in such a manner that partial progress and final payments can be easily and clearly supported by data (e.g., when the work was completed, measurements and calculations to support the quantity and quality allowed). Initial all records, calculations, and measurements. Consider the following additional guidelines:

1. Blasting. Any material outside the authorized cross-section that becomes shattered or loosened by blasting will be removed without compensation as ordered by the Project Engineer/Supervisor.
2. Water. The Contractor is responsible for the expense of water used to adjust the moisture content of soil during compaction.
3. Cross-Sectioning. The survey crew is responsible for cross-sections that are needed for partial progress and final payments. Some estimate and final sections are generated from computer models. Cross-sectioning is used for final payment because it is accurate. The material actually moved is measured in its original position as cross-sections are taken of the excavated areas. The excavation quantity is calculated using the average-end-area method. The method of cross-sectioning is difficult to use at commercial borrow sites because of other unrelated hauling operations.
4. Truck Counting. Truck counting is used for estimating purposes. The quantity of material each truck hauls is estimated as 80% of the truck’s total volume. The truck’s total volume is calculated based on the

length and width of the inside bed and the average height of the load. Where rock is hauled from commercial borrow sources that use weigh tickets, the quantity of material can be determined using the conversion factor 1.65 tons/yd<sup>3</sup> (1.14 Mg/m<sup>3</sup>).

5. Shrink/Swell Factors. Refer to the plans for the appropriate shrink/swell factors. The proper factor must be used in each case. Shrink factors will reduce the amount of embankment that is in place, and swell factors will increase the amount. Note that payment for unclassified excavation is for the actual quantity of material moved and disposed or placed.







## Section 211

# BORROW EXCAVATION

### 211.1 GENERAL

#### 211.1.1 Description of Work

Before the Contractor begins borrow excavation work, the Division first must approve the use of the borrow site and the borrow material. The Contractor is responsible for: selecting the site; developing and submitting any needed plans and applications; obtaining requisite permits and approvals; and excavating, transporting, placing, and compacting borrow excavation in accordance with the contract plans and specifications. The following Sections present what the Inspector can expect of the Contractor before, during, and after the borrow excavation operation.

#### 211.1.2 Protection and Preservation of Property

During borrow excavation, the Contractor is responsible for the protection and preservation of all property, including the expense of correcting any damages that occur. Inform the Contractor of any apparent or obvious violations of the contract plans and specifications. As needed, report any damage to the Project Engineer/Supervisor, and note any relevant comments or actions in the Inspector's Daily Report. See Section 207.1.2 for additional information on the protection and preservation of property.

#### 211.1.3 Clearing and Grubbing

Unless the material is furnished from a commercial source, the borrow site probably will need to be cleared and grubbed before excavation can begin. Where needed, the Contractor is responsible for clearing and

grubbing the site. Do not allow excavation to begin until the Contractor has satisfactorily cleared and grubbed the borrow site. See Section 201 for additional information on clearing and grubbing operations.

#### 211.1.4 Drainage

The Contractor is responsible for all needed permanent and temporary drainage improvements at non-commercial borrow sites. Emphasize to the Contractor that borrow pits are not to be excavated below the level of natural drainage and that ditches are required to keep the pit free of standing water during the borrow excavation operation. Pay particular attention to any locations of seeps and springs. See Section 207.1.3 for additional information related to off-site drainage.

#### 211.1.5 Erosion and Sediment Control

At non-commercial borrow sites, the Contractor is responsible for all needed permanent and temporary erosion and sediment control treatments. Check that the work is in conformance with the Erosion and Sediment Control Plan. Visually check that the Contractor excavates borrow pits in a workmanlike manner to minimize erosion, pollution, and sedimentation of streams, lakes, and reservoirs. See Section 207.1.4 for additional information on erosion and sediment control.

#### 211.1.6 Dust Control

Depending on the location of the borrow site, dust may or may not be a considerable problem. At other than commercial sources, the Contractor is responsible for dust control. See



Section 207.1.5 for additional information on dust control.

#### **211.1.7 Blasting Considerations**

Controlled blasting may or may not be needed to excavate the required borrow material. Where blasting is conducted, check that the Contractor does so in a safe and productive manner. See Sections 207.1.7 and 207.3.3 for additional information on blasting operations.

#### **211.1.8 Hauling Considerations**

At other than commercial borrow sources, the Contractor is responsible for the construction, drainage, control of erosion and sedimentation, and restoration of any temporary haul roads or other similar facilities needed to haul the excavated material from the borrow site. See Section 207.1.6 for information on hauling considerations. Where the Contractor uses public road facilities to haul borrow materials, the Contractor will take the necessary precautions to ensure public safety. See Section 207.2.1 for additional information on public safety considerations.

#### **211.1.9 Site Restoration**

At the end of the work, check that the Contractor neatly trims, dresses, grades, fertilizes, seeds, and mulches all non-commercial borrow sites and disposes of all debris and spoil in an acceptable manner. See Section 207.4 for information on disposal of materials.

#### **211.1.10 Historic and Archeological Findings**

Historic and archeological artifacts may be uncovered during the borrow excavation work. See Section 207.1.8 for information on historic and archeological findings.

#### **211.1.11 Materials and Equipment**

Materials and equipment must conform to the requirements of the contract specifications. See Section 207.1.9 for information on materials and equipment including quality control testing and the Contractor's required Quality Control Plan.

### **211.2 HAZARDS**

The Contractor is responsible for performing construction operations in a manner that is safe to both project personnel and the general public. The Contractor is responsible for conducting the operations in accordance with the governing provisions of all applicable Federal, State, and local laws (e.g., OSHA). See Section 207.2 for information on the typical hazards of excavation operations.

### **211.3 BORROW EXCAVATION**

#### **211.3.1 Justification and Approval**

Before the Division will approve borrow excavation, the Contractor first, in some cases, completely utilize all available suitable material within the right-of-way (i.e., balancing excavation with embankment). Some projects require the borrow excavation to begin prior to the project excavation to construct detours. Furthermore, suitable excess material, including that from slides and slipouts, and any Division-furnished borrow material, if available, must be fully and completely used before the Contractor may borrow material outside the right-of-way. If the Division approves borrow excavation as a pay item, the Contractor will select the site and the Division must review and approve the use of the borrow site and the material before excavation work begins.

#### **211.3.2 Site Selection and Approval**

Borrow excavation sites off Division right-of-way that are selected and furnished by the



Contractor must be approved before use. If the Division approves borrow excavation as a pay item, the Contractor is responsible for selecting the borrow site. The site may be either a commercial pit or other location off the right-of-way. Regardless, the Division must review and approve the use of the site with regard to such factors as material acceptability, haul economics, environmental impacts, etc. Specifically for non-commercial sources, the Contractor will submit to the Division for review and approval a Site Grading Plan that addresses permits and agreements, excavation limits, clearing and grubbing, drainage, erosion and sediment control, dust control, haul roads, and restoration. Consider the following guidelines:

1. Commercial Sites. Use of any commercial borrow source must be reviewed and approved by the Division before borrow excavation begins. Factors that will be taken into consideration are material acceptability, haul economics, alternative sources, etc. Where commercial borrow sites are involved, truck counting is typically used as the method of measurement. Cross-sectioning, although accurate, is difficult to control at common borrow sites. See Section 211.5 for additional information on measurement for payment.
2. Non-Commercial Sites. The following guidelines apply to the selection and approval of non-commercial borrow sites:
  - a. Site Grading Plan. For non-commercial borrow sites, the Contractor will submit to the Project Engineer/Supervisor, for review and approval, a Site Grading Plan. The Plan will address permits and agreements, excavation limits, clearing and grubbing, drainage, erosion and sediment control, dust control, haul roads, restoration, etc. Check to make sure that the Site Grading Plan has been submitted and approved before allowing borrow excavation operations to begin.
  - b. SHPO. The Contractor also will submit the Site Grading Plan to the State Historic Preservation Offices (SHPO) to determine the potential impact on cultural resources (e.g., Indian burial grounds). A lengthy investigation could result if, in the opinion of the SHPO, disturbing the site could affect cultural resources. Sites where such impacts typically occur are in the flood plain areas of major rivers and in areas with large rock shelters. Steep hillsides and narrow valleys normally do not necessitate such investigations.
  - c. DEP. If an area 3 acres (1.2 ha) or more is disturbed, the Contractor also must obtain, if not already covered by contract documents, approval from the West Virginia Division of Environmental Protection (DEP). Before borrow excavation begins, check to make sure the Contractor has the requisite DEP permit and approval. See Section 201.5.4 for additional information on DEP permits and requirements.
  - d. Off-Site Property Agreement. Because the borrow site will be outside the limits of the right-of-way, check to make sure that the Contractor has obtained permission from the property owner. See Section 201.1.4 for additional information on off-site property agreements.
  - e. Cross-Sectioning. Borrow material can be excavated from an approved non-commercial source only after the Contractor has satisfactorily cleared and grubbed the site and the Division has taken cross-sections as a baseline for measurement purposes. See Section 211.5 for additional information on measurement for payment.
3. Material Testing. Emphasize to the Contractor to select needed borrow sites as early as practical. In addition to the lead time



required for Site Grade Plan review and approval, including the processing of any permits, the Division may need to take material samples and perform laboratory tests if the borrow site is not already a Division-approved source.

Check that the Contractor has fulfilled the above requirements and do not allow the Contractor to open a borrow area until the Project Engineer/Supervisor authorizes such action

### **211.3.3 Classification, Placement, and Compaction**

The Contractor is responsible for excavating, transporting, placing, and compacting borrow excavation in accordance with the contract plans and specifications. Borrow excavation may be classified as follows:

1. Unclassified Borrow Excavation. This classification includes materials that conform to the contract specifications for use in embankments, backfill, shoulders, and other items as designated on the plans or as directed by the Project Engineer/Supervisor. Use the procedures and criteria presented in Section 207.5 to inspect the placement and compaction.
2. Rock Borrow Excavation. Rock borrow excavation includes rock materials that conform to the contract specifications for use in embankment construction and other items as designated on the plans or as directed by the Project Engineer/Supervisor. Use the procedures and criteria presented in Section 207.6 to inspect the placement and compaction of rock borrow excavation.
3. Select Borrow Excavation. Select borrow excavation includes select granular materials that conform to the contract specifications for use in embankments, backfill, shoulders, and other types of work as designated on the plans or as directed by the Project Engineer/Supervisor. Use the procedures and criteria

presented in Section 207.7 to inspect the placement and compaction of select borrow excavation.

Check to make sure that the Contractor places and compacts all borrow material in accordance with the contract plans and specifications.

## **211.4 RECORDS AND DAILY REPORTS**

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports the activities for borrow excavation work. Pay particular attention to keeping accurate and up-to-date records in the Inspector's Daily Report of all items related to measurement for payment and any measurements, calculations, and dimensions to support compliance or non-compliance to the contract plans and specifications. Specifically note the pay quantity measurements for each classification of borrow excavation in the Inspector's Daily Report and any damages and directives given the Contractor regarding corrective actions. This documentation will be valuable in the event that the Contractor files a claim for work performed on the project. See Section 207.9 for suggested items to documents during excavation operations.

## **211.5 MEASUREMENT FOR PAYMENT**

Borrow excavation will be paid for at the contract unit price based on the quantity of material obtained from its original position and incorporated in the work. This will be full compensation for performing acceptable work, including all labor, tools, equipment, supplies, and incidentals. Use the following guidelines:

1. Approval Contingency. The Contractor will not be paid for any borrow excavation before the borrow site and material has been approved for use by the Division.
2. Unit of Measurement. Determine the quantity of borrow excavation, cubic yards



(cubic meters), actually obtained from its original position and incorporated in the work.

3. Method of Measurement. Use either the cross-sectioning method, as described in Section 207.10, or determine the quantity from weigh slips as follows:
  - a. Cross-Sectioning. If cross-sectioning is used, the borrow pit must be cross-sectioned before excavation to establish a baseline. Cross-sectioning, although accurate, probably will not be used at common borrow sites.
  - b. Weigh-Slips. If weigh slips are used, make sure they come from a Contractor-furnished, State-certified scale in accordance with the contract specifications and that the correct weight-to-volume conversion factor is used.
4. Adjustments. If borrow material is used for embankment that could have been constructed with suitable excess material that the Contractor wasted (e.g., roadway excavation, unclassified excavation, slides, slipouts), deduct the wasted quantity from the quantity borrowed. To adjustment a pay quantity for unauthorized placement, measure and deduct the quantity placed outside the construction tolerance and adjust the quantity for shrinkage or swelling. There will be no additional compensation for furnishing, grading, fertilizing, seeding, and mulching borrow pits.







## Section 212

# STRUCTURE, ROCK, AND WET EXCAVATION

### 212.1 GENERAL

#### 212.1.1 Description of Work

Structure, rock, and wet excavation are specified for the excavation of structural footings and may consist of any of the following activities as designated on the plans or as otherwise directed by the Project Engineer/Supervisor:

1. excavation, backfill, and disposal of materials required to remove or construct retaining walls, box culverts, catch basins, drop inlets, manholes, bridges foundations, and other structures;
2. removal of old structures including abutments, piers, and wingwalls; and/or
3. pumping, draining, sheeting, and constructing cribs and cofferdams.

A foundation, or footing, is constructed to provide adequate bearing support by distributing the load of the structure over the underlying soil or rock. Excavation for footings may be categorized as follows:

1. Structure Excavation. Structure excavation is the excavation needed to allow the placement of the structural foundation. The limits of the area generally extend from the original ground line to the bottom of the footer, with sufficient width to permit placement of forms.
2. Rock Excavation. If a portion of the footer will be seated in rock, the area that is excavated to the neat lines of the footer is classified as rock excavation.

3. Wet Excavation. Where foundations will be constructed in rivers or streams, the type of excavation that is below the low water line normally is classified as wet excavation.

Unless otherwise directed, check that the Contractor performs the work in accordance with the contract specifications and in reasonable conformance to the lines, grades, and typical section of the plans. Consult the plans and specifications for the absolute definitions and pay limits for each particular item. Upon completion, notify the Project Engineer/Supervisor for approval. Do not allow the Contractor to place footing, pipe, or other structures until the Project Engineer/Supervisor approves the depth of the excavation.

#### 212.1.2 Protection and Preservation of Property

During excavation, the Contractor is responsible for the protection and preservation of all property, including the expense of correcting any damages that occur. As needed, report any damage to the Project Engineer/Supervisor, and note any relevant comments or actions in the Inspector's Daily Report. See Section 207.1.2 for additional information on the protection and preservation of property.

#### 212.1.3 Shoring, Bracing, and Cofferdams

##### 212.1.3.1 Cofferdams

The term cofferdam designates any barrier system that provides an area as watertight as practical, for excavation, inspection, and placing concrete. It may be constructed of sheet piling, wood, sand bags, earth embankment, or a combination of these materials. Cofferdams may



extend below the bottom of the footings. The interior dimension will be sufficient to provide adequate clearance for form construction and to permit the pumping of water outside the forms. Where sandy or porous material is encountered in the excavation, it is impractical to completely dewater the area before placing concrete. In these cases, a tremie is used to place concrete in the bottom of the cofferdam to seal the internal area from water intrusion. Do not allow the Contractor to leave internal bracing in the cofferdam that would extend into the substructure concrete. Make sure that the Contractor removes the cofferdam upon completing the substructure in a manner that will not jeopardize the integrity of the structure or its surrounding environs.

#### **212.1.3.2 Construction Plans**

If shoring, bracing, and/or cofferdams are specified in the contract plans, the Contractor is responsible for their design, construction, and removal. Before the foundation excavation work begins, check that the Contractor has submitted to the Project Engineer/Supervisor, and the Chief Engineer of the railroad if the work is adjacent to railroad tracks, with a copy of the construction plans (Plan) for any needed shoring, bracing, and cofferdams. Check that the Plan has been prepared and sealed by a Professional Engineer registered in the State of West Virginia with experience in designing shoring, bracing, and cofferdams. The Plan will include a complete analysis and design of the needed shoring, bracing, and cofferdam with regard to existing conditions, depth of foundation, footing dimensions, construction phases, work area needed during construction, and removal. Note that it is not the responsible of WVDOH to review or approve the Plan. The Inspector is only responsible for ensuring that the Project Engineer/Supervisor is in receipt of the Plan as described above and that the Contractor is operating within the Plan and the contract specifications.

#### **212.1.3.3 Pumping**

Pay particular attention to how the Contractor pumps water from within the foundation enclosure to make sure that extraneous water does not contact or mix with freshly poured concrete. Unless the Contractor uses a suitable pump that is separated from the concrete by a watertight wall, do not allow the pumping of water during the placement of concrete or for a period of at least 24 hours thereafter.

#### **212.1.4 Drainage**

Check that porous material, tile, and/or pipe drains are provided to adequately drain water from behind the backs of retaining walls, abutments, and wingwalls. Unless selected material is used for backfill, porous drains should be constructed to collect water and to permit the weep holes to drain. Frequently check the drains so make sure that they are not clogged and the drains and weep holes are functioning. Drains will be placed behind and along the length of the wall draining to the elevation of the outlet. Outlet drains will extend through the walls at the ground line or as otherwise specified or directed. If the end of the outlet drain will be below ground or fill material, make sure the Contractor extends the drain outlets to the toe of the slope. Make sure that drain material, size, placement, and backfilling comply with the contract plans and specifications.

#### **212.1.5 Erosion and Sediment Control**

During excavation, the Contractor is responsible for all needed permanent and temporary erosion and sediment control treatments. Visually check that the Contractor excavates in a workmanlike manner to minimize erosion, pollution, and sedimentation of streams. Check to make sure that the Contractor does not obstruct or change the stream channel, unless authorized to do so under the contract. See Section 207.1.4.



### **212.1.6 Blasting Considerations**

Controlled blasting may or may not be needed during the excavation. Where blasting is needed, check that the Contractor does so in a safe and productive manner. Check that rock is removed reasonably close to the plan lines and with little disturbance to the material left in place. See Sections 207.1.7 and 207.3.3.

### **212.1.7 Materials and Equipment**

The Contractor is responsible for the quality control of select backfill material. Check that the testing methods and sampling frequencies conform to MP 717.04.21. Acceptance is based on the Contractor's written certification. Check to ascertain that the test results are included on the certification. Materials (e.g., controlled low-strength material, engineering fabric for subsurface drainage and layer separation) will be in conformance with the contract specifications. As appropriate, check to make sure that materials are selected from the Division's approved list of materials.

## **212.2 HAZARDS**

The Contractor is responsible for performing construction operations in a manner that is safe to both project personnel and the general public. The Contractor is responsible for conducting the operations in accordance with the governing provisions of all applicable Federal, State, and local laws (e.g., OSHA). See Section 207.2 for information on the typical hazards of excavation operations.

## **212.3 EXCAVATION FOR FOOTINGS**

### **212.3.1 Footing Elevation**

The plans show the bottom elevation of each footing and the type of material that will be encountered during excavation. Emphasize to the Contractor not to excavate below the bottom

elevation of the footing unless otherwise directed by the Project Engineer/Supervisor. If questionable foundation material is encountered at the planned footing elevation, immediately notify the Project Engineer/Supervisor to properly resolve the matter without jeopardizing the integrity of the structure or unnecessarily delaying the progress of the Contractor. Where ground or other conditions necessitate a bottom elevation below that shown on the plans, notify and obtain approval from the Project Engineer/Supervisor or Construction Engineer before allowing the Contractor to begin any extra excavation. In such cases, the Engineering Division will need to analyze the changed conditions to determine a practical solution (e.g., increase the footing thickness, redesign the affected part of the structure). Be prepared to provide the Engineering Division with additional information about the material at the lower elevation. Soil samples at various depths may need to be obtained and analyzed. The Project Engineer/Supervisor is responsible for informing the Contractor in writing of any changes in footing dimensions or elevations. When the footing excavation is complete, notify the Project Engineer/Supervisor to inspect and approve the bottom of the footing excavation before allowing any concrete to be placed.

### **212.3.2 Foundation Surface Preparation**

Use the following guidelines when inspecting foundation preparation operations:

1. **Rock**. If the plan shows a footing on rock or other hard material, check that the Contractor cuts (e.g., level, stepped, serrated) the surface according to plan. A footing in sound rock or hard shale normally requires a 6-in to 12-in (150-mm to 300-mm) key into the solid foundation material. The foundation should be cleaned free of all loose material, mud, and water. All large seams and cracks in the rock surface will be cleaned and filled with mortar, concrete, or grout. Check that the excavated rock or hard shale foundation is cut, as practical, to the



neat lines of the footing. And that concrete is placed against the rock without forming.

2. Other Than Rock. If the plan shows a footing on an excavated surface other than rock or hard shale, pay particular attention to make certain that the Contractor does not disturb the bearing surface. Final removal of the foundation material will not be made until just before the concrete is placed.

### 212.3.3 Backfilling Around Structures

A primary objective of backfilling around structures is to thoroughly compact the material to minimize consolidation and settlement after construction. This will improve the riding qualities of the pavement by helping to eliminate the “bump at the end of the bridge” that sometimes develops due to settlement behind the abutment. Check that the Contractor backfills all voids that are not occupied by abutments, piers, and other structures to the surface of the surrounding ground in accordance with the contract plans and specifications. Backfill material will be suitable random material, controlled low-strength material, or select backfill material as specified. Use the following guidelines during inspection:

1. Timing. Plan notes, if specified, will govern when to allow backfilling to be placed around structures. When the plans are silent, the Construction Engineer or Project Engineer/Supervisor will make the determination. It is desirable to backfill as soon as practical after the forms have been removed. Normally, backfilling may begin when the concrete has attained the compressive strength specified in Section 601.8.7 of the **Standard Specifications**.
2. Foundation. Backfill next to a structure must be placed on a firm foundation. Before any material is placed, make sure all loose material and debris have been removed from the foundation area. Any mud or water should be removed and suitable material placed up to the level of the drains or the weep holes in the abutment, and thoroughly compacted.
3. Random Material. Where used, random material will be free from all particles larger than 3 in (75 mm), frozen lumps, wood, or other extraneous material. The material will be thoroughly compacted by rolling or tamping. The moisture content will be adjusted so that the material will be compacted to the required density. The top surface will be neatly graded. Check the backfill operation behind and around all structures to make certain the Contractor places compacted lifts that do not exceed 4 in (100 mm). These structures include abutments, wingwalls, piers, bents, pedestals and those inaccessible to rollers. The quality control for random material will be in accordance with the contract specifications. See Section 207.1.9 for additional information. Five density tests are required with a target dry density of 95%.
4. Controlled Low-Strength Material (CLSM). At the Contractor's option and expense, CLSM may be used in lieu of random material where specified. See Section 219 for additional information on CLSM.
5. Select Backfill Material. Where used, select backfill material will be thoroughly compacted by rolling or tamping. The moisture content will be adjusted so that the material will be compacted to the required density. The top surface will be neatly graded. Check the backfill operation behind all structures to make certain the Contractor places compacted horizontal lifts that do not exceed 4 in (100 mm). Select backfill material will be placed to plan dimensions behind abutments, wingwalls, retaining walls, and box culverts. The quality control for select backfill material will be in accordance with the contract specifications. See Section 207.1.9 for additional information. Testing of select backfill material will comply with MP 700.00.24



Five density tests are required with a target dry density of 95%.

6. Lot Size. The lot size for quality control testing is not a specified quantity. The quantity may be the quantity to backfill one abutment, if it is a rather large abutment, or that required to backfill both abutments. Where there are piers, the backfill may or may not be included in the quantity with the abutments. The lot size should be the quantity that the Contractor feels can be risked by including in one lot. The Project Engineer/Supervisor and Construction Engineer likewise should feel comfortable and assured that the Contractor is not selecting a lot size that may prove to be too costly to remove or rework should it fail.
7. Backfill Over Structures. Check the backfilling operation to make sure that backfill is placed around and over abutments, culverts, arches, and columns uniformly and as soon as practical after the forms are removed to avoid bending or distortional stresses on the structure.
8. Integral/Semi-Integral Abutments. Check to make sure that the backfill around integral and semi-integral abutments conform to the requirements of the contract plans and specifications.
9. Engineering Fabric. In all areas where select backfill material will contact random material, make sure the Contractor uses engineering fabric to separate the layers. See Section 207.8.4 for additional information.
10. Wedging. Where backfilling around abutments and walls, check to make sure the Contractor uses stepping or serrations to prevent wedge action against the masonry and the slope bounding the excavation.
11. Jetting. Do not permit the jetting or flooding of fill behind retaining walls, abutments, or wingwalls.
12. Equipment. Pay particular attention to how the Contractor operates equipment and machinery (e.g., dozers, rollers) adjacent to structures. Emphasize to the Contractor to be careful not to damage to the structures. In places that are inaccessible to a roller, the Contractor should be using an approved pneumatic or power driven backfill tamper to thoroughly compact the material.
13. Backfilling Around Non-Critical Locations. The **Standard Specifications** waive some compaction and testing requirements for non-critical locations (e.g., backfill not part of embankment, highway pavement, or shoulder). Use sound judgment in administering backfill compaction for these locations. A reasonable compactive effort applied to material with reasonable moisture content in 6 in (150 mm) maximum lifts will usually be sufficient. The intent is to achieve a density approximately equal to that of the existing soil. Backfill placed in this manner should be slightly higher in elevation than the surrounding soil and sloping away from the structural element for purposes of draining and possible settlement. The Contractor's Quality Control Plan for structural backfilling will be considered acceptable if it includes the lot sizes to be used for random material and select backfill and the location and compaction procedures for non-critical locations.

## 212.4 DISPOSAL OF MATERIALS

The Contractor will use suitable excavated materials for backfill or embankments as designated on the plans or as directed by the Project Engineer/Supervisor. Surplus and waste material will be disposed consistent with the procedures and criteria presented in Section 207.4. Pay particular attention to how the Contractor disposes of materials. Do not allow the Contractor to engage in operations that would impede the integrity, efficiency, or appearance of the structure, cause stream erosion



or sedimentation, or obstruct or change the stream channel.

## 212.5 RECORDS AND DAILY REPORTS

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports accurate and up-to-date records of the work. Separate the men, equipment, time, and pay quantity measurements for each classification of structure, rock, and wet excavation in the Inspector's Daily Report. Also measure and check the actual dimensions for compliance with plan dimensions of each footing excavation as soon as the excavation has been completed. Document the findings as well as the type of material found in the bottom of the excavation in the Inspector's Daily Report. This documentation will be valuable in the event that the Contractor files a claim for work performed on the project. See Section 207.9 for other suggested items to document during excavation operations.

## 212.6 MEASUREMENT FOR PAYMENT

Structure, rock, and wet excavation are measured and paid at the contract unit price based on the number of cubic yards (cubic meters) represented in the contract plans. This will be full compensation for performing acceptable work, including all labor, tools, equipment, supplies, and incidentals. Use the following guidelines:

1. Structure Excavation. Measure structure excavation as the number of cubic yards (cubic meters) excavated and limit the volume to that within parallel vertical planes 18 in (450 mm) outside the neat lines of the footing. Do not measure or pay separately the excavation and backfilling for drains with sand, crushed stone, or gravel. Do not measure or pay separately the clearing of the right-of-way within the construction limits of piers, abutments, retaining walls etc, nor backfilling to the level of the original ground. These items will be included in the unit price. Measure and pay separately backfill that is placed above the original ground as designated in the contract plans (see Sections 207 and 211).
2. Rock Excavation. Measure rock excavation as the number of cubic yards (cubic meters) excavated and limit the volume to the neat lines of the footing. This includes all material encountered in the excavation, required blasting and removal, and removal of all boulders greater than 0.5 yd<sup>3</sup> (0.4 m<sup>3</sup>).
3. Wet Excavation. Measure wet excavation as the number of cubic yards (cubic meters) bounded between the normal pool elevation of the stream and the bottom of the footing between the lines designated on the plans for the footing. Material paid as rock excavation below the waterline should not be included for payment in wet excavation.
4. Select Backfill Material. Measure and pay separately the placement and compaction of select backfill material. Do not measure and pay separately for engineering fabric that is used in select backfill material. This item is included in the unit price for select material.
5. Additional Work. The Project Engineer/Supervisor must authorize any additional work beyond the limits of the contract plan, especially any increase in foundation depth. Such work will be measured in cubic yards (cubic meter) as excavated material removed or select backfill in place. Pay any increase in foundation depth 5 ft (1.5 m) or less at the unit bid price. Pay increases in foundation depth over 5 ft (1.5 m) as extra work (see Division 100).
6. Blasting. Where drilling and blasting is involved, check to see if the rock was removed in accordance with the contract specifications, in reasonable conformance with the required plan lines, and with as little disturbance as practical to the material that is to remain. If the Contractor removes



material beyond the plan dimensions, measure and record the quantity of extra excavation. The volume of excavation to be paid will be computed from original and final cross-sections with pay lines drawn in accordance with plan dimensions.

7. Shoring and Bracing. The cost of bracing, shoring, and supporting excavation that is adjacent to railroad tracks will be included in the unit price bid for structure, rock, and wet excavation.
8. Cofferdams. Where a footing is placed below the water level and a cofferdam is built, measure and pay for cofferdams for each unit complete in place. This will include all labor, materials, and equipment incidental to design and plan preparation, construction, pumping and removal. If the Contractor requests to be paid in progress payments, use the following schedule:
  - a. Pay 50% after the cofferdam is completed and deemed satisfactory by the Project Engineer/Supervisor.
  - b. Pay up to an additional 25% for pumping operations if needed throughout the life of the cofferdam. As deemed necessary, prorate this portion over the estimated life of the cofferdam and pay on a monthly basis.
  - c. Pay the remaining 25% after the cofferdam is removed as deemed satisfactory by the Project Engineer/Supervisor.







## Section 218

# SLOPE AND FOUNDATION PROTECTION

### 218.1 GENERAL

#### 218.1.1 Description of Work

Slope and foundation protection consists of installing erosion-free slopes around heavy wash areas of structures, channel changes, and foundations. The surface treatments could consist of stone or concrete (with or without engineering fabric) including graded limestone for crushed-rock slope protection, large sandstone for riprap, rocks and river gravel placed in wire-mesh baskets, concrete for sills and concrete slope protection, grout, reinforcement, pre-cast concrete blocks, and other items as specified. The surface treatments will be designated on the plans. As work progresses, the Project Engineer/Supervisor may identify other locations where such treatments are needed.

#### 218.1.2 Materials and Equipment

Check that all materials conform to the requirements of the contract specifications. In some cases, acceptance will be based on the Contractor's written materials certification. Check to make certain that the appropriate samples and test results are reported on all material certifications, including lab numbers. As necessary, check to make certain that the materials are selected from the Division's approved list of materials. See Section 207.1.9 for additional information on materials and equipment. See Division 700 for additional information on control of materials and quality control programs.

### 218.2 SLOPE PROTECTION

#### 218.2.1 General

Slope protection generally is placed to stabilize the slope and protect it from the elements of erosion. Check that any slope protection reasonably conforms to the lines, grades, dimensions, and cross-sections of the contract plans and that the materials used comply with the contract specifications. The following Sections present additional guidelines.

#### 218.2.2 Riprap/Grouted Riprap

Riprap often is used in channels and areas exposed to erosion by water. Riprap basically consists of individually placed large stones with smaller stones placed to fill any voids to form a compact mass that protects the slope. Stone size will be specified on the plans. In some cases, the riprap material is grouted to provide additional stability. Use the following guidelines when inspecting riprap operations.

1. Trenching. Where slopes are treated with riprap, check that a 2 ft (600 mm) wide trench is provided at the toe of the slope. Visually inspect that the trench invert is parallel to and 2 ft (600 mm) below the toe.
2. Stone Size. Of the various stone sizes, the larger stones will be approximately 3 in by 12 in (75 mm x 300 mm).
3. Placement. Placement operations should begin at the trench invert and proceed up the slope to the plan limit. Occasionally check the stones to see that they are firmly embedded in the slope face. The larger stones are placed with the longer dimension oriented horizontal and parallel to the slope.



Adjoining rocks should abut one another to form a single layer. Spalls and smaller rock should fill the voids. The finished riprap surface should appear smooth as practical with abutting stones not differing more than  $\pm 1\frac{1}{2}$  in (40 mm).

4. Grouting. If cement grout is specified, check that the Contractor thoroughly wets the riprap immediately before the grout is applied. As the grout is applied, it will be worked into the exposed joints. The Contractor should then brush the grout to expose the face of the stones. Check that the grout is cured either for 72 hours with a blanket of wet earth or by sprinkling with a fine spray of water every two hours during daylight hours for 3 days.
5. Weep Holes. Weep holes generally are provided in grouted riprap but may not be specified on the plans. Check that the Contractor provides weep holes. The Project Engineer/Supervisor will clarify any uncertainties.

### **218.2.3 Gabions**

Gabions are often used along banks of streams and channels. They are constructed by encasing rock in galvanized wire mesh baskets. Equipment may be used to fill the basket; however, the rock at the exposed faces of the basket must be placed by hand to ensure filling of voids and an attractive appearance

### **218.2.4 Crushed Rock**

Where crushed rock is specified for slope protection, the limits and depth will be designated on the plans. Normally, concrete sills also will be specified at the bottom and on each side of the limits of protection. Sills may be pre-cast or cast-in-place and will be placed in a trench excavated to receive them. Visually inspect the trench and sill dimensions for conformance. The crushed rock will be placed

on the slope within the limits of the sills. Placement will start at the bottom sill and proceed up the slope to the berm in front of the abutment. The rock may be placed by either hand or equipment; however, if the Contractor uses equipment, inspect both the sills and the adjacent structure for any damage. The rock should be raked in place to obtain a reasonably smooth and continuous surface. Check the finished work to see that the thickness and slope line reasonably conform to the plans.

### **218.2.5 Concrete**

Concrete slope protection can consist of either a reinforced cast-in-place concrete slab or adjoining reinforced pre-cast concrete blocks embedded in the slope face. Check to make sure the Contractor uses one or the other, not both, at any one bridge. Use the following guidelines during inspection:

1. Sills. Normally, concrete sills will be specified at the bottom and on each side of the limits of protection. Sills may be pre-cast or cast-in-place and will be placed in a trench excavated to receive them. Visually inspect the trench and sill dimensions for conformance.
2. Cast-in-Place Concrete Slab. Check that the reinforcement of the slab meets specifications, is firmly secured, and will not protrude through the finished face. The forms should be set to receive a slab pour not less than 6 in (150 mm) thick. Construction joints will be placed at intervals of 10 ft (3 m) in both directions. A wood float finish is acceptable. The concrete will be poured on the slope within the limits of the sills. Placement will start at the bottom sill and proceed up the slope to the berm in front of the abutment.
3. Precast Blocks. The size of the reinforced precast concrete blocks will be 3 ft by 1½ ft (1000 mm by 500 mm), 4 in (100 mm) thick. Check that the blocks are firmly



embedded in the slope face. The blocks will be placed with the longer dimension oriented horizontal and parallel to the slope. Adjoining blocks should tightly abut one another to form a single, even layer that reasonably conforms to the line, grade, and section of the plans.

4. Weep Holes. Check that weep holes are provided as directed by the Project Engineer/Supervisor.

#### **218.2.6 Engineering Fabric**

See Section 207.8.4 for information on engineering fabric. The engineering fabric used must be selected from the Division's list of approved materials. Emphasize to the Contractor not to operate machinery directly on the fabric and to protect the fabric from contamination by surface runoff. If the fabric does get contaminated, have the Contractor replace the contaminated runs. The machine direction of the fabric will be placed parallel with the direction of the stream.

### **218.3 FOUNDATION PROTECTION**

Foundation protection, generally rock, is an important element provided in the plans to protect the structural integrity of the structure. The plan will designate the placement of rock material around the footings, abutments, and piers. This will prevent water from scouring (i.e., eroding) the soil material from under footings and other load-bearing structural elements. Pay particular attention to how the Contractor performs this operation. The depth, width, and limits on the plans are critical dimensions. Also, check that the Contractor is placing the type of material called for in the plans. Placement of material can be performed by equipment (e.g., dumped) in lieu of hand placement; however, the material must be properly bulldozed in place and consolidated. Generally, stone for foundation protection will be largely equidimensional and angular with a

size ranging between 1 ft<sup>3</sup> (30 000 mm<sup>3</sup>) to 1 yd<sup>3</sup> (0.8 m<sup>3</sup>).

### **218.4 RECORDS AND DAILY REPORTS**

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports accurate and up-to-date records. As needed, separate the men, equipment, time, and pay quantity measurements for each type of slope and foundation protection in the Inspector's Daily Report. Also measure and check the actual dimensions for compliance with plan dimensions. Document any particularly relevant findings in the Inspector's Daily Report. This documentation will be valuable in the event of a dispute.

### **218.5 MEASUREMENT FOR PAYMENT**

Unless otherwise specified, all slope protection will be measured and paid at the contract unit price based on the number of cubic yards (cubic meters). Volume quantities may be determined by verified plan dimensions or from measurements of the completed work. Shot rock will be measured in tons (Mg) based on truck counts and weigh slips from State-certified scales. Crushed rock slope protection, concrete slope protection, and fabric are measured and paid on the number of square yards (square meters). Area dimensions will be based on slope measurements. Concrete sills are included in the area measurement. Foundation protection will be measure in cubic yards actually produced and incorporated in the work, determined in its original position from cross sections by the average-end-area method. This will be full compensation for performing acceptable work, including all labor, tools, equipment, supplies, and incidentals.







## Section 219

# CONTROLLED LOW-STRENGTH MATERIAL

### 219.1 GENERAL

mix design and CLSM properties must meet the requirements of the contract specifications.

#### 219.1.1 Description of Work

Controlled low-strength material (CLSM) is a non-compacted cementitious material used primarily as a backfill in lieu of a compacted material. The work consists of furnishing and placing CLSM as a backfill material in accordance with the plans and specifications. At the Contractor's option and expense, CLSM may be used in lieu of random material where specified around structures.

#### 219.1.2 Materials and Equipment

##### 219.1.2.1 Quality Control

The Contractor is responsible for the quality control of CLSM. The materials, mixing, properties, equipment, and tools of CLSM and placement operations must comply with the specifications. Check to make sure that the Contractor is using certified PCC Inspectors during the operation (See Section 705). The Contractor's Quality Control Plan will conform to MP 601.03.50. Check that the Project Engineer/Supervisor is in receipt and has approved the Contractor's Quality Control Plan. Visually observe to see if the Contractor is operating within that Plan (samples, tests, frequencies). The Contractor's quality control sampling and testing may be used for acceptance.

##### 219.1.2.2 Mix Design

Prior to the backfill operation, check that the Project Engineer/Supervisor is in receipt of the approved Contractor's mix design and test results for each type of CLSM to be used. The

### 219.2 PLACEMENT

During placement operations, use the following guidelines for inspection purposes:

1. Consistency. During placement, visually inspect the consistency of the CLSM to see that it is satisfactorily filling all voids without vibration or other consolidation methods. The Contractor should not be using vibrators with CLSM.
2. Pour Height. The Contractor should not drop CLSM from an excessive height. Check that placement is performed by moving the discharge point of the chute or by manually spreading the material.
3. Pipes. For backfilling around pipes, check that the CLSM is placed evenly on both sides of the trench to avoid overstressing or laterally moving the pipe.
4. Lift Thickness. The lift thickness of the CLSM backfill operation will be shown on the plans. Do not allow the Contractor to exceed this limit. The limit is specified to avoid overstressing the pipe, forms, structures, etc. and to avoid potentially floating a pipe out of its trench. Prior to placement of subsequent lifts, ensure the Contractor allows each lift to adequately cure until it is self-supporting.
5. Bonding. Between lift pours, check that the surface of the previous lift is clean to ensure bonding with the next.



**219.3 RECORDS AND DAILY REPORTS**

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports accurate and up-to-date records of the work. As needed, separate the men, equipment, time, and pay quantity measurements for each pay item in the Inspector's Daily Report. Also measure and check actual dimensions for compliance with plan dimensions. Document any particularly relevant findings in the Inspector's Daily Report. This documentation will be valuable in the event that the Contractor files a claim for work performed on the project.

**219.4 MEASUREMENT FOR PAYMENT**

CLSM will be measured and paid at the contract unit price based on the number of cubic yards (cubic meters) of backfill in place. Volume quantities may be determined by verified plan dimensions or from measurements of the completed work. This will be full compensation for performing acceptable work, including all labor, tools, equipment, supplies, and incidentals.



## Section 228

# SUBGRADE PREPARATION

### 228.1 GENERAL

#### 228.1.1 Description of Work

Subgrade preparation consists of preparing the subgrade for the placement of base or subbase materials in accordance with the contract specifications and in reasonable conformance to the lines, grades, dimensions, and cross-sections of the contract plans. This work is typically specified for road sections that will be paved without grading.

#### 228.1.2 Materials and Equipment

Check to ensure that the Contractor's subgrade materials, equipment, test methods, and quality control requirements, as applicable, conform to the provisions of the contract specifications. See Section 207.1.9 and Division 700 for general guidelines regarding materials, equipment, and quality control.

### 228.2 SUBGRADE PREPARATION

Prior to placing the base or subbase, check that the Contractor grades and shapes the entire width of subgrade to present a uniform appearance that is in reasonable conformity to the lines, grades, and dimensions shown on the plans. Visually inspect that the Contractor uses excavated materials to bring any eroded areas up to plan cross-section. Any ruts or irregularities will be scarified and re-compacted. Check to see that the subgrade is maintained in such condition that it will drain at all times. In general, use the applicable guidelines presented in Sections 207 during the inspection of subgrade preparation, especially Section 207.8.2. See Section 207.5.4.2 for procedures to check lift thickness.

### 228.3 RECORDS AND DAILY REPORTS

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports the activities of subgrade preparation. Pay particular attention to keeping accurate and up-to-date records of all the work. Separate the men, equipment, and time worked in the Inspector's Daily Report. Specifically record field measurements for lift thickness checks. This documentation will be valuable in the event the Contractor files a claim for work performed on the project. See Section 207.9 for suggested items to document.

### 228.4 MEASUREMENT FOR PAYMENT

Subgrade preparation will be measured and paid at the contract unit price based on the number of square yards (square meters) as determined from the lines and dimension on the plans. This will be full compensation for performing acceptable work, including all labor, tools, equipment, supplies, and incidentals. In general, maintain project records in such a manner that partial progress and final payments can be easily and clearly supported by data (e.g., when the work was completed, measurements and calculations to support the quantity and quality allowed). Initial all records, calculations, and measurements.







## Section 229

# SHOULDERS AND DITCHES

### 229.1 GENERAL

#### 229.1.1 Description of Work

This work consists primarily of trimming, sloping, shaping, grading, subgrading, scarifying, and compacting existing shoulders and ditches including inlets and outlets to pipe culverts, and constructing new shoulders and ditches where necessary in accordance with the contract specifications and in reasonable conformance to the lines, grades, and cross-sections of the plans.

#### 229.1.2 Materials and Equipment

Check to ensure that the Contractor's materials, equipment, test methods, and quality control requirements, as applicable, conform to the provisions of the contract specifications. See Section 201.1.8 for general guidelines regarding materials and equipment. See Division 700 for additional information on control of materials and quality control plans.

### 229.2 PUBLIC SAFETY HAZARDS

Public and private roadways and intersections may be affected by the Contractor during shoulder and ditch work. The Contractor is responsible for maintaining these facilities in a safe and passable condition. Perform daily visual checks to ensure the Contractor is adequately cleaning and sweeping mud, oil, debris, and any other objectionable materials from the traveled way. Do not allow the Contractor to place any equipment or materials that would be an obvious hazard to vehicular or pedestrian traffic. Check that the Contractor has an approved plan for maintaining and protecting traffic during this operation. Visually inspect that the Contractor is

performing this task in accordance with the governing contract specifications and note the observations in the Daily Report. See the WVDOT publication **Traffic Control for Street and Highway Construction and Maintenance Operations** for additional information.

### 229.3 SHOULDERS AND DITCHES

Use the following guidelines when inspecting shoulder and ditch work:

1. Shoulders. As soon as practical after the surfacing is complete, have the Contractor begin scarifying, shaping, and compacting the shoulders to the grade and cross-section of the plans. Inspect the entire shoulder area to see that it is uniformly compacted by rollers, mechanical tampers, or hand methods and dressed true to the cross-sections of the plans. Ensure that compaction procedures comply with the requirements of the contract specifications. See Division 700 for additional information on compaction.
2. Ditches. Existing ditches are to be trimmed, graded, or otherwise excavated to relieve drainage along the roadway and to and from existing drainage structures. Check that existing ditches are trimmed, sloped, and cleaned and that inlets and outlets are opened and shaped to a uniform grade. Visually inspect that all drainage appurtenances are open, free of debris and obstructions, graded to drain, and functioning properly.
3. Disposal of Materials. Unless select material is designated on the plans, the Contractor should use suitable excavation material.



Surplus and unsuitable material will be removed and disposed of properly as discussed in Section 207.4. Unsuitable material that is removed from ditches must be picked up and removed, exercising care not to allow material to be strewn on the roadway. Any material spilled on the roadway must be cleaned up and properly disposed of.

4. Reconstruction Projects. On reconstruction projects, all shoulders will be constructed to the maximum practical width and the material compacted firmly against the existing edge of pavement.
5. Hand Dressing. Hand dressing or grading of shoulders may be required to minimize damage under existing guardrail, or in areas inaccessible to equipment.
6. Public Safety. Check that materials are not scattered on the roadway where it can become a hazard to the traveling public. See Section 229.2.
7. Damages. Caution must be exercised to prevent damage to the pavement, structures, etc. Emphasize to the Contractor not to damage the pavement or any structures during the operation. Any damage will be the Contractor's responsibility. Document in the Daily Report any observed damage and contact the Project Engineer/Supervisor to discuss acceptable alternative methods to prevent future damages.

#### 229.4 RECORDS AND DAILY REPORTS

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports the activities for shoulder and ditch work. Pay particular attention to keeping accurate and up-to-date records in the Inspector's Daily Report of all items related to measurement for payment and any measurements, calculations, and dimensions to support compliance or non-compliance to the contract

plans and specifications. Specifically note the disposition of traffic control operations, any damage to pavement or structures, and any directives given the Contractor regarding corrective actions. This documentation will be valuable in the event that the Contractor files a claim for work performed on the project.

#### 229.5 MEASUREMENT FOR PAYMENT

Shoulder and ditch work will be measured and paid at the contract unit price based on the number of linear miles (kilometers) designated in the contract plans. Do not make deductions for work not performed on either side of the centerline. Stabilization, if specified, will not be included in shoulder and ditch work but will be measured and paid for separately. This will be full compensation for performing acceptable work, including all labor, tools, equipment, supplies, and incidentals. In general, maintain project records in such a manner that partial progress and final payments can be easily and clearly supported by data (e.g., when the work was completed, measurements and calculations to support the quantity and quality allowed). Initial all records, calculations, and measurements.



## Section 240

# CLEANING CULVERTS, INLETS, AND MANHOLES

### 240.1 GENERAL

#### 240.1.1 Description of Work

This work primarily consists of the complete removal of obstructions and thorough cleaning of trash, dirt, and other debris from culverts and their appurtenant structures (e.g., inlets, manholes) at locations designated by and in a manner acceptable to the Project Engineer/Supervisor.

#### 240.1.2 Materials and Equipment

Check to ensure that the Contractor's equipment conforms to the provisions of the contract specifications. See Section 201.1.8 for general guidelines regarding materials and equipment.

will minimize, as practical, the pollution and sedimentation of all receiving streams, rivers, and other bodies of water.

2. Protection of Property. Check to make sure that the Contractor's operation will not deposit debris or otherwise damage adjacent or downstream properties.
3. Damage to Structures. Visually inspect the drainage structures for damage. The cleaning procedures and equipment used will ensure the removal and disposal of obstructions, trash, and debris without damaging existing drainage structures.
4. Abhorrent Chemicals. Do not permit the use of any abhorrent chemicals during the cleaning operation.

### 240.2 PUBLIC SAFETY HAZARDS

The Contractor is responsible for maintaining public facilities in a safe and passable condition during the cleaning operation. Appropriate traffic control measures will be in place during the operation. See Section 229.2 for additional information on public safety hazards.

### 240.3 CLEANING CULVERTS, INLETS, AND MANHOLES

The Contractor will use a method that is acceptable to the Project Engineer/Supervisor. Use the following guidelines during inspection:

1. Environmental Considerations. Check to make certain that the Contractor is not performing the operation in a manner that would jeopardize bodies of water or the downstream environment. The method used

### 240.4 RECORDS AND DAILY REPORTS

The Project Engineer/Supervisor and Inspectors in charge of the work are responsible for recording in the Daily Reports the activities for cleaning culverts, inlets, and manholes. Pay particular attention to keeping accurate and up-to-date records in the Inspector's Daily Report of all items related to measurement for payment and any measurements, calculations, and dimensions to support compliance or non-compliance to the contract plans and specifications. Specifically note the disposition of traffic control operations, any damage to pavement or structures, and any directives given the Contractor regarding corrective actions. This documentation will be valuable in the event that the Contractor files a claim for work performed on the project.



**240.5 MEASUREMENT FOR PAYMENT**

Cleaning culvert, inlets, and manholes will be measured and paid at the contract unit price based on the number of linear feet (meters) of each size of culvert cleaned. Measure the length along the centerline of the culvert, including branch connections (e.g., tees, wyes, elbows). For skewed and sloped conduit, measure the length along the invert. The portion of culverts extending through to the inside face of headwalls, wingwalls, manholes, inlets boxes, and other similar structures will be included in the measurement. This will be full compensation for performing acceptable work, including all labor, tools, equipment, supplies, and incidentals. In general, maintain project records in such a manner that partial progress and final payments can be easily and clearly supported by data (e.g., when the work was completed, measurements and calculations to support the quantity and quality allowed). Initial all records, calculations, and measurements.