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DIVISION 16
EROSION CONTROL AND ROADSIDE DEVELOPMENT

GENERAL

The Department's guiding principle is "**We will not sacrifice safety or environmental protection in order to expedite delivery of a project**."

The Department is committed to the prevention of erosion and sedimentation. In order to accomplish this goal, we must stop eroded material from leaving the project, establish permanent controls as soon as possible, and enhance the appearance and maintainability of the roadside.

Temporary devices are to be used to prevent and/or control erosion during construction of the project. Permanent devices are to be placed as soon as possible. Early establishment of permanent devices reduces the potential for erosion and sedimentation. **Early permanent seeding and mulching is a requirement of this section (Article 1660-3).**

In the year 2000, Chief Engineer Goins issued a memorandum which provided erosion control policy and procedures. This memo continues to provide guidelines for the Engineer's staff and is supplemented by the **Erosion & Sediment Contol/Stormwater Certification** program and provisions. The Chief's letter is provided at the end of this section.

When permanent devices are installed, the temporary erosion control measures must be maintained until the final features are established. Temporary devices should be cleaned and removed as soon as the permanent devices are established and the erosion controlled.

The devices in this section have been designed to serve a particular function and must be built according to the design standards in order to accomplish their intended purpose. Even though many of these devices are temporary, they are just as important as other items of construction in the contract. Therefore, the same inspection standards and attention must be applied to ensure that they are properly installed and maintained.

The Contractor is responsible for providing a Level II Certified Erosion and Sediment Control/Stormwater Supervisor. Among the duties of this Level II Supervisor is the responsibility for completing the weekly NPDES form SPPPForm30. This form is found at http://www.ncdot.org/doh/operations/dp_chief_eng/roadside/fieldops/downloads/. In addition to the Contractor's Level II Supervisor, the Department will have a Level II Representative who will review and sign the completed form. Additional instructions for compiling the form can be found at the referenced website.

It is best to have one Technician who is responsible for reviewing the installation and maintenance of erosion control devices. This Technician should be identified as the Erosion Control Coordinator at the preconstruction conference. They must understand the importance of and be dedicated to controlling the erosion on the job. They should also be given the authority to make the necessary decisions and the support and backing necessary to get the job done. This Technician should develop a relationship with the Contractor so the Contractor does not have several people coming to him asking that other things be done. This individual must make frequent inspections (no less than once weekly and after each ½" rain event) of all erosion controls and be sure that they are effective and in place for the next rain. This inspection should include sections of the project that are idle. All project personnel should continually look for and be aware of the erosion control needs and discuss them with the Erosion Control Coordinator. There are several forms that are required to document inspections, rainfall and responses. These forms are located on the web at http://www.ncdot.org/doh/operations/dp_chief_eng/roadside/fieldops/downloads/. They include a weekly erosion control inspection form, an NPDES Inspection form and a Response for

Erosion Control form. These forms are required and important for the Department's continued program delegation.

Article 107-13(G) of the Standard Specifications list sanctions that may be applied if the Contractor does not fulfill any of the erosion control requirements.

On February 25, 1991 the NC Sedimentation Control Commission (SCC) re-extended the authority to the NCDOT to administer its own Sediment and Erosion Control Program within the jurisdiction of its activities. The Division of Land Resources , Land Quality Section reviews the NCDOT's program on an annual basis. Land disturbing activities within the NCDOT must be in compliance with the Sedimentation and Pollution Control Act (SPCA) of 1973.

Construction and Maintenance projects are reviewed by either the Roadside Environmental Field Operations Engineer or Technician on a monthly basis to check for compliance with SPCA. . A report is compiled listing comments or actions that may need to be addressed. The 4 areas that are concentrated on are Installation, Maintenance and Effectiveness of the EC measures, and Plan Implementation. Then an overall grade is given. The grading scale is a follows: 10-Excellent, 9-Very Good, 8-Good, 7-Fair, 6 or below is unacceptable.

Immediate Corrective Action (ICA) and Notice of Violation (NOV) Process

ICA

If the Field Operations Engineer or Technician gives a project an overall grade of 6 or below, the project will receive an Immediate Corrective Action (ICA). (Things that would warrant an immediate ICA are no EC plan, earthen dike, equipment in streams, lack of perimeter measures, etc.) When an ICA is issued the District or Resident Engineer must respond and begin corrective actions within 24 hours. It is recommended that grading operations be suspended until the ICA is lifted.

The ICA process was revised by the State Highway Administrator's memorandum dated January 23, 2012. The revision includes the implementation of an Immediate Corrective Action Extension (ICAEX) component and a Continuing Immediate Corrective Action (CICA) component, which is similar to the continuing Notice of Violation (NOV) process used by the regulatory agencies. The ICA process is as follows.

- **Immediate Corrective Action (ICA)** – an ICA will be issued when an erosion control inspection reveals that a project is in violation of the Sedimentation Pollution Control Act and/or the NPDES Permit and is given an overall grade of 6 or below. Once issued, the ICA status will remain in effect until corrective actions have been satisfactorily implemented. To ensure that compliance with the Sedimentation Pollution Control Act and/or the NPSEA Permit is regained, a follow-up inspection is conducted within five (5) working days after an ICA is issued.

- **Immediate Corrective Action Extension (ICAEX)** – Circumstances may warrant that an ICA remain in effect for an extended period of time after its issuance. If the follow-up inspection for the ICA reveals corrective actions are progressing but are not sufficient to justify lifting (removing) the ICA, an ICAEX will be issued. (Note: Projects are limited to only two (2) ICAEXs. If corrective actions are still not completed at the time of the follow-up inspection for the second ICAEX, a Continuing Immediate Corrective Action (CICA) will be issued.)

- **Continuing Immediate Corrective Action (CICA)** – A CICA is issued when the follow-up inspection for a second ICAEX reveals that little or no progress has been

initiated or additional corrective actions are needed to bring a project into compliance. (Note: the CICA component replaces the Repeat ICA on the Performance Dashboard Appraisal (PDA) environmental compliance metric for various positions.)

NOV

A NOV is a Notice of Violation given by the Land Quality Section of NCDENR for projects that are out of compliance with the SPCA 1973. Corrective actions should be taken immediately to resolve the NOV.

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

DAVID MCCOY
SECRETARY

January 21, 2000

MEMORANDUM TO: Division Engineers

FROM: J. D. Goins, PE
Chief Engineer - Operations

SUBJECT: Erosion and Sediment Control Practices on Contract Construction Projects

In July of 1992, then Chief Engineer Wayne Bailey, issued a memorandum establishing a policy for erosion and sediment control on construction projects. Since that time, the Department has undergone a significant amount of turnover in personnel. As a result, it seems appropriate to reissue the policy and revise any areas that may have been unclear.

Over the past two years, we have had several Notice of Violations (NOV) issued on our construction projects resulting from failure to satisfactorily install and maintain erosion control devices. Many of these were issued because established procedures for limiting and containing erosion and sedimentation were not followed. Some common problems included not installing devices as shown on the plans, failure to maintain installed devices, and failure to perform staged seeding. It is imperative that we remain proactive in dealing with erosion and sediment control to ensure that we protect the environment and maintain our delegation agreement with the Sedimentation Control Commission.

Attached is the revised policy for Erosion and Sediment Control Practices for Construction Projects. Please review this policy with your appropriate Division staff.

Any questions regarding this policy may be directed towards Mr. Steven D. DeWitt or Mr. Bill Moyers.

EROSION CONTROL POLICY AND PROCEDURES FOR CONTRACT CONSTRUCTION ACTIVITIES

Preconstruction Activity

The Resident Engineer is expected to review the erosion control plans with the inspection technician and engineering personnel who will be assigned to the project. This review should be accomplished prior to the preconstruction conference, such that any questions raised may be properly and expeditiously answered so a complete understanding of the plans is presented to the Contractor when questions arise. The Resident Engineer shall conduct this review. The Roadside Environmental Field Operations Engineer is to be asked to participate in the Resident Engineer's review of the plans with his project staff whenever the contract contains phased erosion control plans. If there are questions as to concept, intent, phasing, etc., the Roadside Environment Unit in the Central Office should be consulted to obtain necessary clarification.

Preconstruction Conference

The Division Engineer shall include the Regional Land Quality Engineer on the list of invited attendees for preconstruction conferences for projects involving significant land disturbing activities. As a part of the conference activity, erosion control shall be discussed in depth. It is important that subcontractors that disturb land as a part of their operations also attend the preconstruction conference. Particular emphasis shall be placed on the expectations of the Department with regard to individual and corporate attitudes toward erosion control. The Contractor and subcontractors should understand at the conclusion of the erosion control discussion that the Department will demand timely implementation of each erosion control measure or activity and that failure to respond in such a manner may lead to sanctions imposed under the provisions of Article 102-15 and/or Article 107-12 of the Standards Specifications.

Beginning of Construction

For each project involving land disturbing activities of one acre or more, the Resident Engineer shall notify the Regional Land Quality Engineer when construction has begun. As a part of that notification, the Resident Engineer shall advise the Regional Land Quality Engineer the name of the technician who will be on the project and be responsible for inspecting sediment and erosion control activities and who will be maintaining the continuously updated erosion control plans in accordance with the Department's program delegation. The Resident Engineer shall include as a part of the transmittal to the Regional Land Quality Engineer one set of erosion control plans for the project.

Inasmuch as it is the policy of the Land Quality Section to contact the project personnel when visiting NCDOT projects, other than semiannual rating visits, it is important that the person identified to the Regional Land Quality Engineer be consistently on the project. Should personnel requirements necessitate a change of assignment, the Regional Land Quality Engineer shall be notified. It is important that the technician selected to represent the Engineer be a person who will be on the project the majority of the time; be a person who champions timely, proper and effective erosion control techniques; and be a person who, most importantly, will portray a positive image to the Land Quality staff.

Monthly Construction Conferences

For contract construction projects, recurring monthly conferences have long been the Department's standard practice. The use of recurring dates, such as the 3rd Tuesday, allows all participants to plan their schedules. Such a practice shall be established for each project involving significant land disturbing activities, and the Regional Land Quality Engineer should be notified of the recurring date, time, and location of the construction conference. Whether or not the Regional Land Quality staff choose to attend, erosion control shall be discussed and documented at each conference. It is expected that the Contractor's future grading activities be closely coordinated with needed erosion and sediment control measures, such that the needed devices are in-place before the areas are disturbed and sediment loss risks have increased.

During Construction

During construction of the project, the Resident Engineer shall take the necessary measures to ensure that the project is constructed and maintained in accordance with the erosion control plans. Any modifications to the erosion control plans necessary to meet field conditions shall be clearly indicated on the set of erosion control plans maintained on the project. In order to ensure that all measures are installed and maintained as necessary, the following procedures shall be followed.

1. Before any land-disturbing activity begins, the Contractor shall be specifically advised that he must install all the required perimeter controls and/or other appropriate measures must be installed before beginning grubbing on the project site and creating erodible surfaces. Grubbing is not to begin until proper sediment control devices are in-place.
2. Maintain a set of **as-constructed** Erosion and Sediment Control Plans (E&SC) on the project, available on-site during business hours that denote the erosion and sediment control devices that have been installed on the plans with a date and initials, including dimensions and measurements. Also include any modifications to the E&SC plans with notes regarding the details of the changes.
3. Note Stormwater Discharge Outlets on the plans or document discharge points with NPDES reports.
4. Periodic erosion control reviews of the project site are imperative. These shall be weekly, at a minimum, and after every significant rainfall. The Resident Engineer shall take into consideration such factors as exposed acreage and the phase of construction during this evaluation. These reviews will be conducted by the Contractor's Level II Supervisor in conjunction with the Department's representative.
5. After each erosion control review the Contractor shall provide a deadline for corrective action.
6. The Resident Engineer shall develop a follow-up process to ensure that corrective measures are implemented. Failure on the part of the Contractor to complete the items noted on any erosion control review list by the established deadline, may result in suspension of the work until all items have been completed.
7. Early establishment of permanent vegetative ground cover is an essential step in the erosion control process. This shall be accomplished by staged seeding. Any exposed areas shall be seeded within the requirements of the most current NPDES permit and project provisions. **The most current NPDES permit and project provisions establish Ground Stabilization Time frames of 7 or 14 days based on the site area. (See the Ground Stabilization Chart at the end of this section.)**

8. Fertilizer top dressing shall be applied to all permanent stands of grass each spring and fall for the duration of the project.

Stabilization Requirements

Site Area Description	Stabilization Time Frame	Stabilization Time Frame Exceptions
Perimeter dikes, swales, ditches and slopes	7 Days	None
High Quality Water (HQW) Zones	7 days	None
Slopes steeper than 3:1	7 days	If slopes are 10' or less in height and are not steeper than 2:1, 14 days are allowed
Slopes 3:1 or flatter	14 days	7 days for slopes greater than 50' in length
All other areas with slopes flatter than 4:1	14 days	None (except for perimeters and HQW Zones)

Whenever an Immediate Corrective Action (ICA) or a Notice of Violation (NOV) is issued for a project, all land disturbing activities on the project shall cease. In addition, should the Contractor no institute immediate corrective action, all work on the project may be suspended.

The Contractor shall begin corrective action within 24 hours of notification of an ICA or NOV. Should the Contractor not institute such corrective action, the Resident Engineer shall contact the Division Engineer. The Division Engineer will arrange for the use of state forces, trained in the proper installation of erosion and sediment control devices, to implement the corrective measures necessary to bring the project into compliance.

Additionally, when a NOV is received, the Resident Engineer shall write the Chief Engineer – Operations, through the Division Engineer, describing the deficiencies that caused the NOV to be issued, the actions taken to satisfy the NOV, and the measures the Resident Engineer has taken to ensure that there will be no reoccurrence.

Final Notification

The Resident Engineer shall notify the Roadway Construction Engineer three weeks prior to the anticipated completion of any project involving major land disturbing activities. Serving as facilitator, the Roadway Construction Engineer in cooperation with the Resident Engineer, Division Construction Engineer, and Roadside Field Operations Engineer will review the project, including waste and borrow sites. The review shall address the retention of temporary measures, status of permanent measures, supplemental and repair seeding, and fertilizer top dressing. Borrow and waste sites shall be treated in the same manner as the project itself.

The review is intended to identify a plan to accept the project from the Contractor in a condition that will satisfy the Department's sediment and erosion control responsibilities. A mature stand of vegetation on all previously disturbed areas is the ultimate objective for acceptance of the project for maintenance. This will require the cooperation of the Contractor in

finishing graded slopes as soon as feasible, such that seeding and mulching can occur. This objective needs to be built into all planning on the project from the time of the preconstruction conference.

Consistent emphasis from the Resident Engineer is essential to ensure that all erosion control responsibilities are met.

A GOOD PHILOSOPHY

1. **Treat erosion control like it is going to rain every day.** (If not, you will get into trouble. It is easy to say that there is no rain in the forecast and, therefore, erosion control is not pursued as it should be).
2. **Ensure the Contractor completes Form SPPPForm30 every week with a deadline for the needs to be corrected.**
3. **Review the required corrective actions listed on Form SPPPForm30 and stop work when the required erosion control measures are not being installed or maintained.**
4. **Make an inspection during heavy rains or as soon as possible thereafter.** (This will highlight potential problem areas and help you decide what needs to be done to control the erosion).

The following actions should be employed by all project personnel to prevent NOV's (Notice of Violation):

- Install and maintain erosion and sedimentation measures according to erosion control plans.
- Modify size and location of erosion and sedimentation measures for specific site conditions and note on plan.
- Apply mulch and seed to cover all bare soil and exposed slopes.
- Establish and maintain buffer zones adjacent to streams.
- Keep all equipment out of the streams unless permitted.

INSPECTION RECORD FOR ACTIVITIES UNDER STORMWATER GENERAL PERMIT NCG010000

SELF-INSPECTION RECORD FOR LAND DISTURBING ACTIVITIES PER § 113A-54.1
RESPONSE FOR EROSION CONTROL FORM 1675

PROJECT LOCATION _____ **TIP #** _____
LEVEL II SUPERVISOR _____ **COUNTY** _____
CONTRACTOR _____

All erosion and sedimentation control measures and stormwater discharge outfalls must be inspected at least once (twice, if on 303(d) listed stream impaired by turbidity, see *http://portal.ncdenr.org/c/document_library/get_file?uuid=d8cf0cc2-6d8d-47e8-96e6-f769fca0cca4&groupId=38364* **, per seven calendar days and within 24 hours of a rainfall of 0.5 inch per 24 hour period. Permittee must keep a record of inspections. Attach Multi Precipitation Estimator (MPE) rainfall data for weekly period. If using on site rain gage, complete daily rainfall measurement.**

Day	Date	Rain Amt (in)	Notes
M			
T			
W			
Th			
F			
Sat			
Sun			

Phase of Grading (Place a check in the box of the current project phase)	
Installation of perimeter erosion and sediment control measures	
Clearing and grubbing of existing ground cover	
Completion of any phase of grading of slopes or fills	
Installation of storm drainage facilities	
Completion of construction or development	
Establishment of permanent ground cover sufficient to restrain erosion	

Has all land disturbing activity been completed? (Y/N) _____
Has the final permanent ground cover been completed and established? (Y/N) _____

By this signature, I certify (in accordance with Part II Section B, 10 of the NCG010000 permit) that this report is accurate and complete to the best of my knowledge:	
Cert. Level II Supervisor	**Cert. #**
NCDOT Cert. Level II Representative	**Cert. #**

Stormwater Discharge Outfalls (SDO) (Required to list during each inspection)			Sheet __ of __			Visible Sedimentation and Stream Turbidity	
Inspection Date	Station Number	Corrective Actions Taken	Priority *	Date Corrected	**Other Pollutants	***Sediment Deposited	****Stream Clarity

* R=Routine, needs attention within 5 days; U=Urgent, needs attention within 24 hrs.	**Is there evidence of other pollutants discharging from site such as oil sheen, discoloration, cement wastes, sanitary waste, fertilizers, or fuel or storage leakage? (Y/N) **If Other Pollutants is marked Yes, describe extent of discharge and list the corrective actions taken.	***Is there any visible sediment deposited in a stream, wetland, buffer or adjacent property? (Y/N) *** Contact DWQ/DLR-LQ within 24 hours if visible sediment is deposited in surface waters or wetlands.	****Is there any visible decrease in stream clarity (increase turbidity-cloudy) because of a discharge? (Y/N)

Erosion & Sedimentation Control Devices

(Required to list all devices that need maintenance)

Sheet __ of __

Inspection Date	Station Number	Corrective Actions Taken	Priority *	Date Corrected

***R=Routine, needs attention within 5 days; U=Urgent, needs attention within 24 hours.**

RESPONSE FOR EROSIN CONTROL INSPECTIOR'S DAILY REPORT SUBSTITURE FORM 1675			
Pay Item	**Standard/Metric Unit**	**Quantity**	**Comments**
Temporary Silt Fence	LF M		
Special Sediment Control Fence	TN/MTN LF/M		
Temporary Mulching	AC HA		
Seed - Temporary Seeding	LB KG		
Fertilizer - Temporary Seeding	TN MTN		
Matting for Erosion Control	SY M^2		
Coir Fiber Mat	SY M^2		
Coir Fiber Baffles	LF M		
Perm. Soil Reinforcement Mat	SY M^2		
Seeding and Mulching	AC HA		
Seed - Repair Seeding	LB KG		
Fertilizer - Repair Seeding	TN MTN		
Seed for Supplemental Seeding	LB KG		
Fertilizer Topdressing	TN MTN		
Response for Erosion Control	EA EA		
Safety/Highly Visible Fencing	LF M		
We agree that this is the work to be performed		We agree that this work was performed	
NCDOT Representative:		NCDOT Representative:	
Prime Representative:		Prime Representative:	
Date		Date	

SECTION 1605
TEMPORARY SILT FENCE

Silt fences do not have the velocity retarding capabilities of the checks and filters; therefore, they cannot be used where the run-off velocity is very high. These fences are commonly used at the toe of fill slopes and adjacent to streams and channels. Ensure the silt fence is maintained. The maintenance of this device is incidental, and the Contractor may have to be urged with persistence to perform this maintenance. Use the weekly erosion control check list to track notification and completion of silt fence maintenance. Article 104-5 does not apply to temporary silt fence. No adjustment in compensation is allowed for overruns or underruns.

1605-3 CONSTRUCTION METHODS

The project Erosion Control plans should be compared to the project Permit Drawing to ensure that silt fence is permitted as shown in the Erosion Control Plan. Place silt fence in a location where the accumulation of silt against the fence, will not violate a permit condition. Provide breaks in the silt fence using special sediment control fence and stone where the area may be inundated during storm events. These special sediment control fence and stone will allow the flow of water without pushing over the silt fence. Prior to installing special sediment control fence and stone in a permitted area, ensure the permit allows for its use as the stone is considered temporary fill and the permit conditions must allow its use. The installation of this device is shown in Roadway Standard Drawings No. 1605.01. The locations shown on the erosion control plans have been selected to provide the proper control for the area. However, it is important to realize the determination was made before the area was cleared and with limited information of the actual conditions. Therefore, it is up to the Technician to make a judgment as to whether additional fencing is needed. **All changes that are made should be noted on the erosion control plans**. The quantity shown is only an estimate but normally should be the minimum amount used in the area.

The installation of all silt fencing should be accomplished before it is needed and as early as possible. When shown on the clearing and grubbing erosion control plans, silt fence should be installed before the clearing and grubbing operation gets to the area or as the clearing and grubbing is being done. Keying in the bottom of the fence and fabric is of utmost importance. If water can get under the fabric, it not only renders the silt fence ineffective but may also cause additional erosion and sedimentation.

1605-4 MAINTENANCE AND REMOVAL

Silt fence should be inspected at least weekly and after each rain to ensure that it is not overtopped, undermined, or broken down. If it is, immediate attention is required before the next rain because it evidently did or tried to do its intended job. The need for maintenance is an indication that the silt fence was necessary and working and should be repaired as soon as possible. If the silt fence is overtopped frequently, other devices should be considered either as a replacement or as an addition to the fences.

Once permanent erosion controls are established in the area, the Technician should consult with the Engineer to determine if the fence should be removed. However, if the permanent controls are not well established at the end of the project, these devices may have to be left-in-place to be removed by the Maintenance Department when they are no longer needed. Leaving or removing erosion control measures should be discussed prior to and during the final inspection. Every effort should be made to remove all unneeded silt fence before the final

inspection because the bid price includes its removal. Before the fence is removed, all accumulated silt is to be removed and disposed of properly. After removal, the entire area is to be properly graded and seeded immediately. The removal of the silt is paid for as **Silt Excavation** unless its existence is due to the negligence of the Contractor.

1605-5 MEASUREMENT AND PAYMENT

The requirements of Article 104-5 for overruns and underruns do not apply to this item. There can be no revision in unit price for overruns or underruns of this item.

TECHNICIAN'S CHECKLIST
SECTION 1605
TEMPORARY SILT FENCE

1) Check the environmental permits to ensure that silt fence is placed in the proper location and in accordance with the permit drawings and provisions. Ensure the silt fence materials meet the requirements of Sections 1605 and Section 1056. Class A silt fence is only permitted in conjunction with woven wire. Use CI B silt fence otherwise.
2) Ensure silt fence is being installed in advance of the need to contain sediment.
3) Make any necessary additions in silt fence.
4) Ensure that materials are installed according to plan details. (See Roadway Standard Drawing No.1605.01)
5) Remove silt accumulation when silt reaches half the height of the silt fence and dispose of waste properly.
6) Measure the silt removed for payment.
7) Remove silt fence when the permanent controls have been established.

SECTION 1606
SPECIAL SEDIMENT CONTROL FENCE

Special sediment control fence is generally used in conjunction with silt fence to provide outlets for water that can be trapped by silt fence. It is also useful in area near flowing water to permit tides and surges to cross the fence without knocking it down.

1606-3 CONSTRUCTION METHODS

Ensure posts meet the requirements of 1605-2(A). All posts may appear similar however it is imperative that a properly sized post is utilized to reduce the occurrence having the fence bend over from pressure.

Once the fence is no longer needed, remove the posts, fence and sediment stone. Do not leave the sediment stone piled along the toe of slope and do not cast the stone into permitted areas.

TECHNICIAN'S CHECKLIST
SECTION 1606
SPECIAL SEDIMENT CONTROL FENCE

1) Check the environmental permits to ensure that the fence is placed in the proper location and in accordance with the permit drawings and provisions. Ensure fence materials meet the requirements of Sections 1606.
2) Ensure the fence is being installed in advance of the need to contain sediment.
3) Make any necessary additions in special sediment control fence.
4) Ensure that materials are installed according to plan details. (See Roadway Standard Drawing No. 1606.01).
5) Remove silt accumulation when silt reaches half the height of the stone and dispose of waste properly.
6) Measure the silt removed for payment.
7) Remove fence, posts and stone when the permanent controls have been established. Do not leave the stone piled at the toe of slope and do not place any stone in permitted areas.

SECTION 1607
GRAVEL CONSTRUCTION ENTRANCE

Gravel construction entrances are installed in an effort to clean vehicle tires prior to their leaving the project. If soil is tracked onto the roadway, it presents a potential safety hazard as well as offsite sedimentation.

1607-3 CONSTRUCTION METHODS

The gravel construction entrance is placed on geotextile to prevent having the stone become contaminated with the in-situ soil. If the stone become contaminated by vehicular use to the extent that the entrances is no longer functioning, it should be removed and replaced with clean stone.

Construct the entrance so that vehicles are corralled into using it. Use geotextile and Class A stone. If vehicles are having trouble entering the roadway on the Class A stone or if the Class A stone is being deposited onto the roadway by tandem tires, extend the length of the gravel construction entrances so that 50' is Class A stone and a length sufficient for vehicles to safely gain traction and enter the roadway without depositing Class A stone is added and covered with ABC stone.

TECHNICIAN'S CHECKLIST
SECTION 1607
GRAVEL CONSTRUCTION ENTRANCE

1) Ensure the planned entrance location provides adequate site distance.
2) Ensure drainage is provided across the planned entrance.
3) Provide adequate radii for the anticipated traffic.
4) Monitor the roadway to determine is stone or soil is being deposited on the roadway and adjust the entrance length or geometry accordingly.

SECTION 1610
STONE FOR EROSION CONTROL

On most larger projects, it is desirable that stone for erosion control be stockpiled at one or more places on the job. It is important to keep these stockpiles as clean as possible so that when the stone is utilized in an erosion and sediment control device, proper water movement is obtained. Stockpiling is a good idea so that it is readily available when needed. The different sizes of stone must not be mixed.

1610-2 MATERIALS

Each size material has a particular function in the several devices in which it is used and substitutions should not be made without proper consideration of the reason for the design. The various classes of stone for erosion control, Class A, B, 1, and 2 rip rap are not graded stone and the acceptability of its gradation is left up to the Engineer. The gradation of sediment control stone can be controlled at the quarry and should meet the gradation requirements indicated in Section 1005.

1610-3 CONSTRUCTION METHODS

Prior to placing any stone for erosion control, ensure the permits allow its use. Even when stone is placed as part of an erosion control device, it is considered temporary fill. Each device has a particular function and must be built in accordance with the standard drawing and placed in the proper location. The lines, grades, and slopes should be proper, neat, and built without wasting or contaminating the stone.

1610-4 MEASUREMENT AND PAYMENT

It is best to pay for the stone as it is received but care should be taken that the stone is not wasted or misused. The specifications require payment for stone that is stockpiled at the Engineer's direction. Excessive stockpiling should not be permitted.

TECHNICIAN'S CHECKLIST
SECTION 1610
STONE FOR EROSION CONTROL

1) Use the proper size stone for the plan device.
2) Keep the stone in the stockpile clean and avoid contamination during loading.
3) Keep the different size stones in separate stockpiles.
4) Ensure that the stone meets the gradation requirements listed in Table 1042-1 of the Standard Specifications. If the stone does not meet these gradation requirements, the Contractor should be notified to correct the problem as soon as possible.
5) Monitor stockpiles to ensure that the stone is utilized for the intended purpose.

SECTION 1615
TEMPORARY MULCHING

Use temporary mulch to cover temporary seeding or bare ground. Temporary mulch is not intended as a long term ground cover. If the area to be covered will remain undisturbed for more than 30 days, temporary seeding is recommended for use with temporary mulch. In no case may exposed erodible slopes remain bare longer than permitted by the most recent NPDES permit. This mulch works by impeding the flow of water over the area, conserving moisture, providing shade, and by absorbing the energy of the rain drops before they hit the ground. Mulch is a benefit in holding the soil together as it is incorporated during the seed bed preparation for permanent seeding and mulching.

1615-2 MATERIALS

Refer to Article 1060-5 of the Standard Specifications. Typical examples of the mulch material are grain straw, wood chips, bark mulch, or emulsified asphalt. In case questions arise concerning the acceptability of certain materials, the Roadside Environmental Field Operations Engineer should be consulted.

1615-3 APPLICATION

A proper coverage is obtained when the ground is not visible from a distance of about 10 feet ahead of you. A proper coverage does not mean that you cannot see the ground when looking straight down however 75% of the ground should be covered when viewed from above.

Crimping is generally not allowed as a method to hold mulch. Review the project special provisions to determine if it has been included in your contract. When the Contractor has requested and received permission to hold the mulch in place by crimping, the mulch strands must be long enough so that they will stand up about 5 inches. After the crimping operation has been completed, a second application of mulch should be applied over the vertical strands. More grain straw per acre is normally required to achieve the proper coverage when crimping is used.

One of the most significant problems with mulch is that it can be displaced by traffic, wind, and rain. For this reason, it is very important to get a sufficient coverage of the binding material on the mulch as soon as it is placed. Insufficient tack will result in displacement of the mulch and the need to reapply and mulch and tack. When mulch is placed adjacent to the traveled lane and the road is open to traffic, or will be before the grass is high enough to hold the mulch, an extra heavy application of asphalt or other binding material needs to be applied to the area within 6 feet of the pavement. This applies even when the area has been crimped. Check the project special provisions to determine if crimping and a second application of mulch is required within 6’ of a travel lane.

In **high quality water zones** (these will be designated on the plans) asphalt is not desired as a binding agent. These areas are close enough to important waters that the asphalt run-off may endanger the fish population.

Great care should be used not to create ruts or to tear up the slope during the mulching or binder placement operations.

At the time that seeding and/or mulching is being performed, temporary erosion control devices are normally in place. These devices lose their effectiveness when they are clogged up with mulch. All mulch must be removed from these devices as soon as possible.

1615-4 MEASUREMENT AND PAYMENT

The method of measurement is by the acre; therefore, it is important that we receive the desired coverage and binding application when the mulch is initially placed.

If it becomes necessary to supplement an area previously temporarily mulched due to deterioration from weather, etc., it must be paid for if the Contractor initially placed it correctly. This reemphasizes the need for sufficient initial mulch and binder coverage. Temporary mulch used to cover temporary seed is made under this Article.

TECHNICIAN'S CHECKLIST
SECTION 1615
TEMPORARY MULCHING

1) Coverage should be visually checked at the beginning of the operation so that adjustments can be made if necessary (2 tons/ac, 75% complete coverage, no ground visible 10' ahead).
2) Is the area in a **high quality water zone**? Asphalt cannot be used as a binding agent in high quality water zones unless approved by the Roadside Environmental Field Operations Engineer.
3) Is the proper binding agent on site with the proper application equipment?
4) Check the rate of binding agent application to ensure that it will serve its intended purpose.
5) Check the project special provision to determine if crimping is required.

SECTION 1620
TEMPORARY SEEDING

Temporary seeding is intended to be a supplement to and not a substitute for other means for the control of erosion and sedimentation. Temporary seeding should be used when no work will be done on an erodible area for a period that does not exceed the requirements in the most recent NPDES permit for an area that is not to final line and grade. However, this should not be for the Contractor's convenience. The Contractor is responsible for continuously grading an area and bringing it to final line and grade for the purpose of permanent seeding and mulching. **If the area is ready, it should be completed, dressed, and permanently seeded rather than wasting money on temporary seeding.** If the effort to obtain a stand of grass is not successful the first time, additional efforts must be made to protect the area. Soil tests are recommended if an area has to be seeded more than once.

Temporary seeding must not be used as stage seeding. As a fill or cut is being constructed, the slope should be placed on grade and permanently seeded when it is about 10 feet high. In many cases, it can become impossible to get on steep slopes that are high or deep, so do the finish work as the slopes are being built and are accessible.

1620-3 CONSTRUCTION METHODS

This is just as important as the seed itself in getting a stand of grass. Every effort must be made to obtain a proper seedbed. On solid undisturbed earth, the seedbed depth should be approximately 5 inches. Just broadcasting seed, fertilizer, and mulch does not constitute temporary seeding. Some seeds cannot take very much cover so it is important to be sure that proper cover is applied.

TECHNICIAN'S CHECKLIST
SECTION 1620
TEMPORARY SEEDING

1) Permanently seed and mulch the area in lieu of temporary seeding if possible.
2) Advise the Contractor if the temporary seeding that has been requested will be at contract unit price or if the Department is not going to pay for seeding due to the Contractor’s negligence in performing continuous grading.
3) Provide ground cover to any exposed erodible slope that has remained ungraded for more than number of days allowed in the latest NPDES permit.
4) Ensure that a 5” seedbed has been established

SECTION 1622
TEMPORARY SLOPE DRAINS

Temporary slope drains are used to carry water down slopes without eroding the slope. Temporary slope drains are normally shown on the plans and are located to handle the volume of water expected in the area controlled by each drain. For this reason, it is important that they be placed as close as possible to the locations shown. The quantity shown should be the minimum installed. The addition of other drains is often necessary and is at the discretion of the Engineer.

1622-2 MATERIALS

Use plastic pipe and collars with a minimum diameter of 12". It is not necessary that sampling or testing be performed. However, it is essential that the drains be checked often to ensure that they are performing properly.

1622-3 CONSTRUCTION METHODS

(A) TEMPORARY SLOPE DRAINS AND BERMS -

Roadway Standard Drawing Number 1622.01

It is important that the temporary slope drains be installed early in the construction rather than to wait until severe erosion has occurred. Particular attention must be paid to the inlet, outlet, and joints as these are the areas where deterioration is most likely.

The berms built to direct the water to the drains must not be overlooked as to their height and width. Keep in mind that if the berm is topped or breached, the water will not get to the drain. It is also important that the berm not have roots and/or debris in it that would permit water to find its way through the berm. The grade of the ditch formed by the berm must also have sufficient fall to keep the water moving toward the drain and not allow ponding where it would top or weaken the berm. Some of these drains will be installed on fills that are still under construction, so it is very important that each inlet is open and that the water can get to it. If the inlet is inaccessible or is stopped up, the water will by pass it and may overtop the berm or overwhelm the drains below it. The inlet will have to be raised as the fill is constructed. This may entail adding new slope drain frequently when earthwork operations are moving well.

An anchor must be used every 10' to secure the slope drain on the slope to keep it from pulling away from the inlet protection and from possibly separating at the joints. These anchors are a part of the slope drain.

The pipe must always have an open outlet. If not, it will cause the pipe to pull apart or to separate, causing washes on the slope at the break. The pipe should also be long enough to reach the bottom of the slope to prevent washing at the end. The end of the pipe should also be turned in the direction of flow of the ditch at the bottom. In some cases, some type of erosion control may be needed at the outlet end. A silt basin or stone dissipater works well most of the time. If stone is used, be sure the end of the pipe is above the stone so the water empties onto the stone and not into it where the pipe may become blocked. Do not allow the end of the slope drain pipe to empty directly against silt fence. Turn the pipe instead.

Care must be taken to assure that the interface between the berm and the slope drain pipe is sealed completely. This is often hard to do if there are two pipes in one inlet. If two pipes are necessary, it is best that the two pipes be separated enough to get a good seal around each pipe separately. As the fill is built, the inlet of the pipe will need to be moved and new inlet protection will need to be installed. It is important that the inlets be located so that at least two

feet of fill can be placed before it is necessary to raise the inlet. Be sure that water can get to each inlet from the berm and that each inlet is open.

(B) OUTLET PROTECTION AT TEMPORARY SLOPE DRAIN

A basin should be installed at the inlet of the slope drain. The outlet should empty onto Class. B stone or into a basin. Ensure the outlet and end treatment are within the permitted footprint. If a basin is installed at the slope drain inlet, the grade will likely become saturated and require removal however, the basin will be easy to access and keep clean. If a basin is installed at the outlet of the slope drain, the grade is saved but the basin may not be assessable as the slope continues to rise. Tees and elbows may be required at slope drain inlets.

1622-4 MEASUREMENT AND PAYMENT

The length of pipe paid for at one location will be the actual maximum length of pipe used at that location. Payment for inlet protection will be made at the contract unit prices for the items involved. Tees and elbows are measured along the invert elevation and paid as temporary slope drain pipe. This article also requires that disturbed areas created by the removal of the slope drain be dressed, seeded, and mulched as a part of this item of work, and no separate payment is to be made for this work. The potential for an increased price due to and overrun or underrun, Article 104-5 Overruns and Underruns of Contract Items, does not apply to this item of work.

TECHNICIAN'S CHECKLIST
SECTION 1622
TEMPORARY SLOPE DRAINS

1) Construct inlets and outlets properly to prevent scour. (See Roadway Standard Drawing No. 1622.01)
2) Inspect the berm at least weekly to determine if overtopping is occurring. If so, additional slope drains are needed.
3) Utilize drains that are long enough to reach the toe of the slope and turn the pipe in the ditch line in the direction of the water flow.
4) If a basin is planned at the toe of the fill, review the permits to determine if it is permitted.
5) Stake the pipe at 10’ horizontal intervals.
6) Place the drains at the low point and no more than 200’ apart.
7) Keep the inlet clear so that water does not bypass the drain.
8) Keep the outlet clear.
9) As the pipe is extended, ensure standards for staking and inlet/outlet protection are met.
10) When the drain is removed, dress and seed the area at no additional cost.

SECTION 1630
CONSTRUCTION AND MAINTENANCE OF SILT DETENTION DEVICES

Silt detention devices should be located where they can be effective and controlled. This control includes cleaning, draining, and removal when necessary. If the device is located on the grade it is important to see that once the device is no longer needed, the area is cleaned dried and possibly undercut before it is covered in order to eliminate possible problems on the slope or in the roadway. Care should be taken to delineate their location for safety purposes, especially if they are very deep or are hidden by tall grass. Consider the safety of deep basins in urban areas and the geometry of all basins that are detailed within the clear roadside recovery area.

1630-2 CONSTRUCTION METHODS

The location, area, and depth of basins are important in that they are designed to handle the water run-off from the area that they are to control. Their purpose is to provide a surface area large enough to slow the speed of the water so that the silt will settle out. The location and size of silt detention basins must be continually monitored and adjusted as construction progresses. Basins are usually twice as long as they are wide. Basins are especially effective at inlets and/or outlets of pipes, in median and lateral ditches, in front of stone checks and at grade points. At drainage outlets, basins should have baffles. They serve as both sediment traps and as velocity checks for surface discharges when they are properly built and maintained. Once the area draining to the basin is stabilized with permanent vegetation, the basin should be removed.

Silt ditches and diversions are usually cut with either motor graders or small buckets and the excavated material is placed on the lower side of the ditch. These ditches are usually placed at the toe of fills, around waste areas, and on natural ground in cuts and in borrow pits. They are also used as diversion ditches across the project where culverts, pipes, or bridges are to be built. Silt ditches are used to control erosion, hold silt, and divert water through other devices so care must to be taken to ensure that they are graded to do the job. Silt ditches that are on the top of a hill will not hold any silt and should not be included in the volume of controls provided for the area when the reclamation plan calculations are approved. Use temporary seeding to stabilize the spoil pile placed on the back side of the ditch. The side slopes of temporary silt ditches and temporary diversion should not exceed 2:1. The typical depth excavated for a temporary silt ditch is 1’ while the combination of excavation and berm height for a temporary diversion totals 1’6”.

Maintenance of these devices is essential because water is concentrated and any breakthrough can cause more erosion than normal.

Any measure installed must be continuously maintained in order to be effective. When to clean out a silt detention device is a judgment decision. By close observation of a device, after its initial installation and after receiving discharge from one or more rains, it can be estimated how many rains of what type it can handle before losing its effectiveness. The rule of thumb is that the **basins should be cleaned when they are half-full.** This is so that there will be room for additional unexpected silt. The Engineer should expect that the next rain will be severe and to have the device ready to receive the water and silt. It is of utmost importance that the excavated material be removed from the area to prevent any wet and soupy material from finding its way back into the basin. It can also saturate the subgrade at that point. If the material is to be used on the grade, it should be spread in a thin enough layer to dry quickly. Be sure that the area where the wet material is to be disposed of is properly controlled for erosion.

1630-3 MEASUREMENT AND PAYMENT

Remember that silt can be similar to quicksand, so you must check to see that it is stable before trying to walk out on it to take cross-sections.

No additional payment will be made when silt detention devices are backfilled with material originating from and compensated as Silt Excavation. No additional payment will be made for removing materials used in the silt detention device and not utilized in the backfilling and shaping of the device to conform with the original ground contour. Utilize this excess material in roadway embankments or dispose of in accordance with Section 802.

The material used to backfill silt detention devices will be paid for when it is trucked to the site.

TECHNICIAN'S CHECKLIST
SECTION 1630
CONSTRUCTION AND MAINTENANCE OF SILT DETENTION DEVICES

1) Make the proper installation and maintenance of erosion control devices a critical portion of the Pre-Construction Conference.
2) Review the project environmental permits to ensure that devices shown on the erosion control plans do not violate the permits.
3) Review permits to determine if silt excavation is permitted as shown in the Erosion Control plans.
4) Install all devices shown on the Erosion Control Plans or have changes approved by the Engineer.
5) Install devices as shown in the Roadway Standard Drawings taking care to ensure that water is provided a path to enter into or pass through the device.
6) Prepare “as-built” drawings indicating changes using various colors. Have the Roadside Environmental Field Operations Engineer review and initial these changes during their reviews.
7) Perform an inspection of all erosion control features at least weekly and after each significant rainfall.
8) Document the inspection on a form that provides instructions to the contractor and abatement dates.
9) Advise the Engineer when erosion control devices are not installed or maintained by the abatement date shown on the erosion control inspection report.
10) Clean silt detention devices when they are no more than 50% full.
11) Remove devices as appropriate for the next phase of construction or when the final stand of vegetation has been established.

SECTION 1631
ROLLED EROSION CONTROL PRODUCTS

These devices are to be used when normal seeding and mulching will not provide the needed erosion controls. They have the added properties of being able to hold the soil better and more quickly by impeding the velocity of the water (thus, reducing the washing effect), providing the needed protection for the seed, conserving moisture If the area has been a problem because of washing, care should be taken to use the proper device. If the volume of water is more than can be controlled by these devices an alternative should be considered.

The proper grade of ditch liner should be specified based on the anticipated water velocity. The use of straw matting is considered appropriate up to water velocities of 2 feet per second (fps), Excelsior matting up to 5 fps, and PSRM matting up to very high velocities. There are other products that may be utilized in special circumstances, and consultation with the Roadside Environmental Field Operations Engineer is recommended.

None of this matting will work unless installed correctly. Bury the upgrade end 5" and staple the matting along the outer edges and down the center of each strip of matting 3 feet apart or as shown in product recommendations

TECHNICIAN'S CHECKLIST
SECTION 1631
ROLLED EROSION CONTROL PRODUCTS

1) Review permits to determine if rolled products are prohibited.
2) Ensure that the material to be used meets the requirements of Article 1054-5 or Article 1060-8.
3) Use the proper type of lining for the ditch grade and water velocity.
4) Use a sufficient width to accommodate the volume of water anticipated.
5) Ensure that the stapling and/or staking is done immediately and that the material is trenched in at the proper intervals as detailed in the specifications at least every 50 feet along the ditch.
6) Ensure that the matting is buried at the beginning edges of all rolls and at the leading edge of the ditches in a narrow trench at least 6" deep. Overlap ends 4". Construct staple checks 4" on center and 30' longitudinally.
7) Staple ends, lapped edges and junctions 10" apart. Staple outer edges and down the center of each strip of matting 3' apart.
8) Ensure netting is on the top side when excelsior or straw matting is used.

SECTION 1632
ROCK INLET SEDIMENT TRAP

Rock inlet sediment traps are typically placed where they are subject to be struck by an out-of-control vehicle. For this reason, they need to be built with the proper size stone since large stone can be a traffic hazard.

1632-3 MATERIALS

When the trap is built in a ditch line having single direction flow, the sides should be extended far enough up the slope so that water will flow over the trap and into the box before it would bypass the trap and the box and overload the other boxes downstream. The inlet protection should be maintained as the drop inlet or apron construction ensues.

Do not build rock inlet sediment traps in locations and to elevations that cause standing water in an open travel lane. Once devices have been installed, ride the project during a rain event. If that rain inspection reveals the possibility that water may back up into a travel lane, consult the Engineer for an alternative but equal device.

1632-4 MAINTENANCE AND REMOVAL

It is very important to keep the stone clean. When the stone becomes clogged it acts as a dam. The device is designed to allow water to flow through the stone. Adding stone over dirty or clogged stone will not solve the problem. Maintenance is essential. Before these traps are removed, the ditch and the area it drains must have established permanent erosion controls. The determination to remove a rock inlet sediment trap from service at the end of the project should be made after considering whether there is any advantage to the Division Maintenance forces to leave it in place. Many times, the completed project will not become stable from an erosion control standpoint for some time, so some of the temporary devices may need to be left in place and removed by Department forces at a later date. If the device is to be left on the project after its completion, the device must be clean and in proper shape at the time of the final inspection. If it is to be removed, all accumulated silt should be removed to keep it from entering the boxes.

TECHNICIAN'S CHECKLIST
SECTION 1632
ROCK INLET SEDIMENT TRAP

1) Check the plans for the proper type of Rock Inlet Sediment Trap.
2) Maintain the device during ensuing drainage structure construction.
3) Keep the sediment stone clean and free of debris.
4) Ensure water will not back up into a travel lane.

SECTION 1633
TEMPORARY ROCK SILT CHECKS

Temporary Rock Silt Checks are placed to reduce the water velocity and provide sufficient capacity to hold the volume of silt expected. Type A Temporary Rock Silt Checks utilize both No. 57 Stone and Class B stone and are used to reduce velocity and trap sediment. Type B Temporary Rock Silt Checks utilize only Class B stone and are intended to reduce runoff velocity. A rule of thumb for placing Type B Temporary Rock Silt Checks is that they are placed where the base of the upstream dam is not higher than the top of the downstream dam. This depends on the drainage area and the type of soil and other factors. It is, therefore, important to put in at least as many as are shown on the erosion control plans.

1633-3 CONSTRUCTION METHODS

The construction of Temporary Rock Silt Checks is of utmost importance in that they are designed to slow down and therefore pond water on the upstream side. This creates hydraulic pressure and water will try to get over, under, around, and/or through the check. It is important that the water be directed where it will not cause additional erosion under or around the sides of the check. For this reason, the weir or throat must be properly sized and built. Keying in the stone tail ditch is important in that it slows the water and brings it back to the ditch flow line. No value is received from stone that is placed on the sides higher than the expected high water elevation. **Also, a pile of stone just dumped into a ditch line does not constitute a proper rock check.**

1633-4 MAINTENANCE AND REMOVAL

It is important that these checks be kept clean and allow the water to flow through the stone because they are supposed to pond water for only a short period of time. These checks can become stopped up with silt, straw, grass clippings, and other items. It is not proper just to add stone to the face of a stopped up check instead of cleaning the existing stone. The clog will still remain. The determination to remove a rock silt check device from service should be made after considering whether there is any advantage to the Division Maintenance forces to leave it in place. Many times, the completed project will not become stable from an erosion control standpoint for some time, so some of the temporary devices may need to be left in place and removed by Department forces at a later date. If the device is to be left on the project after its completion, the device must be clean and in proper shape at the time of the final inspection. If it is to be removed, all accumulated silt should be removed and the area dressed and seeded.

1633-5 MEASUREMENT AND PAYMENT

When the silt is removed from in front of the check, it is paid for as “Silt Excavation.” There is no additional pay for maintaining or removing the device.

TECHNICIAN'S CHECKLIST
SECTION 1633
TEMPORARY ROCK SILT CHECKS

1) Build checks at the frequency shown in the Erosion Control Plans.
2) Install weir sections to permit water to flow over the stone, not around it.
3) Construct the elevation of the throat lower than the elevation where the stone ties into the ditch banks.
4) Install a silt basin if needed just upstream of the check.
5) Once the checks shown on the plans are installed, determine if there are a sufficient number of checks to keep the velocity of the water low enough to minimize erosion of the ditch.
6) Keep the checks clean.

SECTION 1634
TEMPORARY ROCK SEDIMENT DAMS

Temporary Rock Sediment Dams have the same purpose as the temporary rock silt checks but are much bigger and are intended to hold the water for a longer period of time. However, some deposition is expected as the water is drained from the area over a period of time. These devices are placed to reduce the water velocity and to provide sufficient capacity to hold the volume of water and silt expected from the area it is intended to control.

CONSTRUCTION METHODS

The Temporary Rock Silt Dams are designed to slow down and pond water on the upstream side. This creates hydraulic pressure, and the water will try to get over, under, around, and/or through the dam. It is, therefore, important that the water be directed where it will not cause additional erosion under or around the sides of the device. For this reason, the weir or throat must be properly sized and built. Water must be able to flow over the weir before it will go around the dam. **Also, a pile of stone just dumped into a ditch line does not constitute a proper rock dam. Do not use temporary rock sediment dams in a live stream.**

(A) TYPE A

No value is received from stone that is placed on the sides higher than the expected high water elevation. These are large dams and may be the last device that water will pass through prior to leaving the project. Use the proper sized stone and weir width. Do not exceed 8' in height.

(B) TYPE B

The weir or throat and the stone run-off tail ditch must be properly sized and built (see the Standard Drawing).

Keying in the stone tail ditch is important in that it slows the water and brings it back to the ditch flow line. No value is received from stone that is placed on the sides higher than the expected high water elevation.

1634-4 MAINTENANCE AND REMOVAL

It is important that these dams be kept clean and allow the water to flow through the stone because they are supposed to pond water for only a short period of time. These dams can become stopped up with silt, straw, grass clippings, and other items. It is not acceptable to just add filter stone to the face of a stopped up check instead of cleaning the existing stone. The clog will still remain. The determination to remove a temporary rock sediment dam from service should be made after considering whether there is any advantage to the Division Maintenance forces to leave it in place. Many times, the completed project will not become stable from an erosion control standpoint for some time, so some of the temporary devices may need to be left in place and removed by Department forces at a later date. If the device is to be left on the project after its completion, the device must be clean and in proper shape at the time of the final inspection. If it is to be removed, all accumulated silt should be removed and the area dressed and seeded.

TECHNICIAN'S CHECKLIST
SECTION 1634
TEMPORARY ROCK SEDIMENT DAMS

1) Review permits to determine if dam installation is permitted.
2) Locate dams as shown on the Erosion Control plans to control the velocity of water.
3) Construct the dam with a throat that is low enough to ensure that the water will go over the dam before it will go around it and washes out the adjacent ditch slope.
4) Install the proper type of dam based on the planned volume and velocity of water. The greater the anticipated volume and velocity of the water, the larger the structural stone and higher the device should be.
5) Before the dam is removed, ensure the drainage area is stabilized with permanent vegetation.

SECTION 1635
ROCK PIPE INLET SEDIMENT TRAP

Pipe inlet sediment traps are designed to keep silt and debris from getting into the pipe and drainage systems and discharging off the project. They are designed to allow water to flow through and over them. Slowing and ponding the water allows the silt to settle out. Pipe clean out is not a pay item on new pipe laid by the Contractor so it is important to keep pipes as clean as possible at all times.

The fact that the pipe inlet sediment trap may not be accessible after the fill is built may have a bearing on how the device is built. If the device is not going to be cleaned and may have to be removed or breached by hand, the following conditions should be considered: (1) the area where the sedimentation will occur may need to be dug out so that the silt will not leave the site or make the water bypass the pipe, (2) the trap may need to be bigger in radius to provide more filtration area before the trap is topped, (3) a throat may need to be placed in the trap so that water will not bypass the pipe if the trap is stopped up, and (4) the stone should be of a size that can be moved by hand because the trap should be breached when the area's permanent erosion controls are established.

1635-3 CONSTRUCTION METHODS

(A) TYPE A

The Type A trap is larger than the Type B Trap and is designed for pipes 24 inches to 36 inches in diameter. The Standard Drawing shows a true radius but the actual device is to be built to fit the area and to serve the purpose. The purpose of the area in front of the pipe where there is no stone is to allow clean out when necessary. This area should be large enough so that the cleaning can be done with the machinery on the job. It should also be large enough so that the end of the pipe is not damaged during the clean out and so the pipe will not be undermined if the silt is removed below the bottom of the pipe. Since the pipe has been sized for the expected flow, the height of the trap should be about the depth of the pipe or higher. The stone stabilization on the slope should be carried to a height above the top of the pipe and at least as high as the top of the trap. Be sure that the water will flow over the trap before it will wash between the trap filter stone and the slope. It is desirable to leave a throat in the rim of the trap to ensure that this will happen. The water should only rise and fall on the slope and should not run along it.

(B) TYPE B

The Type B trap is smaller than the Type A Trap and is designed for pipes 18 inches and smaller. The Standard Drawing shows a true radius but the actual device is to be built to fit the area and to serve the purpose. The purpose of the area in front of the pipe where there is no stone is left is to allow clean out when necessary. This area should be large enough so that the cleaning can be done with the machinery on the job. It should also be large enough so that the end of the pipe is not damaged during the clean out and so the pipe will not be undermined if the silt is removed below the bottom of the pipe. The stone stabilization on the slope should be carried to a height above the top of the pipe and at least as high as the top of the trap. Be sure that the water will flow over the trap before it will wash between the trap filter stone and the slope. It is desirable to leave a throat in the rim of the trap to ensure that this will happen. The water should rise and fall on the slope only, not run along it.

1635-4 MAINTENANCE AND REMOVAL

It is important that these traps be kept clean and allow the water to flow through the stone because they are designed to pond water for only a short period of time. These traps can become stopped up with silt, straw, grass clippings, and other items. It is not acceptable to just add filter stone to the face of a stopped-up trap instead of cleaning the existing stone. The clog will still remain. Remember that the pipe was placed at the proper location and is to carry the water. If the trap is stopped up and the water bypasses the pipe, it could overload other pipe and cause more erosion problems.

The determination to remove a rock inlet sediment trap from service should be made after considering whether there is any advantage to the Division Maintenance forces to leave it in place. Many times, the completed project will not become stable from an erosion control standpoint for some time so some of the temporary devices may need to be left in place and removed by Department forces at a later date. If the device is to be left on the project after work has stopped, the device must be clean and in proper shape at the time of the final inspection. If it is to be removed, all accumulated silt should be removed and the area dressed and seeded.

TECHNICIAN'S CHECKLIST
SECTION 1635
ROCK PIPE INLET SEDIMENT TRAP

1) Review the permit to ensure that rock may be placed as shown on the erosion control plans.
2) Install the proper type of trap to match the pipe size.
3) Clean sediment from in front of the trap as necessary.
4) Maintain a sufficient area between the pipe and the trap to allow for cleaning.
5) If the device is to remain at the final inspection, ensure the permit will allow it.

SECTION 1636
TEMPORARY STREAM CROSSING

Temporary stream crossings should be installed to prevent fording of live streams during any portion of the work, including clearing and grubbing. Live streams will be detailed in the project plans and shown in the erosion control plans.

1636-3 CONSTRUCTION METHODS

Ensure the temporary stream crossing is allowed in the project permits. The Contractor is responsible for sizing the pipe for the crossing for the 2 year peak storm. It is appropriate to request the pipe sizing calculations. The crossing is paid as pipe and stone so the smaller the pipe, the more stone is required. Given the option, a larger pipe is less costly for the Department and reduces the amount of time the Contractor spends hauling and wasting stone.

TECHNICIAN'S CHECK LIST
SECTION 1636
TEMPORARY STREAM CROSSING

1) Ensure the permits allow the crossing installation.
2) Have the pipe sizing calculations been received?
3) Install geotextile prior to pipe and stone.
4) Given a choice, use a larger pipe instead of a smaller pipe.

SECTION 1637
RISER BASIN

Riser Basins are designed individually as specified in the plans and are built according to Roadway Standard Drawing No. 1630.01. They are normally large enough to handle major sections of the project. Riser Basins are critical and they should not be revised or eliminated without the approval of the Roadside Environmental Field Operations Engineer and the Hydraulics Engineer. These basins work as ponds with stand pipes (or risers) and skimmers, that allow the water to exit through the vertical and horizontal pipes at the flow line elevation of the outfall, not over a filtered weir or through an overflow pipe. Riser Basins are built outside of the roadway area and will typically hold water.

1637-3 CONSTRUCTION METHODS

It is very important that there is a positive seal around the pipe going through the basin's dike to the outfall. This will be a weak area and needs special attention to eliminate the possibility of leaks or blowouts. Good compaction of good material will normally provide this seal. It is also important that the antiflotation device be installed properly before any water is allowed into the basin. Any movement or pressure on the riser will transfer to the outfall pipe and weaken the seal through the dike. Care should be taken to place the stand pipe and filter stone so that they can be reached for maintenance. Some access has to be provided so that the pipe and dikes can be maintained and removed when no longer needed. If the basin is to be excavated, be sure that the base of the stand pipe or riser is on solid ground and is not undermined. Construct overflow spillways to limit erosion, especially on newly constructed dikes. Fabric and stone may be required to stabilize the overflow spillway if vegetation is not established. Grass must be established as soon as possible on the dike and overflow spillway.

1637-4 MAINTENANCE AND REMOVAL

It is usually hard to judge when riser basins need to be cleaned out because they are often filled with muddy water and you cannot see how much silt has settled out. It is, therefore, important to check them frequently to judge how often they need to be cleaned. Check the marker placed to determine if sediment has reached the 50% mark. A conservative rule of thumb is that **half full is too full. Any material removed from the basins must be disposed of properly.**

These basins should be removed before the contract is completed, unless specified otherwise on the plans.

TECHNICIAN'S CHECKLIST
SECTION 1637
RISER BASIN

1) Do not change the shape or size of the basin without consultation with the Engineer.
2) Ensure that the area where the basin is to be placed is permitted for this activity.
3) Ensure the area where the basin is proposed will be suitable for the device, i.e. soil type, access, etc.
4) Maintain access to the basin at all times so that it can be cleaned when needed.
5) Remove the basin at the end of the project, if required.
6) Ensure that the pipe, riser, anti-flotation device, sediment control stone, and trash rack meet the requirements of the plans or Standard Drawings.
7) Compact the dam with good soil so that it is strong enough to withstand the volume of water.
8) Construct the overflow spillway on natural ground and stabilize immediately.
9) Seed and mulch the dam.

SECTION 1638
STILLING BASIN

The location of stilling basins is shown on the plans. The location may be adjusted to ensure that it will not be in the way of construction, the diversion ditch or the outfall. The basin should be located so that it can be cleaned, is within reach of the pump outlet, and safety is not overlooked. In order for these basins to work properly, they must be able to hold enough water to allow for some settlement of suspended soil particles at a flow rate sufficient to dewater the work site in a reasonable time. The basin size will be specified on the plans. In order for the silt to have as much time as possible to settle out and to keep the silt as far as possible from the filter stone, the outlet of the pump should be at the opposite end of the basin from the permeable stone drain. In no case will the pump outlet be allowed between the baffle and the drain. It is also important that the outlet from the pump be controlled to keep it from creating additional suspended solids generated from within the basin itself. In other words, do not allow the outlet to discharge into the dikes or bottom of the basin. The flow rate of the pump must be monitored so that water is retained within the basin for a sufficient time to settle suspended solids. If the water in the basin builds up and begins to run through the overflow pipe, the pump must be slowed down so that no turbid water leaves the basin.

CONSTRUCTION METHODS

Construct stilling basins in accordance with Roadway Standard Drawing 1630.04.

The shape of the stilling basin does not have to be a rectangle, but it must meet the "L=2W" requirement shown in the Standard Drawing and give as much room and distance as possible between the pump outlet and the permeable stone drain. This allows time for the silt to settle out. The total area provides room for the silt to be stored. Be sure that the dikes are wide enough to support the water pressure so that they will not be pushed out or breached. The material used to build the dikes should also be fairly clean soil so that water cannot find a way through the dike along a loose root, tree lap, or limb.

When figuring the size of the basin in relation to the amount of water it can hold, do not figure any volume for depth below the water table or above the flow line of the overflow pipe. Coir fiber baffles are necessary to settle suspended solids. Examination of the empty basin will show that the amount of precipitate decreases at each baffle. A flashboard riser or fabric lined spillway are acceptable substitutes for the permeable stone drain.

1638-4 MAINTENANCE AND REMOVAL

The stilling basin needs to be cleaned prior to losing its effectiveness. These basins are usually removed when the area to be pumped is completed. Be sure that all wet and unsuitable material is removed if the area is within the typical section.

1638-5 MEASUREMENT AND PAYMENT

Be sure that the basin is built as close as possible to the height shown in the Standard Drawings and do not pay for any additional volume above the designed dimensions. The payment also includes the construction of the baffle, so no measurement for payment of the baffle will be made. If fabric is used, the quantity of filter fabric to be paid for will be the area in square measurements measured along the surface of the ground over which the fabric has been acceptably placed.

TECHNICIAN'S CHECKLIST
SECTION 1638
STILLING BASIN

1) Locate the basin so that the treated water can get to the outfall easily without creating further erosion.
2) Place the basin on solid ground.
3) Construct the basin as shown in the plans
4) Tie the permeable stone drain in to the dike. Use filter fabric as necessary to keep the water from eroding under or around the stone.
5) Install coir fiber baffles.
6) Place the outlets of the pump hose as far as possible from the stone drain.
7) Clean the basin before it is no longer able to settle solids.
8) Check the basin often during the time that the pumps are running.
9) Do not pump sediment–laden water directly into a stream.

SECTION 1639
SPECIAL STILLING BASIN

Special stilling basins are typically used where water is pumped at structure site but the construction of stilling basin for pumped effluent is either impractical or violates a permit condition.

1639-3 CONSTRUCTION METHODS

Use bags with a minimum size of 10' x 15' made of materials that comply with the specifications. Pump water directly into the bag. The bag must not be placed directly on soil. Either place on enough pallets to suspend it off the ground or place it on geotextile and stone. Replace the bag when ¾ full of sediment or stops functioning effective. Water leaving the special stilling basin must not be permitted to violate permit conditions.

TECHNICIAN'S CHECKLIST
SECTION 1639
SPECIAL STILLING BASIN

1) Check the permit for siting locations.
2) Place geotextile and stone or pallets for the foundation.
3) Have the bags been received?
4) Are the bags a minimum of 10' x 15'?
5) Is the discharge complying with the permit conditions?
6) Is there a plan for removing full bags.

SECTION 1640
COIR FIBER BAFFLE

Coir fiber baffles are required in multiple erosion and sediment control applications. They function by sediment laden water so that portions of that sediment drop out in the chambers form by the baffles. They only work as well as they are maintain. As a chamber fills and baffles wear, the silt must be excavated and the baffle repaired.

1640-3 CONSTRUCTION METHODS

Install the required number of baffles detailed in the specifications immediately upon excavation of the basin so they can begin to work. The baffle detail allows the basin to be smaller than a basin without baffles, therefore if the basin is cut and the baffles are not installed, then the basin may be undersized.

Receive the coir fiber and ensure it meets the opening size and weight per square yard prior to installation. Ensure the posts meet the required weight per foot prior to installation. These are important to the function of the basin so that soil pressure does not cause the baffle to fall over at shallow depths.

TECHNICIANS' CHECKLIST
SECTION 1640
COIR FIBER BAFFLES

1) Are the baffle locations consistent with the requirements of the erosion control plans?
2) Are there 3 baffles in basins and sediment dams with a spacing of 1/4 of the length when the device is $\geq$ 20 feet?
3) Are there 2 baffles in basins and sediment dams with a spacing of 1/3 of the length when the device is < 20 feet?
4) Does the coir fiber meet the requirements for weight and opening?
5) Do the fence posts meet the specification requirements and are the installed with 2 feet buried?
6) Is there at least 3feet of coir fiber draped on each side of the wire strand?
7) Is the bottom secured with staples at 12 inches on center?

SECTION 1650
WOODED AREA CLEANUP

Wooded area cleanup is only paid on areas outside the clearing limits where seeding and mulching will not be performed.

1650-2 MATERIALS

There may be living vegetation that will be cut off at the ground surface as part of this work that will need to be sprayed with a herbicide. Contact the Roadside Environmental Field Operations Engineer for information about the use of herbicides.

1650-3 CONSTRUCTION METHODS

The intent of this section involves workmanship. The area should be left in a clean and neat condition. Any ruts should be removed and any stumps requiring herbicide treatment should have the herbicide applied immediately after cutting. The purpose of applying the herbicide immediately is so that it can be absorbed by the stump effectively. Waiting several days to apply the herbicide can reduce its effectiveness significantly.

1650-4 DAMAGE TO REMAINING VEGETATION

Remove objectionable material with a minimum of damage to the remaining vegetation. Thought should be given to the Contractor's equipment being used and to the method of accessing the site. Heavy equipment can damage the roots of trees that are intended to be left, especially in wooded sites where roots are often found close to the top of the ground. The Contractor is to repair any damage to the remaining vegetation. This may require pruning damaged limbs or roots, or total removal of the damaged plant.

TECHNICIAN'S CHECKLIST
SECTION 1650
WOODED AREA CLEANUP

1) Determine where this work is to be accomplished.
2) Has the herbicide (if required) been approved by the Engineer? These items must be on the site and approved before the work is begun.
3) Dispose of the vegetation and other debris in accordance with the solid waste disposal laws.
4) Cut off all dead material flush with the ground?
5) Use the herbicide and application rate shown in the contract.
6) Inspect the remaining vegetation for damage and make any necessary repairs.

SECTION 1651
SELECTIVE VEGETATION REMOVAL

1651-3 CONSTRUCTION REQUIREMENTS

Dead vegetation and debris removal are not included in this item of work but are included under Wooded Area Cleanup (Section 1650). Any stumps to be treated with herbicide should be treated immediately after cutting so that the herbicide can be readily absorbed by the plant.

1651-4 DAMAGE TO REMAINING VEGETATION

The intent of this item is to remove the designated material with a minimum of damage to any remaining vegetation. Thought should be given to the Contractor's equipment being used and to the method of accessing the site. Heavy equipment can damage the roots of trees that are intended to be left, especially in wooded sites where the roots are often found closer to the surface of the ground. It may be necessary for the Contractor to use smaller equipment or rubber-tired equipment, instead of track equipment, to minimize the damage to the remaining vegetation. If damage does occur, the Contractor is required to repair the damage at his own expense in accordance with acceptable horticultural practices or to remove the plants if necessary.

1651-5 MEASUREMENT AND PAYMENT

Measurement is made per acre for underbrush removal (vegetation under 4 inches in diameter) and on a per each basis for individual trees 4 inches and larger. Underbrush should be measured in blocks of area between the right-of-way and the construction limits where the work is to be performed. The trees are to be measured individually according to their diameter at a height of 4 feet, 6 inches above the ground and placed into a size group according to Table 1651-1. For example: Trees that have diameters of 4 inches to 8 inches as measured above are considered to be 6 inch trees.

TECHNICIAN'S CHECKLIST
SECTION 1651
SELECTIVE VEGETATION REMOVAL

1) Determine the exact areas where this work is to be performed.
2) Designate any individual trees shown on the plans to be removed.
3) Ensure that the herbicide application is conducted by individuals who possess a pesticide license from the NC Department of Agriculture in accordance with Article 1060-13 of the Standard Specifications.
4) The herbicide must be on the site and approved before the work is begun.
5) Dispose of the vegetation and other debris in accordance with the solid waste disposal laws.
6) Cut off all material flush with the ground.
7) If a herbicide is to be used, apply it in accordance with the Contract.
8) Inspect all of the remaining vegetation for damage. Make repairs as necessary.
9) Measure all trees to be cut 4 feet, 6 inches above the ground before they are cut to determine the proper pay size.

SECTION 1660
SEEDING AND MULCHING

Seeding and mulching are the basic items in the establishment of permanent vegetative ground cover of grasses or legumes in areas such as rights-of-way, easements, waste areas, borrow pits, etc., as described in the Project Special Provisions. The materials to accomplish this are also stated in these provisions and will vary from project to project depending upon location of the project and the soils encountered. There is **no** difference between the methods and materials used to seed and mulch borrow pits and waste areas and those required for the roadway itself.

Areas are to be brought to line and grade as soon as practicable. Seeding and mulching is to be **immediately performed on any area brought to line and grade,** provided it is within any specified seasonal limitation for seeding and mulching, rather than waiting for the major portion of the project to be completed.

Mowing at the proper time is of great importance in the establishment of a permanent vegetative cover.

1660-2 MATERIALS

The materials normally required for seeding and mulching are fertilizer, limestone, seed, and mulch in combination with a binding material. These materials are described under Section 1060-2 through Section 1060-5 of the Specifications. Materials for a specific project will be listed in the Project Special Provisions.

Sampling and testing of these materials is described in the Minimum Sampling Guide.

1660-3 COORDINATION WITH THE GRADING OPERATIONS

These requirements are fully explained in Section 107-12, Control of Erosion, Siltation and Pollution, and Section 225-2, Roadway Excavation: Erosion Control Requirements, of the Standard Specifications. If the Engineer has any doubt, the Roadside Environmental Field Operations Engineer shall be consulted for determination of erodible soil. Whether the Contractor shall be granted permission to exceed the 17 acres of exposed erodible surface mentioned in Section 225-2 of the Standard Specifications is a major consideration. Article 107-12 of the Standard Specifications, "Control of Erosion, Siltation, and Pollution", states, "the Contractor shall take whatever measures are necessary to minimize soil erosion and siltation, water pollution, and air pollution caused by his operations." The most critical elements are the management of earthwork and grading operations. All Sections, within the Specifications, related to these elements reference the requirements for a Contractor to conduct operations such that cut and fill slopes are completely graded to final slope in a continuous manner, specifically Articles 225-2, 226-2, 230-2, and 235-2. This requirement to finish slopes in a continuous manner facilitates the establishment of permanent vegetation and reduces the quantity and cost associated with maintenance of erosion control measures, including temporary seeding. The finishing of slopes also progresses the project in that areas are not regraded multiple times. With the above requirements in place, Article 107-12 states, "The Engineer **will** limit the area over which clearing and grubbing, excavation, borrow, and embankment operations are performed whenever the Contractor's operations do not make effective use of construction practices and temporary measures which will minimize erosion, or whenever permanent erosion control features are not being completed as soon as permitted by construction operations." Many ICAs and NOVs have been issued because the Contractor had not used proper earthwork management

practices and disturbed a substantial amount of the project without finishing areas in a continuous operation. This ineffective method of grading has cost the Department in additional silt excavation, temporary seeding and mulching and most importantly in the relationship established with the regulatory agencies. Therefore, as required in Article 107-12, the Engineer should take action to ensure the Contractor is managing their grading operations to minimize soil erosion, and if not providing proper management, limit such grading activities to complete areas in a continuous manner.

It is the intent of the Specifications that permanent seeding and mulching and other erosion control features be incorporated into the project in a systematic, continuous manner. The Specifications require the Contractor to perform grading operations such that the excavation from any cut and the placement of embankment in any fill shall be a continuous operation to completion. The Specifications also give the Engineer authority to limit the area of exposed erodible slopes to 17 acres if the Contractor has not begun permanent seeding and mulching or other erosion control measures as might be directed by the Engineer. Even when erosion control devices are in place, care must be taken to limit the time bare slopes are exposed. The Specifications also give the Engineer authority to adjust the area limits based on specific circumstances as long as erodible materials are contained within the project limits. As an example: The area limitation can be applied separately to more than one "bona fide" grading crew within any one project as long as permanent erosion control measures are kept up with the grading operations.

1660-4 SEEDBED PREPARATION

Proper seedbed preparation is one of the most important factors in the development of a vegetative cover. The seedbed is the place where seed germinates and the medium from which the resulting plants, through their roots, secure moisture, and nutrients. This prepared soil layer allows movement of moisture, air, and plant nutrients that is favorable for the activity of soil organisms and, thereby produces better plant growth.

By use of spring tooth harrows, tillers, or other means, compacted and undisturbed soils are broken up or loosened to a required depth of 5 inches, except on shoulders within 2 feet of pavement edges where tillage is restricted to a depth of no more than 2 to 3 inches.

Extreme care must be exercised in seeding operations on shoulders and slopes of ditches to maintain the graded cross-section that existed before the seeding operation began.

The top 2 to 3 inches of all areas to be seeded must be worked into a friable seedbed by disking, harrowing, by the use of soil pulverizers or cultipackers, or by other acceptable means. Exceptions to this are slopes steeper than 2:1 where it is impossible or impractical to use mechanized equipment. The earth crust must always be broken; however, the slope surface must be scarified, grooved, or punctured to provide small ridges or pockets in which the seeding materials can lodge. A ball and chain consisting of a large log chain with welded tines and swivel links attached to a large steel ball is used frequently for this purpose when pulled by a tractor driven along the top edge of the slope to be worked. This is not intended to limit the ingenuity of the Contractor who may, depending on circumstances, have other useful and acceptable equipment.

If the tillage operations are followed by a heavy rain, it may be necessary to break the surface crust again before seeding.

Seedbed preparation when the soil is so wet it clings to equipment is not only impractical but unsatisfactory because the soil is not being broken into fine particles. Seedbed preparation when the soil is frozen is unsatisfactory for the same reason. Good drainage is essential to the

successful growth of grasses; therefore, irregularities of the surface in which significant amounts of water could pond should be eliminated before applying seed.

1660-5 APPLYING AND COVERING LIMESTONE, FERTILIZER, AND SEED

(A) GENERAL

It is general practice for the Engineer's personnel to premeasure areas to be seeded using project stationing or assumed stations. These areas are usually in 1/2 acre increments to best fit the Contractor's operation, or the area to be seeded is staked out on the ground and recorded in the pay record book.

The quantity of materials for a given area is then computed and the materials are measured and allotted to this area. In this way, the Contractor and the Technician can ensure that the correct amounts of materials are being used.

(B) LIMESTONE AND FERTILIZER

Limestone can arrive on the project in 2 conditions, in bags or in bulk. Either is acceptable provided that the Contractor has approved equipment with which to apply the material. Refer to Section 1060-2 and Section 1060-3 of the Standard Specifications. The limestone purity should be confirmed prior to application to determine if any increase in rate is warranted.

Fertilizer can also be furnished in 2 conditions, in bags or in liquid form. Either is acceptable provided that the Contractor has approved equipment for application.

Equipment for applying limestone and fertilizer must be approved by the Roadside Environmental Field Operations Engineer prior to its being used on the project. Equipment that does not permit a uniform application of materials shall be rejected.

If liquid fertilizer is to be used, storage facilities shall be as outlined in the Specifications and approved by the Roadside Environmental Field Operations Engineer. Close inspection shall be given to these facilities and the fertilizer when the temperature is 32°F or lower. This material will separate and lose a part of its strength if allowed to freeze. Liquid fertilizer in storage facilities on the project shall be agitated daily to ensure that it remains in mixture.

(C) SEED

All requirements of Section 1060-4 (Seed) must be met. The rates of application and seasonal limitations for seeding will be indicated in the Special Provisions. Any requested deviation from the Special Provisions should be referred, along with proposed justifications and recommendations, through the Division Engineer to the State Construction Engineer for a decision.

In no instance should a Contractor be allowed to apply seed until it has been tested and approved. There are General Statutes governing the use of certain types of seeds and the types and purity of seeds that are incorporated into our projects must be verified. If an approved test report has not been received by the time a seed lot needs to be utilized, the Materials & Tests Unit should be consulted to determine if the seed may be accepted.

Seed is generally applied with a seed drill, hydroseeder, tractor-mounted seed spreader, or in some cases, with a hand operated cyclone seeder. A uniform distribution of the seed over the seedbed shall be required and, in some cases, this may require applying the seed from 2 directions at right angles to each other.

Seed should not be sown when the wind is high. That could cause the seed to be blown in irregular patterns, resulting in less than uniform coverage.

(D) MODIFICATIONS

The use of modifications as described in the specifications can be held to a minimum by careful attention on the Technician's part to the grading of the slopes when they are primarily soil. Slopes are to be left in a rough, uneven condition, and not slick-bladed. These rough, uneven conditions will allow the lime, fertilizer, and seed to lodge on the steepest slope and to be covered as the soil moves on these areas due to rain.

Prior to applying the modifications listed herein, the Engineer should consult with the Roadside Environmental Field Operations Engineer.

1660-6 MULCHING

A proper coverage is obtained when the ground is not visible from a distance of about 10 feet ahead of you. A proper coverage does not mean that you cannot see the ground when looking straight down however 75% of the ground should be covered when viewed from above.

Crimping is not indicated as an acceptable method for holding mulch in the specifications. Review the project special provisions to determine if it is permissible in on specific projects. When the Contractor has requested and received permission to hold the mulch in place by crimping, the mulch strands must be long enough so that they will stand up about 5 inches. After the crimping operation has been completed, a second application of mulch should be applied over the vertical strands. More grain straw per acre is normally required to achieve the proper coverage when crimping is used.

One of the most significant problems with mulch is that it can be displaced by traffic, wind, and rain. For this reason, it is very important to get a sufficient coverage of the binding material on the mulch as soon as it is placed. Insufficient tack will result in displacement of the mulch and the need to reapply and mulch and tack. When mulch is placed adjacent to the traveled lane and the road is open to traffic, or will be before the grass is high enough to hold the mulch, an extra heavy application of asphalt or other binding material needs to be applied to the area within 6 feet of the pavement. This applies even when the area has been crimped. Check the project special provisions to determine if crimping and a second application of mulch is required within 6' of a travel lane.

In **high quality water zones** (these will be designated on the plans) asphalt is not desired as a binding agent. These areas are close enough to important waters that the asphalt run-off may endanger the fish population.

Great care should be used not to create ruts or to tear up the slope during the mulching or binder placement operations.

At the time that seeding and/or mulching is being done, temporary erosion control devices are normally in place. These devices lose their effectiveness when they are clogged up with mulch. All mulch must be removed from these devices as soon as possible.

All requirements of Section 1060-5 (Mulch for Erosion Control) must be met. There are several reasons for mulching in connection with seeding. Mulch will assist in preventing erosion on newly prepared and seeded areas (particularly where the soil is loose and friable), and it will help in conserving moisture and will promote the germination and early growth of grass. The mulch shall be applied within 24 hours of completion of the seeding.

Grain straw is the preferred material for mulching although bark mulch, wood cellulose fiber, and excelsior may be approved for use under certain conditions. If the Contractor desires

to use mulch materials other than grain straw, he shall submit the request, in writing, to the Engineer, who in turn will submit the request together with his recommendation to the Division Engineer. Grain straws do not contain noxious weeds and other weeds that are more likely to be found in other legume or hay materials. Hay produced as a specific cultivated crop, however, is more desirable than hay that is harvested from uncultivated meadow or fallow fields.

Baled grain straw is clean and easily handled, is usually more adaptable for use in mulching equipment and, after being placed on the ground, does not have as great a tendency to roll up and blow away in winds as do hay mulches.

Straw mulch and some other mulches must be anchored or tied together in a manner that will prevent it from being blown by the wind or moved by other causes. The generally accepted way to accomplish this is with asphalt or an asphalt emulsion, sufficiently tacky to bind the straw particles together. Tacking should be done during or immediately following the application of mulch. The material used for tacking may be approved by the Engineer consulting as necessary with the Roadside Environmental Field Operations Engineer.

Emulsified grades of asphalt containing excessive amounts of water are not satisfactory and do not tie the mulch particles together properly. This may necessitate replacing both straw and asphalt if the material becomes displaced. If this is required after the grass has germinated and emerged from the soil, reseeding may be necessary.

The asphalt application used on mulch should be uniform in coverage, leaving no areas without asphalt, and leaving no areas sprayed so thickly that a solid visual sheen results. A proper asphalt application should be black in appearance. A brown asphalt color is an indication that the asphalt used is insufficient in tackiness. Shredded hardwood bark mulch is an acceptable substitute for grain straw if the fiber length of the material is sufficient to form a mat on the seeded area. Material shredded too finely will only wash away or collect in shallow depressions and impede germination.

In order to utilize shredded hardwood bark mulch, the Contractor must demonstrate that he has equipment suitable for transporting and applying the material to the seeded areas. Such equipment usually consists of a bulk hauler and a truck-mounted blower.

The minimum recommended application rate is 35 cubic yards per acre uniformly applied. Additional material may be required if there is insufficient cover due to short fiber lengths and a high percentage of fines.

No binding agent is required for shredded hardwood bark mulch because tests have shown that it is naturally cohesive.

The Roadside Environmental Field Operations Engineer should be consulted prior to the use of hardwood bark so that the material can be inspected and the equipment approved.

When wood cellulose fiber is used, it should contain a water soluble dye for the purpose of visual uniformity of application. A minimum application of this wood cellulose fiber is 1200 to 1500 pounds per acre or more if the seedbed is not entirely smooth and relatively free of clods.

The material must be applied in water suspension using a hydraulic sprayer with half of the application being made in one direction of travel and the balance from the opposite direction.

Wood cellulose fiber cannot be used as a mulching material, only as a tackifier.

Fertilizer and asphalt are very damaging to concrete and metal structures such as bridges, sidewalks, curb and gutter, headwalls, guardrails, delineators, traffic signs, and other structures; therefore, these must be cleaned off immediately if accidentally sprayed. Likewise, highway traffic must be protected against fertilizer and asphalt spray. Generally, seeding and mulching is done prior to the erection of guardrails, delineators, or traffic signs; but when these objects are in place, the best precaution is to cover them during the seeding and mulching operations. If these materials are sprayed onto guardrails they must not be allowed to dry on them and they must be brushed or wiped off and flushed with water or other cleaning agent immediately.

All rock in excess of 3 inches in diameter and all roots or other debris which will prevent proper contact of the mulch with the soil shall be removed prior to starting the mulching operations on slopes which are 3:1 or flatter.

1660-7 MAINTENANCE OF SEEDING AND MULCHING

It is the intent of this article to maintain the areas seeded and mulched in a continuous manner as directed by the Technician rather than waiting until near the end of the project to repair all damaged areas at one time.

Maintenance includes mowing, repair seeding, topdressing, or complete reseeding if required. A pay item for each of these functions is included in the Specifications and guidelines for the Technician to follow are outlined in the appropriate articles in this Manual. If maintenance is needed due to negligence or damage by the Contractor, there will be no pay for the repairs.

The Roadside Environmental Field Operations Engineer should be consulted regarding any questions concerning maintenance of seeding and mulching.

1660-8 MEASUREMENT AND PAYMENT

Pre-measurement of areas to be seeded and mulched is generally the best procedure. This allows the Technician to check rates of application while the work is being performed and eliminates duplication of measurement.

If the Engineer determines that pre-measurement is the method best suited for the project, he shall so advise the Contractor prior to beginning the work that Department forces will establish the lines for the areas to be seeded and mulched and that these lines shall represent the final measurement under this pay item. The Contractor shall be given an opportunity to have a representative present to observe this pre-measurement. **The Engineer should also advise the Contractor in accordance with Article 105-12 of the Specifications that any work performed outside the established lines, unless authorized by the Engineer or his delegated Technician, will not be measured and paid for.**

It should be noted that if modifications are made to rates of materials, etc., the unit price for “Seeding and Mulching” may need to be adjusted.

TECHNICIAN'S CHECKLIST
SECTION 1660
SEEDING AND MULCHING

1) Ensure earthwork is finished to line and grade.
2) Ensure that exposed erodible slopes are vegetated within the amount of time required in the latest NPDES permit.
3) Check project special provisions for areas of the project to be given a lawn type appearance.
4) Ensure all seeds on the project are approved for use.
5) Ensure the limestone and fertilizer meet the specifications.
6) Sample the lime.
7) Properly store and protect the materials from the elements.
8) Apply the mulch material at the rate of 2 tons per acre.
9) Measure the area to be seeded.
10) Ensure that the seedbed is in a loose condition prior to seeding.
11) Apply materials uniformly at the specified rates and properly incorporate into the soil.
12) Remove rocks and other debris prior to the mulching operations.
13) Ensure the Contractor is coordinating his work properly; seeding soon after the seedbed is prepared, cultipacking immediately after the seeding is done, mulching soon after the cultipacking, and applying the tacking material immediately
14) Use a sufficient amount of tack to tie down the mulch.

SECTION 1661
REPAIR SEEDING

Repair seeding is performed to keep the permanently seeded and mulched areas in an acceptable condition so that a vegetative cover will develop over the entire area simultaneously. Repair seeding also prevents minor washes from becoming major washes; therefore, repair seeding should be performed immediately and in a continuous manner during the life of the project and not left until project completion. When the wash is repaired, care must be taken to keep water that caused the wash from taking the same track and washing the area again. This can be done by one of the following:

1. Diverting the water before it reaches the area.
2. Overfilling the wash so that water runs beside the first wash onto established grass.
3. Use of erosion control matting.

Always be sure that any material placed in washouts is properly compacted and keyed into the original slope material. If major earthwork, seed preparation, or matting is needed, other sections of the Standard Specifications will apply.

1661-3 SEEDBED PREPARATION

Since the area to be repaired should have been recently reworked, the soil should be loose and very little seedbed preparation should be needed. Field judgment will have to be used in each instance.

1661-4 APPLICATION OF FERTILIZER, SEED, AND MULCH

Examples of unfavorable conditions for applying seed and fertilizer include when the seedbed is too wet, the seedbed is frozen, the wind is too strong, equipment is not satisfactory, areas requiring seeding need to be filled with soil, or when all material for repair seeding is not on the project.

TECHNICIAN'S CHECKLIST
SECTION 1661
REPAIR SEEDING

1) Do the areas of repair need reshaping to line and grade? If so, be sure to get good compaction on the area. If seedbed preparation, extensive earthwork, or complete reshaping are necessary, the work will be handled under Section 1660.
2) Do the washes need filling? If so, try to use material that will grow grass quickly and that will not wash very easily. If possible, overfill the wash so that future water coming down the slope will not run in the same path and wash the new material out again.
3) Was the area of repair caused by negligence on the part of the Contractor? If so, record all information regarding the condition and work done in the diary. If there is a chance that the work will not be paid for, the Contractor needs to be so advised before the work is performed.
4) Be sure that materials for repair seeding are kept separate from all other seeding operations so that the quantities are properly paid. These quantities are paid on a poundage basis, not on an area basis.
5) If the area needs it, be sure that it is mulched. **The mulch is not paid for but is incidental to the other items in this section.**

SECTION 1662
SUPPLEMENTAL SEEDING

Supplemental seeding may be necessary in an area that has been permanently seeded and sufficient time has passed but little or no grass has started to grow, or if the grass came up but did not give sufficient cover, or if the cover was satisfactory but the grass failed to germinate. However, before the area is supplemental seeded, some thought and investigation needs to take place to determine what caused the problem. Soil tests are recommended. If the problem has been resolved, then the seeding should be done. If the problem has not been resolved, then the seeding should be delayed until it is. Some of the problems could be lack of rain, lack of plant nutrient, insufficient seedbed, soil is too acidic, soil is too wet, insufficient drainage, too much or too little mulch, bad seed, wrong type fertilizer, low seed rate, too heavy binder rate, and others.

1662-3 APPLICATION

Examples of unfavorable conditions for applying seed include when the seedbed is too wet, the seedbed is frozen, the wind is too strong, equipment is not satisfactory, areas requiring seeding need to be filled with soil, or when all material for supplemental seeding is not on the project. Care must be taken when applying the supplemental seed to prevent the area from becoming rutted or torn up and to prevent the existing grass and mulch from being destroyed.

TECHNICIAN'S CHECKLIST
SECTION 1662
SUPPLEMENTAL SEEDING

1) Consult the Engineer and/or the Roadside Environmental Field Operations Engineer for need for supplemental seeding and seed mixture.
2) Determine why the original grass did not become established.
3) Will the area to be supplemental seeded support the equipment to be used in the operation without rutting or losing the shape of the area?

SECTION 1664
SODDING

Sodding is used to give a quicker cover than by planting seed. There are certain types of grass that take a long time to establish a root mat to control erosion. There are times when one particular type of grass is called for that can best be established with sod. When these items are called for on the project, it is essential that they not be deleted unless the Roadside Environmental Field Operations Engineer has given their approval.

1664-2 MATERIALS

There are very specific requirements that the sod must be free of undesirable types of weeds and plants. The Department of Agriculture must have given its approval of the source. Refer to the articles shown in the Specifications.

1664-3 SODDING

Sod must be kept moist during storage. Place sod within 48 hours of being cut. Cover soil within 24 hours of preparation. If fertilizer is used, limit the amount. Ensure all sod is in contact with the soil. **Extreme care should be taken to ensure the sod is not perched so as not to dry out or freeze.** After installation, tamp the sod and thoroughly water the sod.

(A) HANDLING AND STORING SOD

Sod is normally used when immediate cover of permanent grass is necessary or where conditions such as steep slopes or disturbed lawns in urban areas require it.

Care in handling sod is necessary to keep the soil from leaving the roots system. If sod is dug in heavy soil, this generally is not a problem unless the soil is too dry. In light soils, sometimes it is necessary to place the cut sod on pieces of board for handling.

If sod is allowed to be stored, it should be examined regularly (at least daily) to prevent drying out, overheating, or becoming moldy.

(B) SOIL PREPARATION

The surface should be firm and the limestone and fertilizer incorporated before the sod is placed. The surface must be loosened for about 2 inches with rakes, picks, or other approved equipment. This allows the area to keep its shape and provides a loose medium for the roots to take hold and grow.

(C) PLACING SOD

Sod that is placed by hand or mechanical means should be properly rolled with approved equipment to ensure good sod/soil contact. If the sod is placed on a steep slope, alternative rolling methods may be needed as long as they prevent tearing or slippage of sod.

(D) WATERING SOD

Watering shall be done in a manner to avoid packing, eroding, or slipping. A slow gentle application of small droplets is necessary. The area being watered should be examined regularly to determine when sufficient water has been applied. The soil under the sod should be good and moist but not muddy or soggy. It will take more watering in sandy soils than in clay soils. It will also take more frequent watering in sandy soils to keep it properly wet.

TECHNICIAN'S CHECKLIST
SECTION 1664
SODDING

1) Was the sod approved at its source before it was dug?
2) Are the weather and soil conditions favorable for sodding? If there is a doubt, the Roadside Environmental Field Operations Engineer should be consulted.
3) Consult the Contract and/or Roadside Environmental Field Operations Engineer to determine if soil samples are required prior to soil preparation.
4) Prepare the soil; place limestone and fertilizer in accordance with the contract requirements.
5) Ensure that the Contractor has adequate equipment to keep the sod watered.

SECTION 1665
FERTILIZER TOPDRESSING

The establishment of a permanent stand of grass is very dependent on its root mat, which in turn is dependent on the amount of plant food available. The greater the growth of the grass above the ground, the greater the growth of the root mat below the ground will be and, therefore, the better the erosion control characteristics. Another advantage to having a good root mat is that the grass will be much healthier and heartier, which enables it to withstand severe weather like heat, drought, and cold and helps prevent displacement of soil. It is also essential for establishing a long-term stand of grass that requires less maintenance.

1665-2 MATERIALS

The analysis of the fertilizer must be in the ratio shown in the Special Provisions. For example, 8-8-8 has a ratio of 1-1-1 and so does 10-10-10. So, one could be used for the other if the rate is adjusted. Likewise, 5-10-10 has a ratio of 1-2-2, so 10-20-20 could be used at the adjusted rate. However, 5-10-10 or any other fertilizer that does not have a 1-1-1 ratio cannot be used if the required analysis is 8-8-8.

1665-3 APPLICATION

The timing of fertilizer application is very important because if it is applied at the wrong time, it can burn and kill the grass. For example, if fertilizer is applied when the grass is very young and tender, it will burn it and possibly damage the small roots. The same thing could happen if applied in a drought when the grass is stressed. Likewise, if the fertilizer is applied when the grass is supposed to be dormant, it will either do nothing and be wasted, or it could activate the growth at the wrong time of the year and thus damage the grass. On the other hand, if the grass is not fertilized, the growth will not happen. When to apply the fertilizer is dependent on several factors, such as amount of rain, type of soil, time of year, temperature, soil temperature, time since the last fertilizer was applied, etc. If in doubt, contact the Roadside Environmental Field Operations Engineer.

The type or analysis of the fertilizer is also very important because the grass needs different elements at different times. This is described in the Special Provisions.

1665-4 MEASUREMENT AND PAYMENT

Fertilizer with different analysis ratios can be used **only if the ratio is the same** as that which is called for in the contract. However, the rate will have to be adjusted to assure that the proper amount of each element is placed. The following example helps to illustrate this concept.

The contract calls for 1000 lbs/ac of 8-8-8 fertilizer topdressing. The Contractor wants to use 10-10-10 fertilizer topdressing. Should he be allowed to use it, how much must he use, and what quantity should he be compensated for?

It can be used because the ratio of each element is the same. 10-10-10 can be used because it has a ratio of 1-1-1 just as the 8-8-8 does.

When 1000 lbs/ac of 8-8-8 is placed 80 lbs. of each element is used (1000 lbs. x 0.08 = 80 lbs.). To place the same number of pounds of each element using 10-10-10 you would only need to put down 800 lbs./ac. For example: ? x 0.10 = 80 lbs.

Therefore 80 lbs/0.10 = 800 lbs. 800lbs/ac of 10-10-10 equals 1000lbs/ac of 8-8-8.

Since the same number of pounds **of each element** is incorporated into the work, the Contractor should be paid a comparable quantity. Therefore, the Contractor would be paid the 800 pounds of 10-10-10 fertilizer as if the Contractor had put down 1000 pounds of 8-8-8. This should be so noted in the pay record book.

In the example used above, the 800 pounds of 10-10-10 will be paid for as if it were 1000 pounds of 8-8-8.

TECHNICIAN'S CHECKLIST
SECTION 1665
FERTILIZER TOPDRESSING

1) Topdress established vegetation every fall and spring.
2) Take proper precautions to protect traffic, structures, guardrails, traffic control devices, and other appurtenances.
3) Calibrate the equipment and inspect to ensure uniform distribution. Ensure the area to be topdressed is stable enough to support any equipment used in this operation without rutting or losing the area's shape.
4) Calculate the proper rate for the fertilizer analysis being used.
5) Keep proper records and documentation with the analysis recorded so that proper payment can be made.

SECTION 1667
SPECIALIZED HAND MOWING

Specialized hand mowing is utilized around signs and guardrail and can be performed with a variety of powered equipment. The equipment must be capable of working timely and efficiently. Payment is made by the man hour for each worker who is working efficiently.

TECHNICIAN'S CHECK LIST
SECTION 1667
SPECIALIZED HAND MOWING

1) Has the equipment planned for the work been approved?
2) Is there a system in place to monitor the number of man hours?
3) Is the Contractor aware of the area to be mowed?

SECTION 1670
PLANTING

The work covered by this section is specialized in nature and the Roadside Environmental Field Operations Engineer should always be consulted concerning this work. This work is usually performed by a specialized planting subcontractor and is often installed late in a contract. Frequently, there are efforts to rush to complete the item of planting so that a project can be completed and accepted. Take care to perform this work in a workmanlike manner to give the best chance for the plants' survival, and reduce the chance of added work by maintenance forces, especially if there is no warranty period included in the contract.

1670-3 WEATHER AND SEASONAL LIMITATIONS

Because plants can only be planted at certain times of the year (normally in the winter months, when they are dormant) and because there are soil temperature requirements on fumigation, Contractors are normally required to fumigate the plant bed in the early fall. The fumigated beds can lay covered in plastic for an extended period of time if necessary. The moisture content of the soil is extremely important for the fumigant to work properly. Close attention should be given to this particular fumigation requirement.

1670-4 CARE AND HANDLING PLANTS

Utilize care in handling and transporting plants as they are living tissue and can be damaged or put under stress. Plants with foliage and bare root plants should be delivered either in enclosed trucks or have some type of covering to prevent windburn and drying out. Plants should not be handled by the stems or trunks, but should be handled by the container or by the binding on the root ball. The roots of the plants - either bare, balled, or in containers - should never be allowed to dry completely out or to freeze.

1670-5 PLANT LOCATION

Contact the Roadside Environmental Field Operations Engineer regarding adjustments to plant locations.

1670-6 PRUNING

It is an accepted horticultural practice to prune some types of plants to increase livability. Some others need pruning for shape while other types do not need pruning at all. Contact the Roadside Environmental Field Operations Engineer for recommendations on pruning.

1670-7 PLANT BED TREATMENT

When fumigation is specified in a contract, it is generally intended to fumigate all bed areas where shrubs, vines, or ground covers are used. Individual trees and reforestation plants are not fumigated. Herbicide treatments are not intended to replace fumigation generally. Contact the Roadside Environmental Field Operations Engineer if there are questions regarding plant bed treatments. When fumigation is used, it is important to have the proper soil temperature, soil moisture, and pulverization of the seedbed for the materials to work effectively. When post-emergence herbicides are used, it is important that the target weeds are near maturity

and not under stress conditions. When pre-emergence herbicides are used, it is important that the material be incorporated into the soil by either water or tillage. Be guided by special provisions and herbicide labels. Not all pre-emergence products require incorporation but all do require water to enter the soil profile.

1670-9 PLANTING, BACKFILLING, AND WATERING

(A) GENERAL

Care should be taken to perform the planting operation properly to give the plant the best possible chance of survival. When placing the plant in the plant hole, always remember that the soil in the bottom of the plant hole should be loosened. The plant should be set just slightly higher than the desired final elevation to allow for the settling of the material.

Usually the material excavated from the plant hole can be used as backfill as long as it is free of clods, roots, or other debris. If the excavated soil is not acceptable, additional soil should be brought in for backfilling.

(B) BALLED AND BURLAPPED PLANTS

When planting balled and burlapped plants, care should be taken not to loosen the trunk or roots from the soil in the ball. The burlap used to wrap the root ball need not be completely removed, but does need to be cut and pulled back from the plant stem or trunk, likewise the twine used to secure the burlap should be cut to prevent future girding of the plant as it grows.

(C) CONTAINER GROWN PLANTS

When planting container grown plants, it is acceptable and sometimes necessary to cut through the root mat around the perimeter of the root ball to stimulate root growth and development. This root cutting is not intended to make root bound plants acceptable. Also, this cutting should never be so severe so as to loosen the soil and destroy the root ball.

(E) REFORESTATION PLANTS

In the case of reforestation plants, care should be taken to be sure that the roots are all within the planting hole and are all turned downward. If roots are too large to fit properly into the hole, then root pruning may be necessary to facilitate proper planting. When the Contractor is staking the outline of reforestation areas, remember that the intent of the stakes is to delineate the outline of the area for mower operators for the next several years and that grass and weeds will obscure stakes placed too far apart.

1670-10 MULCH FOR PLANTING

This item has changed from previous Specifications in that all mulch for both initial planting and subsequent remulching will be paid for per cubic yard.

1670-11 WATER FOR PLANTING

This item has changed from previous Specifications in that all water for both initial planting and subsequent watering will be paid for per thousand gallons.

1670-12 STAKING OR GUYING

Both staking and guying are normally accomplished using lengths of soft rubber hose with pieces of thin gauge wire threaded through them and attached to support stakes. Wire or string should never be attached directly to the plant. Frequently, the wires will need to be tightened over time as they work loose. All stakes and guys should be removed from the plant after it has gone through one growing season.

TECHNICIAN'S CHECKLIST
SECTION 1670
PLANTING

1) Contact the Roadside Environmental Field Operations Engineer for advice on the following items:
   - Is the soil to be used in backfilling too wet for planting?
   - Are the plant locations correct?
   - Is pruning needed and is it done properly?
   - What beds are to be scarified, fumigated, or treated with herbicide?
   - Has the soil for planting been approved at the source and on the project?
   - How should the roots and burlap on container and balled and burlapped plants be handled?
   - Is the mulch approved and to what depth should it be placed?
   - What plants should be staked and/or wrapped?
   - What rate and analysis of fertilizer is to be used, if any?
2) Check the contract special provisions for the dates during which the planting may be done and for any establishment period.
3) Ensure the Contractor is taking adequate precautions to prevent injury to the plant materials (including protection from freezing.)
4) Ensure the plants have been “healed in” on the project.
5) Check plants that ate delivered bare-rooted, in closed packages, or in bundles to determine if dampening is necessary.
6) Note in the diary the size and condition of all plants delivered to the project before they are pruned.
7) Ensure the plant holes conform with the dimensions shown on the plans and in the Specifications
8) Construct water rings according to details shown on the plans or in the Standard Drawings.
9) Notify the Contractor when watering is necessary.