SECTION 203: EXCAVATION, BORROW, AND EMBANKMENT

203.1 DESCRIPTION

This Work consists of performing excavation in soil and rock Material, providing borrow Material, constructing Embankment, hauling, disposing, placing, and compacting Materials.

203.2 MATERIALS

The Department will provide geotechnical and/or pavement investigation data in the Contract documents, when available. The Contractor shall use the data for information only.

203.2.1 Material Classifications

203.2.1.1 Rock Excavation

Rock excavation is Material that meets one (1) of the following field test criteria:

1. **Ripping Test.** Material that cannot be broken down with two passes parallel to construction centerline with a single tooth ripper mounted on a crawler-type tractor in low gear with a minimum net flywheel power rating of 255 hp;
2. **Seismic Test.** Material that has a seismic velocity greater than 6,000 ft/s. The Contractor shall submit the qualifications of the individual performing and interpreting the seismic testing to Project Manager for approval a minimum of 14 Days prior to testing. Perform the Ripping Test to resolve differences in Material classification if seismic velocities fall below 6,000 ft/s; or
3. **Handling Test.** Boulders or detached stones having a volume greater than one (1) yd^3 that cannot be readily broken down with excavation Equipment.

203.2.1.2 Unclassified Excavation

Unclassified excavation shall consist of the excavation of all Materials other than rock excavation obtained within the Right of Way. Suitable Material obtained from unclassified excavation shall be used for areas that require Embankment.

203.2.1.3 Borrow

Borrow shall consist of Contractor provided suitable Embankment Materials obtained from an approved source outside the Right of Way, unless otherwise specified in the Contract. The Contractor shall only utilize borrow when the following conditions are met, unless approved otherwise by the Project Manager:

1. All unclassified excavation Material has be utilized in the Contractor's current phase of construction;
2. The Contractor has requested to begin Borrow operations and the Project Manager has concurred; and
3. Embankment areas that require borrow have been bladed and cross sectioned by the Contractor and provided to the Project Manager.

Borrow Material placed within two (2) Ft, vertically and laterally, of final Subgrade elevations shall meet the design R-Value as shown in the Contract. Prior to borrow operations the Contractor shall perform R-value testing in accordance with AASHTO T-190 at the best fit exudation pressure of 300 psi at each borrow source. This information shall be submitted to the Project Manager with the request to begin borrow operations. During borrow placement, if the Project Manager observes changes in soil properties, including gradation, plasticity limits,

and/or additional soil characteristics, then, at the Project Manager's request, additional AASHTO T-190 tests may be required, at the Contractors expense.

When Work conforming to Section 306, "Portland Cement or Lime Treated Subgrade" is specified in the Contract, the Contractor shall perform sulfate testing in accordance with AASHTO T290 at each borrow source. Sulfate content shall be determined and reported as parts per million (ppm). Soils with sulfate contents equal to or greater than 2,000 ppm shall not be used as borrow.

203.2.1.4 Unstable Subgrade Stabilization

See Section 203A, "Unstable Subgrade Stabilization", when specified in the Contract.

203.2.1.5 Unsuitable Material

Unsuitable Material includes organic Materials, frozen lumps, ice, and soils such as peat, shale, gypsum or other soil or rock Materials that may degrade with time, or are contaminated. Suitable Material that is unstable may be reworked to create a stable platform as directed by the Project Manager.

Material below embankment and areas identified by the Project Manager and determined to be unsuitable shall be excavated and disposed of in accordance with Section 107, "Legal Relations, Environmental Requirements, and Responsibility to the Public" unless otherwise specified in the Contract.

When unsuitable Material is removed and disposed of, the resulting void shall be filled with Material suitable for its planned use as directed by the Project Manager. Such suitable Material shall be placed and compacted in accordance with this Specification.

203.3 CONSTRUCTION REQUIREMENTS

203.3.1 General

The Contractor shall finish excavation and Embankment for the Roadway, intersections, and entrances to reasonably smooth and uniform surfaces. The Contractor shall not remove Materials from the Project limits without the approval of the Project Manager.

The Contractor shall ensure Borrow Material placed within the top two (2) Ft of the finished Subgrade meets the minimum design R-value.

The Contractor shall preserve the Materials below and beyond the lines and grades while conducting excavation operations. Before beginning excavation, grading, and Embankment operations, the Contractor shall perform the necessary clearing and grubbing in accordance with Section 201, "Clearing and Grubbing." The Contractor shall notify the Project Manager before opening excavation or borrow areas. The Contractor shall take cross section elevations of the ground surface before opening excavation or borrow areas.

The Contractor shall terminate operations in the immediate area of environmental or Cultural Resources not listed in the Contract, until the Department reviews and completes appropriate mitigation actions in accordance with Section 107.12, "Environmental, Hazardous Materials and Cultural Resource Discoveries."

203.3.2 Excavation

Within cut sections, the Contractor shall remove excavated Material from the limits of the cut section to the Subgrade elevation for the width of the Roadbed. The Contractor shall finish Roadbed cut sections to a smooth and uniform surface. The Contractor shall remove unsuitable Material below finished Subgrade in accordance with 203.2.1.5, "Unsuitable Material." The Contractor shall take cross-sectional measurements after the removal of unsuitable Material.

203.3.3 Rock Cuts

The Contractor shall perform proper drilling and blasting operations in accordance with the specified practices. When required, the Contractor shall perform controlled blasting of rock excavation to produce a clean face on the excavated cut. The Contractor shall ensure subsequent blasting and excavation operations do not affect previously excavated faces. The Contractor shall not excavate more than six (6) inches below the specified Subgrade elevation for Roadbed cuts in rock, unless directed otherwise. The Contractor shall not leave undrained pockets on the Roadbed surface. The Contractor shall place and compact Base Course on the rock cut foundation in accordance with Section 303, "Base Course."

203.3.3.1 Blasting Requirements

The Contractor shall use controlled blasting to establish a specified backslope with minimal blast damage, and production blasting to facilitate excavation. Before the start of blasting, the Contractor shall notify adjacent property owners, occupants and utility owners.

203.3.3.1.1 Definitions

Blasting Operations. Activities related to blasting including, but not limited to the following:

1. Collaring and drilling blast holes;
2. Preparing, fixing, loading, and firing explosive charges;
3. Assessing the blast after detonation; and
4. Handling misfires.

Buffer Row. The first row of production blast holes immediately adjacent and drilled in a plane parallel to the controlled blast line. The explosive load in the buffer row should be reduced from standard production loads to minimize damage to the backslope of the final excavation.

Controlled Blasting. The controlled use of explosives and blasting accessories in carefully spaced and aligned blast holes to provide a free surface or shear plane in the rock along the specified backslope, and to limit fly rock, permanent ground displacement, air concussion, and overbreak. Controlled blasting methods include pre-splitting and cushion blasting.

Cushion Blasting (Trim Blasting). The simultaneous detonation of one (1) line of blast holes along a specified excavation backslope after the main excavation is complete. This method is performed to trim the excavation to the final backslope.

Final Line (Controlled Blast Line). Refers to the row of controlled blast holes drilled in the plane of a specified excavation backslope. The controlled blast holes drilled in this plane constitute the basis for payment under the Controlled Blasting pay item. The Department considers the blast holes drilled in front of the final line blast holes to be production blast holes, which are Incidental to the Rock Excavation pay item.

Pre-Splitting. The simultaneous detonation of one (1) line of blast holes drilled along a specified excavation backslope before production blast holes are fired.

Production Blasting. Fragmentation blasting in the main excavation area.

203.3.3.1.2 Submittals

203.3.3.1.2.1 Blaster in Charge

The Contractor shall not begin drilling or blasting Work until the Project Manager approves of the Blaster in Charge. The Contractor shall submit the name and qualifications of the proposed Blaster in Charge to the Project Manager for approval at least 30 Days before the delivery of explosive Material to the Project. The Contractor shall provide the following information:

1. Proof of a license by the applicable State and/or local regulatory agencies to possess, transport, and use explosives; and
2. A list of, and references, for at least three (3) blasting Projects, of similar complexity, successfully completed within the previous five (5) years.

The Blaster in Charge must be on site during blasting operations.

203.3.3.1.2.2 Blasting Plans

The Contractor shall submit a General Blasting Plan to the Project Manager for each cut that requires blasting, at least two (2) weeks before the start of drilling and blasting operations on a specified cut. The Contractor shall provide the following information in the General Blasting Plan:

1. Description of the proposed blasting operation;
2. Preliminary design criteria for production and controlled blasting, including blast hole depths and patterns; and
3. Details regarding the proposed explosives and blasting accessories.

The Contractor shall submit a Detailed Blasting Plan at least 48 H before an individual blast. The Contractor shall provide the following information in the Detailed Blasting Plan:

1. Station limits of the proposed location of the blast, including the bench elevation, if applicable;
2. Date and time the blasting will occur;
3. Required removal of overburden, if applicable;
4. Plan and cross section diagrams of proposed drill pattern for controlled and production blast holes, including buffer rows, free face, burden, blast hole spacing, blast hole diameters, blast hole angles, lift height, and subdrill depth. Draw these Plans and cross sections to scale;
5. Loading diagram showing the type and amount of explosives, primers, and initiators; and the location, depth, and type of stemming;
6. Initiation sequence of controlled and production blast holes, including Delay times and the Delay system; and
7. Manufacturer’s data sheets for the explosives, primers, and initiators to be used.

The Contractor shall submit the blasting Plans to the Project Manager for review and Acceptance. The Project Manager will review and provide comments to the Contractor. The

Contractor shall submit revisions to the blasting Plans for final review and Acceptance. The Contractor shall not proceed with drilling and blasting operations related to a General Blasting Plan or loading of blast holes associated with a Detailed Blasting Plan without written notice.

The Contractor shall cease blasting operations and submit revised blasting Plans if the Department determines that the blasting operations are causing property damage in and beyond the Right of Way.

203.3.3.1.2.3 Blasting Records

The Contractor shall prepare and submit to the Department a Blasting Record for each blast, on the Day of the blast. The Contractor shall provide the following information in a Blasting Record:

1. Actual dimensions of the shot, including blast hole diameters and depths, burden, spacing, subdrilling depths, stemming, powder loads, powder factors, and timing;
2. A drawing or sketch showing the direction of the face and the physical shot layout;
3. The location of the blast in relation to Project stationing and elevation;
4. The date and time of loading and detonation;
5. The name and signature of the person responsible for loading and firing;
6. Comments by Blaster in Charge regarding misfires, fly rock occurrences, unusual results or effects; and damage to existing facilities, adjacent property, or completed Work;
7. Vibration and blast monitoring results; and
8. Any complaints received due to the blasting.

203.3.3.1.3 Explosives

The Contractor shall transport, store, handle, and use explosives in accordance with applicable federal, State, and local laws and regulations. The Contractor shall purchase explosives and accessory devices from industry recognized Suppliers and manufactures. The Contractor shall use explosives and accessory devices in accordance with manufacturer instructions. The Contractor shall not use expired products.

The CFR specifies responsibility for the following federal agencies regarding the administration of regulations involving explosive Materials:

1. Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). Storage and accountability of record keeping and security in accordance with 27 CFR part 555;
2. OSHA. Transportation, worker safety, and health in accordance with title 29 CFR; storage and safe blasting practices in handling and use in accordance with 29 CFR part 1926.900 et seq; and
3. Federal Department of Transportation (USDOT). Transportation and public safety, 49 CFR.

The fire marshal, sheriff, or other local officials, may have additional regulations for explosive Materials.

203.3.3.1.4 Safety

The Contractor shall follow safe practices, including the following:

1. Federal, State, and local regulations pertaining to the transportation, storage, and use of explosives must be strictly followed;

2. When required, the Blaster in Charge must obtain a blasting permit from the local regulatory agency before blasting;
3. Only persons authorized and qualified based on training and experience will handle and use explosives;
4. No person will smoke; carry matches or other flame producing devices; or carry firearms or loaded cartridges while in or near a motor vehicle that is transporting explosives;
5. Keep track of explosives at all times. Explosives must be stored and locked in an approved magazine facility in accordance with the applicable provisions of the Department, ATF, and OSHA until used in blasting;
6. Post appropriate signs in the required areas and vehicles in accordance with federal regulations;
7. Safely station the necessary guards or flag persons on Highways during blasting to control Highway traffic; and
8. Before starting Work in the cut, observe the entire blast area for at least five (5) minutes after each blast. Remove potentially dangerous rocks or other Material located beyond the excavation limits. Cease blasting operations if the required slopes are not stable, or if the safety and convenience of the public are being jeopardized.

203.3.3.1.5 Vibration Risk Survey

For each cut that requires blasting, the Contractor shall perform a vibration risk survey of nearby buildings, Structures, utilities, water supplies, or environmentally sensitive areas that may be at risk of blasting or construction damage. The Contractor shall perform the vibration risk survey in accordance with Section 617, "Vibration Monitoring and Video Taping." The Contractor shall obtain written approval for the vibration risk survey from the Project Manager before drilling blast holes.

203.3.3.1.6 Blasting Test Sections

The Contractor shall demonstrate the adequacy of proposed Blasting Plan with a blasting test section(s) for Material of different geologic characteristics. For Projects involving multiple cuts in similar geologic Materials, the Project Manager may reduce the requirement for a blasting test section in each cut. Blasting test sections include drilling, blasting, and excavating cut sections approximately 100 Ft long to determine the optimal combination of method, blast hole spacing, and charge. When field conditions warrant, the Project Manager may direct the Contractor to use test section lengths less than 100 Ft long.

Blasting test section requirements include the following:

1. The Contractor shall perform the blasting test section in accordance with Section 203.3.3.1, "Blasting Requirements." The Contractor shall prepare and submit a Detailed Blasting Plan for the test section to the Project Manager at least 48 H before the planned time of the blast. The Contractor shall not start blasting the test section until the Project Manager Accepts the Detailed Blasting Plan;
2. Unless the Contractor's Detailed Blasting Plan indicates otherwise, the Contractor shall begin the tests with the controlled blast holes spaced at 30 inches; and
3. After blasting, the Contractor shall remove a sufficient amount of Material from the test section to determine if the blast hole diameter, blast hole spacing, and amount of explosives are adequate to provide the required backslope. The Contractor shall not continue drilling of the test section area until the test section is excavated and the Department evaluates the results.

If, at any time during the progress of the main blasting operation, the methods of drilling and blasting do not produce the desired results, the Contractor shall revise and retest the blasting techniques until a technique produces the required results. The Department will consider the results to be unsatisfactory if:

1. There is an excessive amount of breakage beyond the indicated lines and grade;
2. There is excessive flyrock;
3. The final backslope within the specified tolerances is not uniform or overhangs are created;
4. Ground vibration and air blast levels exceed limits as stated in Section 617, "Vibration Monitoring and Video Taping;"
5. There are violations of other requirements of the Specifications;
6. The slopes are unstable;
7. The safety of the public is jeopardized; and
8. Property or natural features are endangered.

203.3.3.1.7 Blasting Execution

203.3.3.1.7.1 Notification and Schedule

The following requirements will apply to the notification and scheduling of blasting procedures:

1. The Contractor shall coordinate blasting operations with the Project Manager and notify the Project Manager a minimum of 1.5 H before the blast. The Contractor shall provide a one (1) hour timeframe for the blast. For example, if the Contactor notifies the Project Manager by 9:00 a.m. the blast may occur between 10:30 a.m. and 11:30 a.m.;
2. The Contractor shall provide notice to the required federal, State, and local agencies before each blast, as required by the blasting permits;
3. The Contractor shall notify occupants of buildings and owners of Structures and utilities of the blast time and location at least 48 H before the start of drilling or blasting; and
4. The Contractor shall detonate blasts at the planned time, unless approved otherwise by the Project Manager.

203.3.3.1.7.2 General Requirements

The Contractor shall cover the blast area with blasting mats, soil, or another equally serviceable Material, before firing blasts in areas where flying rock may result in personal injury or damage to property or the Work.

203.3.3.1.7.3 Controlled Blasting Requirements

The Contractor shall perform controlled blasting in accordance with the Detailed Blasting Plans that produced Acceptable results in blasting test sections. The Contractor shall perform control blasting using either pre-splitting or cushion blasting in accordance with the following requirements:

1. If the overburden does not support the drill holes, completely remove the overburden soil and loose rock along the top of the cut to expose the rock surface before drilling the controlled blast holes;

2. Mechanically monitor the blast hole angles;
3. Drill and space blast holes with a nominal diameter from two (2) inch to three (3) inch, in accordance with the blasting test sections or the results achieved in similar geologic Materials. Do not exceed three (3) Ft;
4. Use proper Equipment and technique to ensure that no blast holes deviate from the plane of the backslope shown in the Plans by more than eight (8) inches, parallel or normal to the slope. The Department will not pay for blast holes exceeding these limits unless the Project Manager approves the obtained slopes;
5. Drill the controlled blast holes at the required slope inclination, to the full depth of the cut, or to a pre-determined stage elevation. The maximum drill depth is 30 Ft. Use shallower holes if the directional control is inadequate. If more than five percent (5%) of the controlled blast holes are misaligned in any one (1) lift, reduce the height of the lifts until the eight (8) inch tolerance is met. The length of controlled blast holes may be incrementally increased once satisfactory directional control and blast results are demonstrated;
6. Drill unloaded and un-stemmed guide holes to the same diameter, in the same plane, and to the same tolerance as the controlled blast holes;
7. The Department will allow a maximum offset of 24 inches from the bottom of each lift to allow for drill Equipment clearances, when the cut requires more than one (1) lift. Begin drilling the control blast hole at a point that allows the necessary offsets, and adjust at the start of lower lifts as necessary to compensate for drift in the upper lifts;
8. Do not use horizontal blast holes for controlled blasting;
9. Use explosive charges, detonating cord, and other items necessary for the blasting operation in accordance with the manufacturer's recommendations and instructions;
10. Before placing charges, ensure the hole is free of obstructions. Use casing if necessary to prevent the walls of the hole from collapsing;
11. Use only standard explosives manufactured especially for the type of controlled blasting (cushion or pre-splitting). Do not load ammonium nitrate and fuel oil in the controlled blast holes. Use explosives and blasting accessories appropriate for the conditions of the blast hole (including water in the holes) and necessary to achieve satisfactory results;
12. Assemble and affix continuous column cartridge-type explosives to the detonating cord in accordance with the explosive manufacturer's instructions;
13. The bottom charge in a blast hole may be larger than the charges above, but not large enough to cause overbreak. Place the top charge far enough below the collar and sufficiently reduced in size to avoid overbreaking or heaving; and
14. Use a dry, angular, and granular Material that passes a 3/8 inch sieve to stem the controlled blast holes, from the top charge to the hole collar.

203.3.3.1.7.4 Pre-Split Blasting

The Contractor shall perform pre-split blasting in accordance with Section 203.3.3.1.7.3, "Controlled Blasting Requirements," and the following requirements:

1. Detonate the pre-split blast holes before drilling for production blasting; or fire the pre-split blast holes at least 75 Ms before the production holes if detonated in the same blast;
2. Fire pre-split blast holes simultaneously, unless ground vibrations, noise, or air blast are excessive. Fire pre-split holes in delayed sections and reduce the charge weight per delay to mitigate excessive effects;

3. The line of pre-split blast holes will extend beyond the limits of the production blast holes to be detonated. The minimum length of this extension will be 30 Ft or to the end of the cut, but will not be greater than one-half of the distance of the expected blast advance; and
4. Do not perform pre-split blasting if the distance between the controlled blast line and free face is less than 20 Ft or less than three (3) times the blast hole depth, whichever is greater.

203.3.3.1.7.5 Cushion Blasting

The Contractor shall perform cushion blasting in accordance with item No. 3 of Section 203.3.3.1.7.3, "Controlled Blasting Requirements," and the following requirements:

1. Perform cushion blasting as part of the final shot after other blasting is finished;
2. If the final shot includes production blast holes, detonate the cushion blast no more than 75 Ms or less than 25 Ms after the production blast; and
3. Fire cushion blast holes simultaneously, unless ground vibrations, noise, or air blast are excessive. Fire cushion blast holes in delayed sections and reduce the charge weight per delay to mitigate excessive effects.

203.3.3.1.7.6 Production Blasting

The Contractor shall perform production blasting in accordance with the Blasting Plan that produced Acceptable results in blasting test sections and the following requirements:

1. Minimize blast damage to the final excavation backslope;
2. Drill buffer rows of production blast holes on a plane approximately parallel to the controlled blast line;
3. Place the buffer row of production blast holes no closer than six (6) Ft to the controlled blast line unless the Contractor can prove the final excavation backslope will not be damaged by the production blast;
4. Where necessary to minimize damage to the excavation backslope, load blast holes in the buffer row lighter than other production holes;
5. Ensure the bottoms of production blast holes are not lower than the bottom of controlled blast holes, except in the lowest lift;
6. Ensure the diameter of production blast holes does not exceed six (6) inches, unless approved by the Project Manager;
7. Before placing charges, ensure the hole is free of obstructions. Use casing, if necessary, to prevent the walls of the hole from collapsing;
8. Use a dry, angular, and granular Material that passes a 3/8 inch sieve to stem the holes, from the top charge to the hole collar;
9. Detonate production blast holes in a controlled delay sequence toward a free face;
10. Do not use horizontal holes for production blasting, except for Equipment access; and
11. Use explosives and blasting accessories appropriate for wet or dry blast hole conditions as necessary to achieve satisfactory results.

203.3.3.1.7.7 Scaling and Stabilization of Slopes Established by Controlled Blasting

The Contractor shall perform scaling and stabilization of slopes established by controlled blasting in accordance with the following requirements:

1. Observe the entire blast area following a blast before starting Work in the cut. If any rocks are loose, hanging, or potentially dangerous within a blast area, the Contractor shall remove them. Scale slopes by hand using a standard steel mine scaling rod. Use other methods to supplement or in lieu of hand scaling, such as, machine scaling, hydraulic splitters, or light blasting, if approved by the Project Manager;
2. Slopes shall be scaled and stabilized before further construction activities take place. Scale slopes throughout the span of the Contract and as often as necessary to keep the slopes free of hazardous loose rock or overhangs; and
3. Cease blasting operations if the following conditions exist:
    3.1. There is an excessive amount of breakage beyond the specified lines and grade;
    3.2. There is excessive flyrock;
    3.3. The final backslope within the specified tolerances is not uniform;
    3.4. Ground vibration and air blast levels exceed limits specified in Section 617, “Vibration Monitoring and Video Taping;”
    3.5. There are violations of other requirements of the Specifications;
    3.6. The slopes are unstable;
    3.7. The safety of the public is jeopardized; and
    3.8. Property or natural features are endangered.

203.3.4 Borrow

The Contractor shall be responsible for obtaining the borrow source, unless otherwise specified in the Contract. The Contractor shall exhaust all available suitable Material from unclassified excavation operations prior to utilizing a borrow source. The Contractor shall notify the Project Manager in writing, and request that borrow operations commence, when the Contractor exhaust unclassified excavation Material for Embankment. Borrow placed prior to this notification shall not be paid. If the Contractor places more than the specified amount of borrow and causes a waste of unclassified excavation, the Department will deduct the wasted amount from the borrow volume, as measured in the borrow area. After unclassified excavation is complete, the Contractor shall blade the areas that require borrow to allow accurate payment measurements by cross sectioning by the Contractor. The Contractor shall maintain and restore Right of Way fencing removed for borrow operations to its original condition or better to prevent livestock from entering Right of Way during the Project.

203.3.5 Embankments

The Contractor shall not place Embankment Material on frozen earth, or incorporate frozen soils in Embankments. The Contractor shall suspend Embankment construction if Embankment Materials become frozen. The Contractor shall not resume until the Materials are thawed and suitable for compaction. Before beginning Embankment construction, the Contractor shall perform scalping in accordance with Section 201, “Clearing and Grubbing.” The Contractor shall bench new Embankments into the following:

1. Natural slopes including rock;
2. Existing Embankments; or
3. Phased Embankment construction.

The Contractor shall ensure benches are wide enough to allow operation and placement of compacting Equipment. The Contractor shall recompact new Embankment Material and

Material that is cut out at no additional cost to the Department. The Contractor shall not place rock, broken concrete, or other solid Materials in Embankment areas where driven pilings, drilled shafts, utility lines, or other Structures are specified in the Contract.

203.3.5.1 Roadbed Embankments

The Contractor shall break up the original ground surface to at least six (6) inches by plowing, scarifying, or stepping up. The Contractor shall compact this area in accordance with Section 203.3.6, "Moisture and Density Control." The Contractor shall place Material for Roadbed Embankment in uniform lifts not exceeding eight (8) inches thick and compact in accordance with Section 203.3.6, "Moisture and Density Control."

The Department will allow rocks no larger than three (3) Ft (in any dimension) as long as the Contractor distributes and fills the interstices to form a dense mass. If the interstices between the rock fragments cannot be completely filled and compacted, the Contractor shall use bridging geotextile, approved by the Project Manager, over the top of the rock fragments to prevent the overlying Embankment Material from filling the interstices. The Contractor shall not use rock fragments that may degrade with time or may be water sensitive (such as shale or gypsum) as rock fill in Roadbed Embankments.

The Contractor may place larger rocks greater than three (3) Ft in any dimension in the toe of the slope in accordance with the following requirements:

1. No rock is larger than one-half the Embankment height or ten (10) Ft;
2. No rock is placed in fill height less than eight (8) Ft, measured at the edge of the Roadway Shoulder; and
3. Place rocks inside a line six (6) inches from the slope stake, space a minimum of three (3) Ft from edge to edge, and cover with approved Embankment Material.

The Contractor shall construct rock Embankments to a maximum of six (6) inches below Subgrade elevation. The Contractor shall consolidate rock fills by using the appropriate Equipment and methods approved by the Project Manager.

203.3.5.2 Non-Roadbed Embankment

The Contractor shall break up the original ground surface to at least six (6) inches by plowing, scarifying, or stepping up. The Contractor shall compact this area in accordance with Section 203.3.6, "Moisture and Density Control." The Contractor shall place Material for Non-Roadbed Embankment in uniform lifts not exceeding eight (8) inches thick and compact in accordance with Section 203.3.6, "Moisture and Density Control."

If the Embankment Material consists of rock, place the rock in layers of sufficient depth to contain the largest rock in the Material, and carefully distribute and fill the interstices to form a dense mass.

203.3.6 Moisture and Density Control

Maximum dry density of all soil types encountered or used will be determined in accordance with AASHTO T 180 (Modified Proctor), Method A or D (TTCP Modified).

The Contractor shall construct Roadbed, Roadbed Embankment, non-roadbed Embankment, and Roadway Median excavation or Embankment, with moisture and density control. The Contractor shall compact each layer of Embankment to at least 95% of maximum density as specified above. The Contractor shall ensure that the in-place moisture content of the soil shall not be less than five percent (5%) below optimum moisture content or greater

than two percent (2%) above optimum moisture content, at the time of compaction. For soils with a plasticity index of 15 or greater, the Contractor shall ensure the moisture content of the soil at the time of compaction is between optimum moisture to optimum moisture plus four percent (4%). If the moisture content at the time of compaction is not within the specified range, the Contractor shall moisten or dry the Material, then thoroughly mix the Material to the full lift depth before re-compacting. No additional payment shall be made for the reworking of Materials that do not fall within the ranges specified above.

Roadbed Embankments that contain mostly rock or coarse-grained Material (65% or greater retained on the No. 4 sieve) do not require moisture and density control, except the top six (6) inches of the Embankment; the Contractor shall construct in accordance with Section 207.3, "Construction Requirements." Non-roadbed Embankments of rock Material will not require moisture and density control unless otherwise specified in the Contract.

The Department will perform field densities in accordance with AASHTO T 310 or other Department approved methods. Densities shall be measured at each lift before the next subsequent lift is placed in accordance with Section 906, "Minimum Testing Requirements."

203.4 METHOD OF MEASUREMENT

203.4.1 Rock Excavation

The Department will measure Rock Excavation based on the estimated percentages if shown in the Contract, unless otherwise requested by the Contractor and approved by the Department.

If the Contractor requests, the Department will measure Rock Excavation in its original position for Material classified as Rock Excavation in accordance with Section 203.2.1.1, "Rock Excavation." Before excavation, the Contractor and Project Manager must agree on the limits of Material classified as rock excavation. The Contractor shall calculate volumes in accordance with Section 203.4.3, "Unclassified Excavation and Borrow." The Contractor shall include in measurements the overbreakage in rock excavation a maximum of ten (10) inches beyond the backslope specified in the Plans or as directed by the Project Manager. The Department will use the blaster's drill-hole log cards to determine the quantities of rock excavation covered by soil or overburden. The Contractor shall provide these log cards as part of the surveying records.

The Department will pay for stabilization necessitated by existing geological conditions and for Base Course and geotextile if necessary as required to backfill rock Subgrade conditions.

203.4.2 Controlled Blasting

The Department will measure Controlled Blasting by the blast holes drilled along the final line, whether loaded or not; and will measure the lengths from the top of the rock surface to the elevation of the Roadway ditch or to a bench elevation set by the Project Manager. The Department based the quantities for Controlled Blasting shown in the Plans on assumed blast hole spacing; the actual quantities depend on field conditions and the results from test sections.

203.4.3 Unclassified Excavation and Borrow

For each phase of the Project, identified in the Contract or approved by the Department, the Contractor shall measure the original ground surface of all areas that are designated as unclassified excavation (cut sections) and/or Embankment (fill sections using available

unclassified excavation Material), or Borrow (fill sections when all unclassified excavation Material has been exhausted). Prior to any Work continuing in completed excavation areas, the Contractor shall measure the newly excavated ground surface (final surface). For Embankment and borrow areas the Contractor shall measure the final surface once these operations are completed and Accepted by the Project Manager. Prior to commencing Borrow operations the Contractor must ensure that all requirements of Section 203.2.1.3, "Borrow" have been met. Earthwork quantities will be calculated as the neat volume from the original ground surface (less the existing Roadway surfacing) between the limits shown on the plans, and/or authorized changes by the Project Manager, and the new ground surface. The Department will not apply any shrinkage or swell factor due to payment being made on the final cross sectioned volume.

For the measurements described above the Contractor shall survey and submit the original ground surface and final surface data at completion of each phase of construction using an electronic XML- compatible format approved by the Project Manager. The Contractor shall use a New Mexico licensed Engineer or New Mexico licensed surveyor to stamp and certify cross-sections at 50 Ft intervals, unless otherwise specified in the Contract or approved by the Project Manager prior to commencement of earthwork operations. The Contractor shall submit certified volume summary reports to the Project Manager based on this electronic data for each phase of construction including a report that summarizes the basis for the final volumes.

203.5 BASIS OF PAYMENT

Pay Item	Pay Unit
Rock Excavation	Cubic Yard
Unclassified Excavation	Cubic Yard
Borrow	Cubic Yard
Unsuitable Material Excavation	Cubic Yard
Controlled Blasting	Linear Foot

203.5.1 Double Handling

The Department will pay for excavated Materials that require more than one (1) handling as identified within the Contract before final placement, including fertile topsoil required to be stockpiled and reserved for later use in the Work:

1. At the Bid Item Unit Price for unclassified excavation, for each handling approved by the Project Manager; or
2. As another item of Work for the second handling if specified in the Contract.

However, if the Contractor handles excavated and borrow Materials more than once, at the Contractor's request or at the convenience of the Contractor, there will be no additional cost to the Department. If the Contractor chooses to stockpile excess unclassified excavation Material to be used as borrow in a later phase, the Department will not pay for this Material as double handling. Double handling shall not be paid for Material that is excavated and placed in the same phase of the Project.

203.5.2 Work Included in Payment

The Department will consider the item(s) listed in this section as included in the pay items(s) listed in Section 203.5, "Basis of Payment" and will not measure or pay for them separately:

1. Controlled blasting drill holes through overburden;
2. Production blasting;
3. Scaling within the limits of a final backslope established by controlled blasting;
4. Damage resulting from blasting;
5. Mobilization of any Equipment and testing of rock in accordance with Section 203.2.1.1, “Rock Excavation;”
6. Time Delays to perform testing of rock in accordance with Section 203.2.1.1, “Rock Excavation;”
7. Material required to fill the voids and irregularities in Embankment areas below the tolerance limit from the specified elevation;
8. Bridging geotextiles required to prevent overlying Embankment Material from migrating into the interstices between rock fragments;
9. Fence removal and replacement;
10. AASHTO T-190 Resistance R-Value and Expansion Pressure of Compacted Soils, including sampling, laboratory testing and reporting;
11. AASHTO T-290 Water-Soluble Sulfate Ion Content in Soil, including sampling, laboratory testing, and reporting;
12. Survey, calculations, and engineering;
13. Hauling and/or disposal related to Rock Excavation, Unclassified Excavation, Borrow, and Unsuitable Material Excavation; and
14. Suitable backfill Material for Unsuitable Material Excavation.

The Contractor shall dispose of Material in accordance with Section 107, “Legal Relations, Environmental Requirements, and Responsibility to the Public” unless otherwise specified in the Contract. The Contractor shall not dispose of Material within the Project Limits without written approval from the Project Manager.