STANDARD SPECIFICATIONS
FOR
HIGHWAY AND BRIDGE
CONSTRUCTION

NEW MEXICO
DEPARTMENT
OF
TRANSPORTATION

2019 EDITION

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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.

SECTION 303: BASE COURSE

303.1 DESCRIPTION

This Work consists of providing, hauling, and placing Base Course.

303.1.1 Stockpiling

This Work consists of providing, hauling, and stockpiling Base Course at specified locations.

303.1.2 Removing, Processing, and Placing Base Course

This Work consists of removing, hauling, processing, placing existing Base Course Material.

303.2 MATERIALS

303.2.1 General

Base Course consists of one (1) or more of the following:

1. Crushed stone;
2. Crushed or screened gravel;
3. Caliche;
4. Sand;
5. Recycled Asphalt Pavement (RAP) not to exceed 50%; recycled concrete pavement (RC) not to exceed 75%; and the combined RAP and RC not to exceed 75% by weight;
6. Processed glass aggregate.

Base Course shall not contain organic matter or other Deleterious Materials, including silt and clay balls.

The Department will allow a maximum of ten percent (10%) (by weight) processed glass aggregate, uniformly distributed, in composite Base Course. Processed glass aggregate shall meet physical properties and deleterious substance requirements in accordance with AASHTO M 318.

303.2.2 Aggregate Acceptance

The Department will accept Base Course based on random samples taken by the Department from the Roadway. Unless the Contract specifies otherwise, the Contractor shall produce Material in compliance with Table 303.2.2:1, “Type I Base Course Gradation Band or Table 303.2.2:2, “Type II Base Course Gradation Band” as specified in the Contract and Table 303.2.2:3, “Base Course Physical Properties.”

Table 303.2.2:1
Type I Base Course Gradation Band

Sieve size	% passing
1.0 inch	100
¾ inch	80--100
No. 4	30-60

Table 303.2.2:1
Type I Base Course Gradation Band

Sieve size	% passing
No. 10	20-45
No. 200	3.0-10.0

Table 303.2.2:2
Type II Base Course Gradation Band

Sieve size	% passing
1.0 inch	100
¾ inch	85-95
No. 4	40-70
No. 10	30-55
No. 200	6.0-15.0

Table 303.2.2:3
Base Course Physical Properties

Property	Specification Limit
Fractured Face[a]	Minimum 50% on Untreated Material
AI[b]	Maximum 35
LL	Maximum 25
PI	Maximum 6

[a]Materials retained on or above the No. 4 sieve shall have at least two (2) Fractured Faces when evaluated in accordance with AASHTO T-335, “Determining the Percentage of Fractured Faces in Coarse Aggregate.”

[b]Maximum AI of 35 for untreated natural aggregate source when calculated in accordance with Section 910, “AGGREGATE INDEX”.

303.3 CONSTRUCTION REQUIREMENTS

303.3.1 Subgrade

The Contractor shall place base course on subgrade prepared in accordance with Section 207, "Subgrade Preparation."

303.3.2 Mixing and Placing

The Contractor shall:

- Place maximum six (6) inch (compacted) lifts, unless specified otherwise.
- Not Place Base Course Material on frozen Subgrade.
- Compact Base Course to at least 96% of maximum density as determined by AASHTO T 180 (Modified Proctor), Method D (TTCP Modified).

The Department will use nuclear testing methods to determine in-place densities in accordance with AASHTO T 310 and TTCP procedures for wet density moisture correction.

303.3.3 Surface Tolerance

The surface tolerance shall not exceed ½ inch within ten (10) feet as verified by the Department. All deviations greater than ½ inch shall be corrected by the Contractor and reverified by the Department.

303.3.4 Plan Base Course and Sub-base Depths

The Department will monitor and record Base Course depth during the placement in accordance with the Department's "Minimum Testing Requirements." If the placed thickness deviates from the requirements by more than minus ½ inch, the Contractor shall add Material and reprocess to correct the deficiency.

303.3.5 Stockpiled Base Course

The Contractor shall stockpile base course material at locations shown on the Plans and prevent segregation of Materials at each stockpile. The Contractor shall maintain each stockpile in accordance with the following requirements:

1. Place stockpiles upon prepared sites;
2. Make stockpiles neat and regular to prevent segregation;
3. Provide enough storage space for each size of aggregate;
4. Prevent contamination (store stockpiles away from vehicular and Equipment traffic);
5. Keep the storage site neat and orderly and keep the stockpiles accessible for sampling; and
6. Acceptance by the Department will be at the final stockpile location.

303.3.6 Removing and Processing Existing Base Course

The Contractor shall:

1. Minimize contamination of Base Course Material when removing it from the Roadway for reuse, and;
2. Meet the requirements as indicated in Section 303.3.2 "Mixing and Placing."

303.3.7 Sampling and Testing

The Contractor and Department shall sample and test the Base Course in accordance with Section 906 "Minimum Testing Requirements" for Base Course. Department personnel may test locations other than the random locations generated for statistical analysis. These tests will not be used for pay factor determination, but may be used to determine Acceptance or rejection of localized Material.

303.3.7.1 Contractor Quality Control

The Contractor shall develop and administer a Quality Control plan that ensures the product meets the requirements of Section 902, "Quality Control." The Contractor shall ensure that the Quality Control plan addresses the following elements:

1. Contractor management and process control personnel,
2. Testing Equipment and lab facilities,
3. Aggregate production,
4. Aggregate quality,
5. Stockpile management,

6. Proportioning,
7. Mixing and processing,
8. Transporting,
9. Placing and spreading,
10. Compaction,
11. Line and grade control, and
12. Criteria for the correction or rejection of unsatisfactory Materials.

The Contractor shall:

1. Provide copies of TTCP wallet cards or certifications for personnel who are responsible for sampling and testing the Base Course.
2. Update the list as required if personnel substitutions are made.
3. Use test results, inspections, and other Quality Control practices to assure the quality of each material source and to control processes for crushing, mixing, proportioning, processing, transporting, placing, spreading, and compacting quality.

303.3.8 Acceptance

The Department will accept Base Course Materials based on samples taken in accordance with the Section 906, “Minimum Testing Requirements” after placement but before compaction. Acceptance will be in accordance with Section 303.2.2, “Aggregate Acceptance” and Section 303.3, “Construction Requirements. If necessary, the Contractor shall re-work the Base Course until all requirements are met at no additional expense to the Department.

303.4 METHOD OF MEASUREMENT

When calculating the square yardage the Department will use the average Base Course width and the station-to-station length along the centerline. The dimensions will show on the typical section of the Plans. When calculating the weight of the material, the Department will deduct the weight of moisture that exceeds the optimum moisture content plus two percent (2%). No additional payment shall be made for the stockpile pad.

303.5 BASIS OF PAYMENT

The Department will pay for the accepted quantities of *Base Course* as determined in Section 303.3.8, "Acceptance."

Pay Item	**Pay Unit**
Base Course	Cubic Yard or Ton
Base Course _____inch Depth	Square Yard
Remove, Process and Place Base Course	Square Yard or Ton
Stockpiled Base Course	Cubic Yard or Ton

303.5.1 Work Included in Payment

The Department will consider as included in the payment for the pay item(s) listed in this section and will not measure or pay separately for the following Work:

1. Providing, hauling, placing, and compacting Base Course Material;
2. Stockpiling, if required by contract;

3. Quality Control in accordance with Section 902, “Quality Control;” and
4. Remove, process, and place Base Course, if required by contract.

SECTION 407: TACK COAT

407.1 DESCRIPTION

This Work consists of providing and applying asphalt Material to an existing HMA, WMA, or portland cement concrete pavement surface.

407.2 MATERIALS

The Contractor shall use one (1) of the following asphalt Materials types for the tack coat:

1. CSS-1, CSS-1H, or SS-1, or SS-1H emulsified asphalt;
2. Performance-graded asphalt binder; or
3. Project Manager approved selection from the Department's *Approved Products List*.

The Contractor shall provide the asphalt Materials in accordance with Section 402, "Asphalt Materials and Mineral Admixtures."

407.3 CONSTRUCTION REQUIREMENTS

The Project Manager will determine the tack coat application rate and as indicated in Section 407.3.4, "Application of Asphalt Materials."

407.3.1 Temperature and Weather Limitations

The Contractor shall:

1. Not apply tack coat on a wet surface.
2. Not apply emulsified asphalt when the air temperature is below the manufacturers recommended application temperature.

407.3.2 Equipment

The Equipment shall include an asphalt distributor and Equipment for heating asphalt Material. The Contractor shall provide Equipment that is in accordance with Section 408, "Prime Coat."

407.3.3 Preparation of Surface

The surfaces and edges to be tack coated shall be dry, patched, cleaned, and free of dirt, surface moisture, vegetation and other Deleterious Materials or irregularities.

407.3.4 Application of Asphalt Material

The Contractor shall:

1. Uniformly apply asphalt Material with a pressure distributor at a rate determined by the Project Manager (to provide a "residual" asphalt cement content of from 0.04 gal per square yard to 0.08 gal per square yard);
2. Ensure that the nozzles on the pressure distributor are fully open and at the same angle from the spray bar, approximately 30°;
3. Keep the spray bar at a height above the pavement surface to provide for a double or triple lap of the applied asphalt Material;
4. Keep traffic off of the tack coat, unless otherwise approved by the Project Manager. If the Roadway being paved is closed to traffic, the Contractor may place tack coat a

maximum of 24 h ahead of the laydown operation. If the Roadway being paved is open to traffic, place the tack coat only over the area that can be paved during that Day's laydown operation. If the Contractor uses an emulsified asphalt tack coat, the Contractor may begin paving operations after the emulsified asphalt is cured.

5. Reapplication of tack coat damaged by traffic or construction Equipment will be at no cost to the Department.

407.4 METHOD OF MEASUREMENT

The Department will consider any water added to further dilute emulsified asphalts Incidental to *Asphalt Material for Tack Coat* and no separate payment will be made.

407.5 BASIS OF PAYMENT

Pay Item	Pay Unit
Asphalt Material for Tack Coat	Ton

407.5.1 Work Included in Payment

The Department will consider as included in the payment for the pay item(s) listed in this section and will not measure or pay separately for the following Work:

1. Providing, mixing, heating, and applying asphalt Materials to the roadbed with an asphalt distributor;
2. Shipping/Delivery to Project site;
3. Sampling and Testing; and
4. Water.

SECTION 408: PRIME COAT

408.1 DESCRIPTION

This Work consists of providing and applying asphalt Material and blotter Material (if required) to an existing surface.

408.2 MATERIALS

The Contractor shall provide one (1) of the following types of prime coat asphalt Material:

1. Asphalt emulsified prime (AE-P);
2. Penetrating emulsified prime (PE-P);
3. Emulsified Petroleum Resin Prime (EPR-1)
4. MC-70; or
5. Other Material approved by the Project Manager.

The Contractor shall provide prime coat asphalt Material in accordance with Section 402, "Asphalt Materials and Mineral Admixtures."

408.2.1 Certification

The Contractor shall provide a manufacturer's written certification that the prime Material is chemically identical to those identified on the Department's *Approved Products List*.

408.2.2 Blotter Material

The Contractor shall provide fine aggregate (sand) blotter Material in accordance with Table 408.2.2:1, "Blotter Material," unless otherwise approved by the Project Manager.

Table 408.2.2:1
Blotter Material

Sieve size	% passing
3/8 inch	100
No. 4	80 – 100
No. 16	45 – 80
No. 50	10 – 30
No. 100	2 – 10

408.3 CONSTRUCTION REQUIREMENTS

The Project Manager will determine the prime coat application rate and as indicated in Section 408.3.4, "Application of Prime Material."

408.3.1 Temperature and Weather Limitations

The Contractor shall not apply the prime Material in the following conditions:

1. If the surface has standing water;
2. If the air temperature is less than manufacturer's recommendation; or
3. If weather conditions prevent the proper placement of the prime coat.

The Project Manager may waive these temperature and weather limitations due to wet weather conditions or to protect Work in progress during Department approved suspensions.

408.3.2 Equipment

The Contractor shall:

1. Provide a distributor and Equipment for heating bituminous Material. Ensure the distributor is capable of maintaining the prime Material at an even temperature and can uniformly distribute the Material on variable widths with uniform pressure;
2. Ensure that the distributor can apply the Material as required;
3. Ensure that the distributor circulates the prime Material within the tank, the spray bar, and other accessories when not spraying; and
4. Ensure that the distributor has a hand spray gun with a precise-control single or double nozzle and a positive shut-off valve.

The Contractor shall ensure that the distributor has the following Equipment:

1. A tachometer;
2. Pressure gauges;
3. Accurate volume-measuring devices or a calibrated tank;
4. A thermometer that measures the temperature of tank contents;
5. A power unit for the pump; and
6. Laterally and vertically adjustable spray bars.

408.3.3 Preparation of Surface

The Contractor shall:

1. Shape the surface to be primed in accordance with the Plans, and ensure that it is free of ruts, corrugations, segregated Materials, or other irregularities.
2. Uniformly compact the surface in accordance with Section 303, “Base Course.”
3. Ensure that the surface is slightly moist but not saturated when applying the prime.

408.3.4 Application of Prime Material

The Contractor shall:

1. Not apply the prime coat until the Project Manager has approved the quantities, application rates, Material temperature, and locations;
2. The Contractor shall apply the prime Material in a uniform and continuous layer using a pressure distributor;
3. Ensure the nozzles on the pressure distributor are fully open and at the same angle from the spray bar, approximately 30°;
4. Keep the spray bar at a height above the pavement surface to provide a double or triple lap of the prime Material;
5. If using a hand-held want, ensure the application is uniform; and
6. If distribution irregularities occur, cease operations and take corrective action.

If the Department allows traffic on the surface, the Contractor shall maintain one (1)-way traffic on the untreated section of the Roadbed until the treated surface has absorbed the prime Material, then transfer traffic to the treated portion and prime the untreated section.

The Contractor shall perform Work and procedures in accordance with manufacturer's recommendations.

408.3.5 Application of Blotter Material

If the prime Material fails to penetrate the surface within 24 h after its application, the Contractor shall spread blotter Material to absorb the excess Material. The Project Manager may approve the use of blotter Material on Roadway sections that must be opened to traffic before the 24 h waiting period.

408.4 METHOD OF MEASUREMENT

The Department will consider any water added to further dilute emulsified asphalts Incidental to *Asphalt Material for Prime Coat* and no separate payment will be made.

408.5 BASIS OF PAYMENT

Pay Item	Pay Unit
Prime Coat Material	Ton

408.5.1 Work Included in Payment

The Department will consider as included in the payment for the pay item(s) listed in this section and will not measure or pay separately for the following Work:

1. Providing, mixing, heating, and applying asphalt Materials to the roadbed with an asphalt distributor;
2. Provide blotter Material as required;
3. Shipping/Delivery to Project site;
4. Sampling and Testing; and
5. Water.

SECTION 423: HOT MIX ASPHALT (HMA) (MAJOR PAVING)

423.1 DESCRIPTION

This Work consists of constructing one (1) or more pavement courses of Hot-Mix Asphalt (HMA) on a prepared base, to include crushing, stockpiling, hauling, binder, mineral admixture, mix design, mixing, providing cold feeds, process control testing and placement.

423.2 MATERIALS

423.2.1 General

HMA is a mixture of asphalt binder, aggregate, blending sand, mineral filler, and mineral admixture. Unless otherwise prohibited in the Contract, the Department will allow Recycled Asphalt Pavement (RAP) in HMA mixtures as long as the resulting mixture conforms to all Specification requirements.

The Contractor shall size, uniformly grade, and combine aggregate fractions in accordance with the Contract. The Contractor shall test Materials in accordance with applicable AASHTO/ASTM methods, as modified by the Department (if applicable) or other test procedures as directed by the Department. The State Materials Bureau will decide all questions pertaining to the interpretation of test procedures.

423.2.2 Aggregate

The Contractor shall ensure the aggregate gradation of the HMA mixture meets the requirements of Table 540
.2.2.1:1, “HMA Aggregate Gradation Control Points.” The Project Manager may require, at no additional cost to the Department, wet preparation, per AASHTO T 146, Method A, if the Project Manager determines there are Deleterious Materials present in the aggregate stockpiles before aggregate gradation testing. The Contract will specify the type of HMA the Contractor is to use. The Department will allow the Contractor to combine Materials from two (2) or more sources to produce aggregate only when each individual aggregate source meets all applicable quality requirements.

423.2.2.1 Gradation and Quality Requirements

Table 423.2.2.1:1
HMA Aggregate Gradation Control Points

	% passing per HMA type							
	SP-II		SP-III		SP-IV		SP-V	
Sieve size	Min	Max	Min	Max	Min	Max	Min	Max
Two (2) inch	—	—	—	—	—	—	—	—
1 1/2 inch	100	—	—	—	—	—	—	—
One (1) inch	90	100	100	—	—	—	—	—
3/4 inch	—	90	90	100	100	—	—	—
1/2 inch	—	—	—	90	90	100	100	
3/8 inch	—	—	—	—	—	90	90	100
No. 8	19	45	23	49	28	58	32	67
No. 200	1.0	7.0	2.0	8.0	2.0	10.0	2.0	10.0

423.2.2.1.1 Aggregate Quality

For each Material source, the Contractor shall ensure the HMA coarse aggregate has an AI of 25 or less when calculated in accordance with Section 901, "QUALITY CONTROL/QUALITY ASSURANCE (QC/QA)."

The Contractor shall regulate the crushing of aggregate to:

1. Minimum Fractured Faces content of the plus No. 4 Material complies with the requirements of Table 423.2.2.1.2:1, "Fractured Faces, Sand Equivalent, and Fine Aggregate Angularity," and evaluation by AASHTO 335-09, "*Fractured Face Determination for Coarse Aggregate;*"
2. Ensure the combined plus 3/8 inch material contains no more than 20% flat, elongated particles with a dimensional ratio of 3:1 or greater as determined by ASTM D 4791 (TTCP Modified);
3. Ensure the combined Material, excluding RAP; passing the No. 40 sieve is non-plastic;
4. Ensure that before the addition of mineral admixtures, the minimum sand equivalent value and the minimum fine aggregate angularity value of the combined aggregate, excluding RAP, complies with the requirements of Table 423.2.2.1.2:1, "Fractured Faces, Sand Equivalent, and Fine Aggregate Angularity;" and
5. Determine the Sand Equivalent value in accordance with AASTHO T 176, Alternate Method No. 1, and Fine Aggregate Angularity value in accordance with AASHTO T 304, Method A.

423.2.2.1.2 Fractured Faces

The Department will consider a face to be fractured when at least one-half of the projected particle area exhibits a rough, angular, or broken texture with well-defined edges.

Table 423.2.2.1.2:1
Minimum Fractured Faces, Sand Equivalent, and Fine Aggregate Angularity for Virgin Aggregates

Design Traffic, ESALs[a] x 10^6	Fractured Faces[b]	Sand Equivalent (%)	Fine Aggregate Angularity
< 3.0	75.0 / —	45.0	40.0
≥ 3.0 – < 10.0	85.0 / 80.0	45.0	45.0
≥ 10.0 – < 30.0	95.0 / 90.0	45.0	45.0
≥ 30.0	99.0 / 95.0	50.0	45.0

[a]ESALs are based on a 20-year design life for all scenarios.

[b]Under "Fractured Faces," 85.0 / 80.0 denotes that 85.0% of the coarse aggregate has at least one (1) Fractured Face and 80.0% has at least two (2) Fractured Faces.

Ensure RAP provided from sources outside the Project has at least 75% Fractured Faces (one (1) Fractured Face); however, Sand Equivalent and Fine Aggregate Angularity do not apply.

423.2.2.2 Production

When producing aggregates for HMA, the Contractor shall:

1. Remove natural fines by screening and stockpiling separately;

2. Use a No. 4 screen, minimum, or a larger screen if needed to properly control the crushing and screening operation;
3. Crush the aggregate retained on the scalping screen and separate the crushed Material into at least two (2) stockpiles of fine and coarse aggregates; and
4. Regulate crushing operations to produce Material that meets design requirements when combined.

423.2.2.3 Stockpiling

The following requirements apply to stockpiles, the Contractor shall:

1. Place stockpiles upon prepared sites;
2. Make stockpiles neat and regular to prevent segregation;
3. Provide enough storage space for each size of aggregate;
4. Separate the aggregate stockpiles far enough apart to prevent mixing, or with walls or partitions;
5. Prevent contamination (store stockpiles away from vehicular and Equipment traffic);
6. Keep the storage yard neat and orderly and keep the stockpiles accessible for sampling; and
7. Keep the aggregate sizes separated until delivered to the cold feed system that feeds the drier.

423.2.2.4 Combining

When combining crushed Materials from different stockpiles, including RAP (if in the mixture); the Contractor shall ensure the product is in accordance with the mix design gradation requirements. The Contractor shall use controlled feeders from each stockpile to combine crushed Material.

423.2.3 Asphalt Binder

The Contract will specify the type and grade of asphalt binder. The Contractor shall provide asphalt binders in accordance with Section 402, “Asphalt Materials and Mineral Admixtures.” The Contractor shall not change the asphalt source after approval of the mix design without written approval of the State Materials Bureau.

423.2.4 Mineral Admixtures

The Contractor shall provide mineral admixtures in accordance with Section 402, “Asphalt Materials and Mineral Admixtures.”

423.2.5 Blending Sand

Blending sand consists of the following:

1. Natural fines from the scalping process;
2. Concrete sand;
3. Sandy Material; or
4. A combination of these, graded to the mix design requirements.

The Contractor shall determine the need for and percentage (a maximum of 20.0%) of blending sand using mix design tests on samples taken from stockpiles during crushing operations and submitted to an approved testing Laboratory.

423.2.6 Mineral Filler

The Contractor shall, if required by mix design, provide mineral filler in accordance with AASHTO M 17 and approved by the State Materials Bureau. The Department will not allow fly ash as mineral filler for HMA.

423.2.7 Reclaimed Asphalt Pavement (RAP)

Unless otherwise specified in the Contract, the Contractor may use RAP removed under the Contract consisting of salvaged, milled, pulverized, broken, or crushed asphalt pavement. The Contractor may use RAP produced from outside sources provided the following is met: after the Contractor obtains sufficient quantities of RAP aggregate samples in accordance with AASHTO T 308; the Department will Accept RAP for which the coarse aggregate has a percent wear of 40.0 or less, at 500 revolutions, when tested in accordance with AASHTO T 96. The Contractor shall provide plus No. 4 RAP Material with a minimum of 75% Fractured Faces content (one (1) face). The Department will make no additional payment for the asphalt binder in the RAP or asphalt binder due to asphalt binder grade adjustment.

The Contractor may use a maximum of 15% RAP (by weight) in the production of HMA mixtures without changing the asphalt binder.

For quantities greater than 15% and up to 25% RAP, the Contractor shall:

1. Either lower the asphalt binder's high and low temperature grades by one (1) grade (e.g. lower a PG 76-22 to a PG 70-28); or
2. Extract, recover, and combine the RAP's asphalt binder with a virgin asphalt binder per AASHTO M 323, Appendix A, ensuring the resultant binder meets the entire AASHTO M 320 (excluding direct tension) required Project PG asphalt binder properties indicated on the approved mix design.

For quantities greater than 25% and up to 35% RAP, the Contractor shall:

1. Extract, recover, and combine the RAP's asphalt binder with a virgin asphalt binder per AASHTO M 323, Appendix A; and
2. Ensure the resultant binder meets the entire AASHTO M 320 (excluding direct tension) required Project PG asphalt binder properties indicated on the approved mix design.

The Department will not allow the Contractor to use more than 35% RAP in the production of HMA mixtures.

For Projects of entirely new construction, the Contractor shall:

1. Limit the RAP to 15% in the top mat or extract, recover and combine the RAP's asphalt binder with a virgin asphalt binder per AASHTO M323, Appendix A; and
2. Ensure the resultant binder meets the entire AASHTO M320 (excluding direct tension) required Project PG asphalt binder properties indicated on the approved mix design.

If Plus Grades of PG asphalt binder is specified on the project, for quantities greater than 15% RAP, the Contractor shall extract, recover, and combine the RAP's asphalt binder with a virgin asphalt binder per AASHTO M 323, Appendix A. The Contactor shall ensure the

resultant binder meets the entire AASHTO M 320 required Project PG asphalt binder properties indicated on the approved mix design including the additional Plus Grade requirements for Elastic Recovery and Solubility.

The Contractor shall:

1. Process RAP so that 100% passes a 1-1/2-inch sieve;
2. Maintain adequate stockpile management (i.e. sufficient quantities and shaping of the stockpiles);
3. Address in the Quality Control Plan how RAP will be controlled, such as which screen will be used to split into two (2) stockpiles, or by what method the RAP will be controlled to keep the resultant mix within Acceptable limits;
4. Account for the weight of the binder in the RAP when batching aggregates;
5. Provide RAP that is free of Deleterious Materials; and
6. Perform process control testing in accordance with Section 901, "Quality Control/Quality Assurance (QC/QA)" and Table 901.5:3, "Minimum Process Control Guidelines for Aggregates, Base Course, and RAP (QC);" as RAP is produced and prepared for inclusion in the HMA.

If problems with HMA consistency or compliance with Project Specifications occur, additional efforts taken to achieve Acceptable levels of consistency and compliance with Contract Specifications, at the Contractor's discretion (at no additional cost to the Department), include, but are not limited to:

1. Reduce the top size of the RAP from 1-1/2 inch to one (1) inch;
2. Fractionate the aggregates on a second screen, such as the 3/8 inch or ¼ inch Screen so that the RAP is maintained in three (3) stockpiles, one being RAP larger than 1-1/2 inch to two (2) inches, Coarse RAP and the third being Fine RAP;
3. Ensure that the RAP used in the HMA mix design is representative of the RAP available on the Project;
4. Cover the RAP pile(s) so that ambient moisture is not absorbed; and
5. Process and maintain the stockpiles so that the RAP Material is equally and uniformly distributed throughout the entire stockpile(s) and is withdrawn such that uniform, non-segregated RAP is delivered to the hoppers.

423.2.8 Mix Design

The Contractor shall provide a mix design developed by a Department approved testing Laboratory, reviewed and signed by a professional Engineer licensed by the New Mexico Board of Registration for Professional Engineers and Land Surveyors. A list of approved private testing laboratories is available from the State Materials Bureau. The Contractor shall develop the mix design at no additional cost to the Department. The Contractor may develop the mix design at any time prior to the Project Pre-Paving Conference.

The Contractor shall provide to the State Asphalt Engineer the mix design developed in accordance with the Contract documents and AASHTO R35 as modified by NMDOT for review and concurrence. The Contractor shall summarize the mix design results from the Department approved testing Laboratory in a format approved by the State Materials Bureau. Department concurrence of a mix design will not relieve the Contractor of full responsibility for producing an Acceptable mixture. The mix design may require adjustment in accordance with Section 423.2.9, "Job Mix Formula."

The Department will require a minimum of one percent (1.0%) for mix designs that include hydrated lime, anhydrite based Material, or Portland cement. The Contractor shall include these mineral admixtures in the gradation for developing the mix design. AASHTO T 354 may be used in lieu of AASHTO T 84/T 85. If lubricating antistrip is used as a mineral admixture, the percent dosage shall be done in accordance with the manufacturer's recommendation and approved by the Contractor's design Lab. Lubricating antistrip shall be approved by the Department and included in the most current Approved Products List (APL). The mix design shall be in accordance with Table 423.2.8:1, "HMA Superpave Design Requirements for Aggregates with Less Than three percent (3.0%) Absorption," or Table 423.2.8:2, "HMA Superpave Design Requirements for Aggregates with three percent (3.0%) or Greater Absorption."

The Contractor shall test the HMA in accordance with AASHTO T 283, as indicated below:

1. Use six (6) inch diameter specimens; Compact all test specimens in accordance with AASHTO T 312;
2. Conditioned specimens shall include one (1) freeze thaw cycle;
3. On the AASHTO T283 Section 11.3 scale of zero (0)-five (5), with five (5) exhibiting the most damage from moisture, visually estimate the amount of damage caused by moisture on the interior surfaces of each broken specimen; and
4. The tensile stress ratio shall be a minimum of 85%.

The Contractor shall provide a mixture that meets all applicable criteria. If tests indicate the need for additives or modifiers not specified in the Contract or a change in source of binder to satisfy mix design requirements, the Contractor shall perform the required changes at no additional cost to the Department.

Table 423.2.8:1
HMA Superpave Design Requirements for Aggregates with Less Than 3.0% Absorption

20-year design ESALs (a)	**N initial**	**N design** (b)	**N max**	**Percent Voids in the Mineral Aggregate (VMA) per nominal maximum aggregate size**				**Voids Filled with Asphalt (VFA) Range, %** (c)	**Dust to Binder Ratio Range**
				One (1) inch (SP-II)	**3/4 inch (SP-III)**	**1/2 inch (SP-IV)**	**3/8inch (SP-V)**		
< 0.3	<91.5	96.0	< 98.0	12.5 – 14.0	13.5 – 15.0	14.5 – 16.0	15.5 – 17.0	72.0–80.0	0.6 to 1.4
0.3-3.0	<90.5							68.0–78.0	
≥3.0	<89.0							68.0–75.0	

Table 423.2.8:1
HMA Superpave Design Requirements for Aggregates with Less Than 3.0% Absorption

20-year design ESALs	N initial	N design (b)	N max	Percent Voids in the Mineral Aggregate (VMA) per nominal maximum aggregate size	Voids Filled with Asphalt (VFA)	Dust to Binder Ratio Range

[a]In Millions.

[b]Design Air Void Content of four percent (4%).

[c]For one (1) inch nominal maximum size mixtures, the specified lower limit of the VFA shall be 70% for the design traffic level <0.3 million ESALs.

Table 423.2.8:2
HMA Superpave Design Requirements for Aggregates with 3.0% or Greater Absorption

20-year design ESALs (a)	N initial	N design (b)	N max	Percent Voids in the Mineral Aggregate (VMA) per nominal maximum aggregate size				Voids Filled with Asphalt (VFA) Range, % (c)	Dust to Binder Ratio Range
				One(1) inch (SP-II)	3/4 inch (SP-III)	1/2 inch (SP-IV)	3/8 inch (SP-V)		
<0.3	<91.5							70.0–80.0	
0.3–<3.0	<90.5	96.5	< 98.0	12.0 – 14.0	13.0 – 15.0	14.0 – 16.0	15.0 - 17.0	65.0–78.0	0.6 to 1.4
≥3.0	<89.0							65.0–78.0	

[a]In Millions.

[b]Design Air Void Content of 3.5%.

[c]For one (1) inch nominal maximum size mixtures, the specified lower limit of the VFA will be 70% for the design traffic level <0.3 million ESALs.

Department reviewed commercial mix designs are Acceptable for use on NMDOT Projects with the concurrence of the State Asphalt Engineer. The commercial mix design will be submitted for review and concurrence by the State Asphalt Engineer for conformance with the Contract documents and re-issued with Project information.

An approved mix design is valid up to one (1) year from the date of review. If the Aggregate Index expires within that year, a new Aggregate Index needs to be established in order to keep the mix design valid. The Contractor shall submit a new mix design if changing the source of Materials.

For Projects that are longer than one (1) year and aggregate Materials are produced and stockpiled the mix design and Aggregate Index (AI) may be approved for an extension by the State Asphalt Engineer.

423.2.9 Job Mix Formula

The Job Mix Formula (JMF) must be in accordance with all aggregate gradation requirements and result in a mix that meets all specified mix design requirements. The Department will refer to the result of the Laboratory mix design developed in accordance with Section 423.2.8, “Mix Design,” as JMF1.

423.2.9.1 Job Mix Formula Adjustment

The Contractor may request a modification to the JMF based on field testing of Material produced through the plant. Test results and calculations that verify a proposed JMF adjustment complies with the Specifications will be required prior to being reviewed by the Project Manager, District Lab Supervisor, and concurred by the State Asphalt Engineer. Review and concurrence of a JMF adjustment can only be made after:

1. JMF adjustment results in a new TV that is within the tolerance from the design TV. (Example: If design TV for No. 4 sieve is 30%, then a new TV may be approved in the field from 23% - 37%);
2. Submittal by the Testing Laboratory responsible for the original mix design to the Project Manager with a copy to the State Asphalt Engineer;
3. Confirmation by the Project Manager that the Quality Control Plan is being followed; and
4. If the JMF is adjusted after the Shakedown Period, the Contractor shall terminate the current lot. Once the adjusted JMF has been reviewed and concurred by the Project Manager, Assistant District Engineer for Construction and the State Asphalt Engineer; the Contractor shall begin a new lot with the adjusted JMF.

423.3 CONSTRUCTION REQUIREMENTS

423.3.1 General

The Contractor shall:

1. Provide sufficient storage space for each size of aggregate and RAP;
2. Keep the different sizes separate and ensure that segregation, degradation, or combination of Materials of different aggregate sizes does not occur until delivery to the cold feed system;
3. Re-screen or waste segregated or degraded Material;
4. Provide separate storage and feeder for mineral filler if the Contract requires mineral filler; and
5. If the Project Manager determines that uncoated aggregate exists, the Contractor shall take corrective action.

423.3.2 Mix and Laydown Temperature Requirements

The Contractor shall not allow the temperature of the HMA discharged from the mixer into the transport vehicle to be greater or less than ten percent (10%) of the target mixing temperature specified in the mix design, not to exceed 350° F, unless written concurrence by the asphalt binder supplier and design lab are provided to the Project Manager.

HMA delivered to the Project with mix temperatures outside the acceptable laydown temperature range as specified in the mix design shall, at the sole discretion of the Project Manager, be removed and replaced at no cost to the Department.

423.3.3 Addition of Mineral Admixtures

The Contractor shall:

1. Monitor the out feed of the mineral admixture with sensors that provide audible and visual signals to control the out feed with an accuracy of ± three percent (3.0 %) by weight;
2. Control the mineral admixture content such that it meets the range specified in the approved mix design;
3. Add the mineral admixture to the aggregate in an enclosed pug mill immediately after leaving the cold feed and just before introduction into the drier drum or aggregate drier; and
4. Minimize the loss of mineral admixture while adding to the aggregate.

When mixing the aggregate and mineral admixture, the Contractor shall maintain the moisture content of the combined aggregate at the recommended moisture content as shown on the approved mix design.

423.3.4 Equipment

423.3.4.1 Mixing Plants

423.3.4.1.1 Plant Scales

The Contractor shall ensure that the scales are accurate to 0.5% of the maximum allowable load in accordance with the Federal Motor Carrier Safety Administration (FMCSA) publication, as certified by a licensed scale technician. The Contractor shall submit a copy of the certification to the Project Manager.

423.3.4.1.2 Storage of Asphalt Binder Materials

The Contractor shall provide storage tanks for asphalt binder capable of holding, heating and circulating the asphalt at the required temperatures and measuring the temperature of the asphalt in the tank.

The Contractor shall allow measuring and sampling of asphalt binder from the delivery trucks upon arrival.

423.3.4.1.3 Feeder for Drier

The Contractor shall equip the plant with an accurate feeding mechanism to deliver the aggregate into the drier and maintain uniform production.

423.3.4.1.4 Drier

The Contractor shall equip the plant with a system to continuously agitate the aggregate during the heating and drying process. The Contractor shall use a drier that can dry and heat the aggregate and prevent fuel oil or carbon from coating the aggregate. The Contractor shall take corrective action if the aggregate becomes coated with burner fuel.

423.3.4.1.5 Bins

The Contractor shall equip the plant with storage bins large enough to supply the mixer when it is operating at full capacity and arrange the bins to ensure separate and adequate

storage of the appropriate aggregate sizes. The Contractor shall equip the bins with warning devices that notify the control panel when the bins are low.

423.3.4.1.6 Asphalt Binder Control Unit

The Contractor shall equip the plant with a scale or meter to control the rate of flow to determine the amount of asphalt binder added to the mix.

423.3.4.1.7 Thermometers

The Contractor shall equip the discharge chute of the drier with a recording thermometer to register the temperature of the heated aggregates or mix. The Contractor shall provide the Project Manager with a record of discharge temperatures at the end of each week's production or as requested by the Project Manager.

423.3.4.1.8 Truck Scales

The Contractor shall weigh the HMA on approved plant or truck scales provided by the Contractor or public scales in accordance with Section 109.1, "Measurement of Quantity."

423.3.4.1.9 Requirements for Batching Plants

423.3.4.1.9.1 Weigh Box or Hopper

The Contractor shall provide a batching plant that can accurately weigh aggregate in a weigh box or hopper suspended on scales. The Contractor shall use a weigh box or hopper that can hold a full batch. The Contractor shall ensure that the gate of the weigh box or hopper does not allow Material to leak into the mixer while being weighed. The Contractor shall test the scales in accordance with Section 109.1, "Measurement of Quantity."

423.3.4.1.9.2 Mixer

The Contractor shall provide a batch mixer with a capacity of at least 2,000 lb, capable of producing a uniform mixture within specified tolerances.

423.3.4.1.9.3 Control of Mixing Time

The Contractor shall equip the mixer with an accurate timing device that signals the end of the mixing time.

423.3.4.1.10 Drum Mix Plants

The Contractor shall equip the drum mix plant with the following auxiliary Equipment and capabilities:

1. Separate cold feed controls for each Material;
2. An automatic interlocking device for cold feed, asphalt, and mineral admixtures;
3. A means for controlling moisture content of aggregate. A means for sampling individual cold feeds and provisions for sequential sampling of aggregate, RAP, asphalt binder, and mineral admixtures;
4. Equip the bins with mechanical or electrical devices that provide an audible or visual warning when the bins are less than 1/4 full;
5. Bins shall be designed and equipped to prevent segregation;

6. Equip the bin containing fine aggregate and filler, if required, with a device that prevents Material hang-up during plant operation;
7. A minimum of one (1) cold feed bin for each aggregate size in the mix;
8. Equip the cold feed with mechanical or electrical devices that indicate with an audible or visual warning when the cold feed belt is not carrying the proper amount of Material;
9. A separate cold feed for RAP Material. Introduce RAP so that it does not come into direct contact with the burner flame; and
10. Couple the asphalt feed control with the total-aggregate-weight measurement device to automatically vary the asphalt feed rate to maintain the required proportion.

423.3.4.2 Haul Equipment

The Contractor shall haul asphalt mixtures with trucks that are tarped and have tight, clean, smooth metal beds and a thin coat (a minimal amount) of a Department approved release agent in accordance with Section 423.3.4.2.1, "Asphalt Release Agent (ARA)."

423.3.4.2.1 Asphalt Release Agent (ARA)

The Contractor shall use Asphalt Release Agents (ARA) for prevention of asphalt mixtures adhering to haul trucks and any other type of Equipment that is used for asphalt paving operations. ARA shall meet the requirements of Table 423.3.4.2.1:1, "Asphalt Release Agent Properties" and shall be on the NMDOT's Approved Products List. All testing will be in accordance with NTPEP Evaluation of Asphalt Release Agents AASHTO ARA 14.

Table 423.3.4.2.1:1
Asphalt Release Agent Properties

Test	Result
7-Day Asphalt Stripping Test	
Diluted	No Stripping
Full Strength	No Stripping
Mixture Slide Test (truck beds)	10 g retained, maximum
Asphalt Performance Test	Does not fall after 3 pours

423.3.4.3 Pavers

The Contractor shall use self-contained, self-propelled pavers, with activated screeds or strike-off assemblies, heated if necessary, and capable of spreading and finishing courses of HMA in accordance with the Plans.

423.3.4.4 Compaction Equipment

The Contractor shall provide a sufficient number, weight, and type of rollers to obtain the required compaction and specified pavement density while the HMA is in a workable condition. All rollers must be capable of reversing direction without shoving or tearing the mixture.

423.3.5 Placement Operations

For cold milled surfaces, the Contractor shall prepare the surface in accordance with Section 414, "Cold Milling." The Contractor shall clean the existing surfaces and apply a tack coat as required in the Plans or at an application rate as approved by the Project Manager in accordance with Section 407, "Tack Coat."

The Contractor shall place HMA on prepared Base Course in accordance with Section 303, “Base Course.” The Contractor shall apply prime coat as required in the Plans or at an application rate as approved by the Project Manager in accordance with Section 408, “Prime Coat.”

The Contractor shall place the HMA on the Accepted surface, spread and compact to specified width, lift thickness, and cross slope in accordance with the Plans.

Materials Transfer Vehicle (MTV): The Contractor shall use a MTV with storage and remixing capabilities on all mainline construction that utilizes greater than 25% RAP when placing HMA State approved designs. The MTV will independently remix and deliver mixture from the hauling Equipment to the paving Equipment.

The Contractor shall furnish an MTV with the following capabilities:

1. An unloading system to receive mixtures from the hauling Equipment;
2. A minimum storage capacity of 13 tons with a remixing system in the MTV storage bin;
3. A discharge conveyor to deliver the mixture to the paver hopper; and
4. The MTV system cannot exceed maximum legal loading on Structures.

Pick-up machines, hopper inserts and Material transfer devices are not considered MTVs.

In the event the MTV malfunctions during paving operations, the Contractor can finish the Day without the MTV. The Contractor shall not resume further mainline mix placement until the MTV is operational.

Consistently overloading the HMA mix into the paving machine is not Acceptable. The Contractor shall coordinate the speed of the paving machine with the production of the plant and keep enough haul Equipment available to achieve continuous operation.

The Contractor shall use the control system on the paving machine to control the grade and the transverse slope by either of the following methods:

1. One end directly and the other indirectly through controlling the transverse slope; or
2. Each end independently, including screed attachments.

The Contractor shall suspend operations if the control system does not achieve the typical section in accordance with the Plans. The Contractor shall place, spread, and finish the courses of HMA according to the following:

1. Without segregation or tearing;
2. True to the line, grade, and crown in accordance with the Plans; and
3. With self-propelled pavers, except as otherwise directed.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing Equipment impracticable, the Contractor shall dump, spread, and level the HMA by other methods to achieve the required compacted thickness.

423.3.5.1 Weather Limitations

The Contractor shall not place HMA on wet or frozen surfaces or if weather conditions prevent proper handling, finishing, and compacting. The Contractor shall place HMA when the

Chill Factor is at least 40 °F and rising. If the air temperature is 60 °F or warmer do not consider the Chill Factor.

423.3.5.2 Compaction

The Contractor shall:

1. Compact the HMA thoroughly and uniformly immediately after placement. Operate rollers at speeds slow enough to minimize displacement of the HMA, including the lines and grades of the asphalt edges. Remove marks from pneumatic rollers;
2. Prevent the HMA from sticking to the roller wheels by keeping the wheels moistened with water; water mixed with very small quantities of detergent or other approved Material. Do not use diesel fuel or other petroleum diluents;
3. At locations inaccessible to the rollers, the Contractor shall compact the HMA with hot hand tampers, smoothing irons, or mechanical tampers;
4. Use a trench roller or cleated compression strips under the roller to transmit compression to depressed areas; and
5. Remove areas that become loose, broken, mixed with dirt, segregated or defective, replace with fresh HMA, and compact to match the surrounding area, at no additional cost to the Department.

423.3.5.3 Not Used

423.3.5.4 Joints

The Contractor shall off set longitudinal joints at least six (6) inches relative to the longitudinal joints of the underlying course.

Unless otherwise specified, the Contractor shall taper transverse and longitudinal joints as follows:

1. At least a three (3) ft taper for transverse joints, with a taper slope no steeper than 24:1;
2. At least a one (1) ft taper or a notched taper, for longitudinal joints, with a taper slope no steeper than 6:1 or a notched taper with a one (1) inch vertical edge at the top of the taper connected to a slope no steeper than 6:1;
3. Cut and square off transverse tapers before commencing new Work;
4. Clean and tack coat longitudinal joints from previous operations; and
5. Avoid placing longitudinal joints in the wheel paths, unless approved by the Project Manager.

The Contractor shall completely bond joints and provide smooth surface for each course at the joints. The Department will not allow deviations greater than 3/16 inch when tested with a ten (10) ft straightedge in any direction. When paving under traffic, the Contractor shall schedule the daily surfacing operations so that tapered longitudinal joints are not exposed for longer than seven (7) Days.

423.3.5.5 Surface Tolerances

The Contractor shall provide a final HMA surfacing course that conforms to Section 401, “Pavement Smoothness Measurement.”

423.3.5.6 Plan Surfacing Thickness

The Contractor shall:

1. Place pavement at the thickness specified in the Contract;
2. Monitor thickness by calculating continuous production yields using the formula found in the MT-1, as maintained by the State Materials Bureau;
3. Calculate the required yield and the corresponding yields for 0.25 inch increase (upper limit) and decrease (lower limit). The Project Manager may adjust the required yield to fit field conditions. If adjusted, the new target yield will be communicated to the Contractor in writing;
4. Control production to keep yield within the upper and lower limits;
5. Correct deficiencies at no cost to the Department;
6. Correct deficient depths during placement; and
7. Address Plan Surfacing thickness in the Quality Control Plan.

423.3.5.7 Test Strip & Shakedown Period

Prior to the Test Strip & Shakedown Period, the Contractor shall provide binder ignition oven calibration samples in accordance with the State Materials Bureau's, current *Binder Ignition Calibration Procedure.* All Quality Control, Quality Assurance and Independent Assurance ovens must be calibrated by this procedure. The Project Manager will suspend paving operations until calibration of the ovens has been completed. No additional time or compensation will be granted for completion of this requirement.

The "NMDOT Binder Ignition Calibration Procedure" is available by accessing the NMDOT website, and navigating within the Construction and Civil Rights Bureau's (CCRB) link.

The Contractor shall construct a test strip for each HMA mix design to be incorporated in the Project prior to placing the Material on mainline. The test strip will consist of a maximum of 1,000 tons, the minimum test strip size will be 500 tons or as approved by the Project Manager. The Contractor shall construct test strip on shoulders, low volume segments of the pavement, or area approved by the Project Manager.

The Contractor shall obtain a minimum of three (3) Contractor and three (3) agency samples to evaluate the JMF, process control, and placement operations. If necessary, based on the results obtained from the test strip, the Contractor shall develop a revised JMF, modify placement operations, and/or implement adjustments to process control procedures. Production and placement operations performed prior to approval of a revised JMF are at the Contractor's risk.

The test strip will be evaluated for Acceptance according to Table 423.3.5.7:1, "Test Strip Acceptance Limits." If Accepted, the test strip will be paid at the unit price for HMA Complete or HMA per Section 423.5, "Basis of Payment." If rejected, said Material shall be handled in accordance with Section 423.3.6.3.2," Adherence to Specifications and Rejection of Non-Specification Material." The Contractor shall remove rejected test strip Material placed within the Roadway Prism at no cost to the Department. If the Contractor disagrees with removing and replacing unacceptable Material placed in test strips outside the Roadway Prism, the Assistant District Engineer for Construction, based on engineering judgment, will decide if the Material can remain in place with a maximum pay factor of 50%, or shall be removed and replaced at no cost to the Department.

If the test strip is rejected, the Contractor shall construct a subsequent test strip. The Contractor shall not proceed to full production until an Accepted test strip is produced. After the test strip is Accepted, the Contractor shall continue to evaluate the mix properties and the JMF during the placement of the first two (2) sublots in the first lot. Changes may be made to the JMF or the mix proportions and/or properties with the concurrence of the State Materials Bureau, Project Manager, and Assistant District Engineer for Construction. For changes made prior to the completion of the first two (2) sublots, the adjustments will be applied to the entire lot for purposes of payment.

The Project Manager may waive test strip requirements for the Project, if requested by the Contractor based on prior experience with the JMF.

The Shakedown Period is defined as the first two (2) sublots produced in the first lot.

As the test strip is placed, the Contractor shall evaluate the mix properties and the JMF. Changes may be made to the JMF or the mix proportions and/or properties with the concurrence of the State Materials Bureau, Project Manager, and the Assistant District Engineer for Construction.

Table 423.3.5.7:1
Test Strip Acceptance Testing Limits [a,c]

Characteristic	Allowable Tolerances from TV
Air Voids, %	± 2.0
Pavement Density %[c]	90% to 97%
Mineral Admixture %	±0.2%
Voids in the Mineral Aggregate (VMA), % [a]	± 2.0
Asphalt Content %[a,b]	± 0.50

[a] Asphalt Content will be determined using AASHTO T308 as modified by TTCP.

[b] HMA will not be rejected based on Asphalt Content Determined by AASHTO T 308.

[c] Acceptance will be based on the average test values.

423.3.6 Sampling and Testing

The Contractor shall sample and test in accordance with Section 901, “Quality Control Quality Assurance General Provisions,” and Section 906, “Minimum Testing Requirements.” The Department will sample and test in accordance with Section 901, “Quality Control /Quality Assurance General Provisions,” and Section 906, “Minimum Testing Requirements.”

423.3.6.1 Contractor Quality Control

The Contractor shall administer a Quality Control Plan, referred to hereafter as “the Plan”. The Contractor shall ensure the Plan conforms to Section 902, “Quality Control.” The Contractor shall submit the Plan a minimum of two (2) weeks prior to commencement of crushing operations and at a minimum comply with “Contractor Quality Control Plan Guidelines.” No HMA operations are allowed until the Plan has been approved by the Project Manager and the District Lab Supervisor. The Contractor shall sample and test the mixture and pavement on a statistically random basis in accordance with Section 906, “Minimum Testing Requirements.”

423.3.6.1.1 Contractor Quality Control of Aggregate

The Contractor shall obtain samples in accordance with Section 902.5, “Sampling.”

The Project Manager may sample and test the aggregate at any time during production or stockpiling, or may request to split samples with the Contractor.

423.3.6.1.2 Contractor Quality Control for Compaction

The Contractor shall:

1. Monitor the compaction process by determining the density of the HMA with a portable densometer in accordance with the Plan;
2. Establish calibration of the portable densometer from cut pavement samples;
3. Determine the density readings of the cut pavement samples in accordance with AASHTO T 166 (weight, volume method); determine the density readings of the pavement with the portable densometer and correlate these test results;
4. Conduct Quality Control testing in accordance with Division 900, “QUALITY CRITERIA” and provide test results to the Project Manager;
5. Perform Quality Control density testing while the asphalt mixture is hot enough to permit further compaction;
6. Not roll for compaction when it becomes ineffective or damages the HMA; and
7. Not use vibratory mode when it becomes ineffective or damages the HMA.

423.3.6.2 Department Quality Assurance

The Department will sample and test the mixture and pavement on a statistically random basis in accordance with Section 906, “Minimum Testing Requirements.”

423.3.6.3 Acceptance

The Department will evaluate Materials using Contractor and Department test data from each Random sampling Plan for Acceptance in accordance with this section.

Table 423.3.6.3:1
Acceptance Testing Tolerances[a]

Characteristic	Specification limit, percentage points from TV
Air Voids, %	± 1.4
Pavement Density %[c]	± 2.5
Mineral Admixture%[e]	Minimum of JMF Target Value
Voids in the Mineral Aggregate (VMA), % [a,d]	± 1.6
Asphalt Content %[a,b]	± 0.50

[a] All gradation, Asphalt Content, VMA, and VFA values shall be determined using the AASHTO T 308 testing results.

[b] HMA will not be rejected based on Asphalt Content Determined by AASHTO T 308.

[c] Density payment will be adjusted in accordance with Section 901.3.11, “QLA.”

[d] If Gmm fluctuates more than ±0.03 on a consistent basis, it is recommended that the Specific Gravity of the aggregates be checked in order to verify VMA.

[e] If Mineral Admixture is below Design TV cease hot mix production, investigate and correct.

Department personnel may test locations other than the random locations generated for statistical analysis. These tests will not be used for pay factor determination, but may be used to determine Acceptance or rejection of localized Material.

423.3.6.3.1 Quality Level Analysis (QLA)

The Department will determine Acceptance of the Materials in accordance with Section 904, "Quality Level Analysis (QLA)," using the Acceptance limits in Table 423.3.6.3, "Acceptance Testing Tolerances." Acceptance lot sizes shall be determined at the Pre-Paving Conference. The Department will have the final authority for determination of Acceptance lot size. For all QLA Projects, if a composite pay factor of more than one (1.00) is calculated, the composite pay factor will be a one (1.00) for the purposes of payment.

423.3.6.3.1.1 Acceptance of Pavement Density

The target density for Acceptance of HMA will be 94.50% of the theoretical maximum density as determined from AASHTO T 209. For determination of maximum specific gravity, the Contractor shall obtain and test a minimum of two (2) samples and ensure the Department obtains and tests a minimum of one (1) sample for each Day that the HMA is placed, in accordance with the random sampling Plan. Each individual density test value obtained less than 92.0% or more than 97.0% of the theoretical maximum density will be evaluated in accordance with Section 423.3.6.3.2, **"**Adherence to Specifications and Rejection of Non-specification Material."

For purposes of Acceptance and pay factor determination:

1. Determine the density from cut pavement sections (cores) with six (6) inch diameters extending through the full thickness of the HMA;
2. Determine the pay factor in accordance with Section 904, "Quality Level Analysis;"
3. To be prepared for dispute resolution, the Contractor shall provide one (1) additional core for each core tested by the Department for Acceptance of density in accordance with section 423.3.7, "Dispute Resolution;" and
4. If a composite pay factor of more than one (1.00) is calculated, the composite pay factor will be a one (1.00) for the purposes of payment.

For Projects consisting of single lift overlays or mill and inlay with a single lift of two and a half inches or less, the Project Manager may grant an exception to the mean density target requirement of at least 94.5% of the theoretical maximum density if the Contractor can demonstrate that a minimum of 92.0% cannot be reasonably obtained because of the existing conditions of the Pavement Structure or Subgrade Materials. The Contractor demonstrates this by providing non-destructive density results obtained during paving operations witnessed by a State Inspector at the location in question. If the Project Manager grants this exemption, the Contractor shall construct a Roadway test strip and develop an HMA compaction process to get the highest possible density based on an approved roller's density gain per pass, in accordance with Section 423.3.4.4, "Compaction Equipment." The Project Manager will approve the process, establish a new target value for density and establish a new Acceptance lot only for the portion of the Project addressed herein (except for the Roadway test strip) before paving begins or continues. Lot density shall not fall below 91%. If a lot does not meet either of the revised density requirements, the Project Manager will, with the concurrence of the Assistant District Engineer for Construction do the following:

1. Accept and pay for the lot of HMA at 50% of the Bid Item Unit Price; or
2. Reject the in-place Material and require the Contractor to remove and replace at no cost to the Department.

423.3.6.3.2 Adherence to Specifications and Rejection of Non-Specification Material

The Contractor shall produce Material in substantial compliance with all Specification requirements. The Department will evaluate Air Voids, Pavement Density, Void in Mineral Aggregate (VMA), and Asphalt Content test results for Specification compliance. Evaluation of Material that does not meet Specifications will be in accordance with the following:

Individual Test Results. If an individual test is outside the Specification limits but is less than two (2) standard deviations from the mean of previously produced Material of the current lot, investigate and propose corrective actions but production may continue and the result will be entered into QLA. If an individual test result (for the current lot) is outside the Specification limits and is two (2) or more standard deviations from the mean of previously produced Material, the Contractor shall cease production, investigate the causes of the failure, and propose corrective actions. The Contractor shall not resume production until the proposed corrections are approved by the Project Manager.

Consecutive Test Results. If two (2) consecutive test results of the same property (for the current lot) are outside the Specification limits, cease production, investigate the causes of the failure, and propose corrective action. The Contractor shall not resume production until the proposed corrections are Accepted by the Project Manager in writing. Limit production to a maximum of 1,000 tons, production will include a minimum of two (2) Contractor tests and one (1) Department test. If testing indicates that the problem has been corrected, the Contractor shall resume full operations. If the problem has not been corrected, the Contractor shall perform further trial runs and testing.

Pavement Density Below 90.000%. All pavement density tests that are below 90.000% are rejected and the Contractor shall remove and replace all Material represented by the test with Specification Material at the Contractors expense. The Contactor shall submit a Plan in writing for approval by the Project Manager that determines the limits of Material to be removed within 48 hours of reporting a Quality Control test or receiving a Quality Assurance test for pavement density below 90.000% density. If the test below 90.000% is a Department test, the Department will obtain a new test from the Material replaced by the Contractor to replace the density test reported by the Department. If the test below 90.000% is a Contractor test, the Contractor shall obtain a new test from the Material replaced by the Contractor to replace the test reported by the Contractor. The test obtained from the replaced Material will be input into the QLA to replace the test below 90.000%.

All Material that is rejected, at the sole discretion of the Department, shall be removed and replaced with Specification Material at the Contractor's expense. If the Material is allowed to remain in place by the Department all random, sample data will be entered into QLA, this does not apply to pavement density below 90.000% that shall be removed and replaced. Sampling for corrective action will not be entered into QLA.

The Project Manager may reject Material that appears to be defective based on visual inspection.

423.3.6.4 Independent Assurance Testing

The Department will perform Independent Assurance sampling and testing in accordance with Section 906, "Minimum Testing Requirements."

423.3.7 Dispute Resolution

For any test incorporated into the pay factor, if a dispute exists the Project Manager and Contractor will investigate to determine why and make corrections if possible. If the

discrepancy cannot be resolved, then either party may invoke the dispute resolution process. The State Asphalt Engineer will maintain a list of labs that are willing and capable of performing referee testing. All referee Labs shall be AASHTO Materials Reference Laboratory (AASHTO RE: SOURCE) certified for the test(s) to be performed. Neither the Department's Project staff, nor the Contractor will know who is performing the referee testing. The State Asphalt Engineer will select a Laboratory, without disclosing the name of the Lab to Department Project personnel or Contractor personnel, from the following, not in priority order:

1. A District Laboratory not from the District in which the Project resides;
2. A Laboratory currently listed on the State Material's Bureau's list of approved testing labs not involved in the subject Project in any manner, such as mix design submittal, preliminary testing for design, etc. Only Laboratories that are in the routine business of providing testing and designs will be considered; or
3. State Materials Bureau Laboratory.

For all testing incorporated into the pay factor, an additional sample from the Department's Acceptance Samples and the Contractor's Quality Control Samples shall be obtained for referee testing purposes. Failure to provide the referee samples will result in the Project Manager suspending the Project at no cost to the Department. Additional time will not be added to the Contract for Project suspension caused by failure to comply with Dispute Resolution Process. Work shall not resume until the Contractor provides the sample(s) and satisfies the Project Manager, in writing, that future samples will be provided in compliance with this requirement. The referee sample(s) is (are) to be retained by the Department. The Department will retain the referee samples at a location determined by the Project Manager. Once the pay factor is determined, the Contractor shall dispose of the unused samples at no cost to the Department. In no case will the unused samples be disposed of prior to the ten (10) Calendar Day period in which the Dispute Resolution process may be invoked.

For Pavement Density, the additional core(s) will be stored and retained in a location approved by the Project Manager. Should the Dispute Resolution Process for Density be invoked, the additional core will be provided to the Referee Lab per the NMDOT REFEREE TESTING POLICY. The original density value obtained will be replaced by the data obtained from the Referee Lab result.

When a referee Lab is used, the referee Lab's test results will be used in determining the pay factor. The request to referee must be invoked in writing within ten (10) Calendar Days of receiving the test results from the other party. If not invoked within ten (10) Calendar Days, the test results are deemed Accepted. The test results from the referee Lab will replace the Department's or the Contractor's test results for the sample in question. If the composite pay factor decreases from applying the referee Lab's results, the Contractor shall pay for the testing performed by the referee Lab. If the composite pay factor increases from applying the referee Lab's results, the Department will pay for the testing performed by the referee Lab. If the composite pay factor remains unchanged, the cost shall be split with each party responsible for 50% of the total cost.

The "NMDOT REFEREE TESTING POLICY" will be used to coordinate the efforts of managing Dispute Resolution by both the Department and Contractor. This policy is made available by accessing the NMDOT website, and navigating within the Construction and Civil Rights Bureau's (CCRB) link.

Failure to comply with the requirements contained herein will result in the pay factor being calculated in accordance with the applicable Sections of 423, "Hot Mix Asphalt (HMA) (Major Paving) and 904, "Quality Level Analysis" and no test results will be replaced by referee results.

423.4 METHOD OF MEASUREMENT

If the Department measures *HMA* by the square yard, the Department will use the average width of the HMA in place and the length from station to station along the centerline of the Roadway when calculating quantities.

423.5 BASIS OF PAYMENT

Pay Item	Pay Unit
HMA Complete	Ton or Square Yard
HMA	Ton or Square Yard

The Department will pay for Accepted quantities at the Bid Item Unit Price, adjusted in accordance with Section 423.5.1, "Price Adjustments." Providing and transporting all cores, samples and storage containers shall be Incidental to the Pay Items above.

423.5.1 Price Adjustments

The Department will pay for Accepted quantities of *HMA* or HMA Complete at the Bid Item Unit Price, adjusted in accordance with Section 904, "Quality Level Analysis (QLA)." The HMA will be evaluated on a lot-by-lot basis at a price determined by multiplying the Bid Item Unit Price by the weighting factor. The Department will use Table 904.1:1, "Weighting Factors," to calculate each lot's composite pay factor. The pay factor for the entire Project will be calculated by applying weighted averages, based on tonnage contained within each lot, to each lot's composite pay factor. If the composite pay factor for a lot is greater than one (1.0), the pay factor will be set at one (1.0).

423.5. 2 Work Included in Payment

The Department will consider as included in the payment for the pay item(s) listed in this section and will not measure or pay separately for the following Work:

1. Asphalt binder, aggregate, blending sand, mineral filler, mineral admixture, and WMA additive or process as appropriate;
2. Mixing, hauling, placement, and compaction of HMA or WMA;
3. Quality Control in accordance with Section 902, "Quality Control;"
4. Providing and transporting all cores for correlation;
5. Providing Mix Design in accordance with Section 423.2.8, "Mix Design;" and
6. Providing storage container for samples and cores if referee testing is used.

SECTION 604: SOIL AND DRAINAGE GEOTEXTILES

604.1 DESCRIPTION

This Work consists of providing and installing geotextiles.

604.2 MATERIALS – RESERVED

604.2.1 Classifications

The Contractor shall use the class of geotextile in accordance with Table 604.2.1:1, "Cross Reference of Old Classes to New Classes of Geotextiles."

Table 604.2.1:1
Cross Reference of Old Classes to New Classes of Geotextiles

Geotextile	Old class	New class
Subsurface drainage	A or B	2 or 3
Sediment control	B	2
Erosion control	C or D	1 or 2
Separation	C or D	2 or3
Stabilization	None	1

The Department specifies Class 1 for more severe or harsh installation conditions where there is a great potential for geotextile damage and specifies Class 2 and 3 for less severe conditions.

604.2.2 Subsurface Drainage Geotextiles

The Department prohibits the use of woven slit film geotextiles or geotextiles made from yarns of a flat, recording-like character.

The Contractor shall provide Class 2 geotextiles for drain system installations that require use of very coarse, sharp angular aggregate with a one (1) inch diameter or greater, or require a depth of trench greater than six (6) ft.

The Contractor shall provide Class 3 geotextiles for general underdrain installations that require smooth graded surfaces having no sharp angular projections and fine aggregate.

604.2.3 Erosion Control Geotextiles

The Department prohibits the use of woven slit film geotextiles or geotextiles made from yarns of a flat recording-like character. If the Contractor uses a woven monofilament geotextile, the Contractor shall provide a Class 2 geotextile; otherwise the Contractor shall provide a Class 1 geotextile.

604.2.4 Separation Geotextiles

The Contractor shall provide separation geotextiles that are of woven or non-woven Material.

The Contractor shall use a Class 2 separator for Pavement Structures constructed over soils with an R-value greater than 20 to separate dissimilar Materials where water seepage is

allowable. The Contractor shall use Class 2 geotextiles where installation requires a depth of trench greater than ten (10) ft, where stone drop height is to be more than zero (0), or where there is no sand cushion protection. The Department requires field trials where stone drop height exceeds three (3) ft or where individual stone weight exceeds 250 lb.

The Contractor shall use Class 3 geotextiles to prevent mixing of a Subgrade soil and an aggregate cover Material (Subbase, base, select Embankment, etc.), to separate dissimilar Materials where water seepage is allowable. The Contractor shall not use Class 3 geotextiles under pavement. The Contractor may also use Class 3 geotextiles in Structures or under conditions where the geotextile is protected by a sand cushion or by "zero (0) drop height" placement of stone.

The Contractor shall use Table 604.2.4:1, "Required Class of Separator Geotextile and Cover Thickness for R-values Greater Than or Equal to 20," to determine the class of separator geotextile and the required minimum thickness.

Table 604.2.4:1
Required Class of Separator Geotextile and Cover Thickness for R-values Greater Than or Equal to 20

Required minimum cover thickness, compacted	Required class of geotextile
6 inch.	2
12 inch.	3

The Contractor shall not use aggregate larger than one (1) inch.

604.2.5 Stabilization Geotextiles

The Contractor shall provide stabilization geotextile in wet, saturated conditions to provide separation, filtration, and also reinforcement. The Contractor shall use stabilization geotextiles for Pavement Structures constructed over soils with R-values from ten (10) to 20. The Contractor may provide stabilization geotextiles made of woven or non-woven Material.

The Contractor may use stabilization geotextiles in applications that require a design by a licensed professional Engineer. The Contractor shall obtain Department approval of these designs.

604.2.6 Certification

For each class of geotextile fabric, the Contractor shall provide a certificate from the manufacturer stating that the geotextile meets the physical and chemical requirements in accordance with AASHTO M 288, and that geotextile fabric meets R-value requirements for the respective application.

The Contractor shall include in the certification the product name, chemical composition of the filaments or yarns, or other relevant information to fully describe the geotextile.

The Contractor shall submit the certification to the Project Manager before geotextile placement.

R-values corresponding to California bearing ratio (CBR) used in AASHTO M 288 are presented in Table 604.2.6:1, "CBR Values Used in AASHTO M 288 and Corresponding R-values."

Table 604.2.6:1
CBR Values Used in AASHTO M 288 and Corresponding R-values

Soil strength (CBR)	Corresponding R-value
1	10
2	15
3	20

604.3 CONSTRUCTION REQUIREMENTS

604.3.1 Geotextile Packaging, Storage, and Handling

The Contractor shall use geotextile rolls wrapped with a Material to protect the geotextile, including the ends of the roll, from damage.

The Contractor shall cover and elevate geotextile rolls during storage to protect them from the following:

1. Site construction damage (tearing, excessive mud, wet cement, or epoxy);
2. Precipitation;
3. Extended ultraviolet radiation including direct sunlight;
4. Chemicals that are strong acids or strong bases;
5. Flames including welding sparks; and
6. Temperatures above 160 °F and below -22 °F.

604.3.2 Geotextile Exposure After Placement

The Contractor shall not expose geotextiles to the elements after placement for more than 14 Days, unless otherwise directed by the Project Manager.

604.3.3 Site Preparation

The Contractor shall prepare the installation site by clearing and grading the area and preparing a firm, smooth surface on which to place the geotextiles. The Contractor shall remove sharp objects and large stones and cut trees and shrubs flush with the smooth surface.

The Contractor shall ensure correct orientation (roll direction). The Contractor shall place geotextiles as smoothly as possible on the prepared surface; pull tight, align, and anchor such that the geotextile is free of wrinkles and does not show evidence of holes, tears, or rips before placing cover Material on the geotextile. Before placing cover Material, the Contractor shall hold geotextiles in place by pins, staples, or piles of fill or rock as required by fill placement procedures. On curves, the Contractor shall fold or cut geotextiles to conform to the curve.

The Department will not allow vehicles directly on the geotextile, but will allow vehicles after the Contractor places at least six (6) inches of cover Material on the geotextile. The Contractor shall not allow vehicles to turn on the cover Material until at least two (2) lifts of cover Material have been placed.

604.3.4 Backfill

The Contractor shall obtain approval from the Project Manager before beginning backfill operations. The Contractor shall not end dump backfill directly onto exposed geotextile. The

Contractor shall backfill by end dumping onto previously spread backfill and then pushing the dumped backfill over the exposed geotextile. On Subgrades having an R-value less than ten (10), the Contractor shall dump and spread the Material placed on the geotextile to minimize the potential of a localized Subgrade failure.

The Contractor shall backfill in layers from six (6) inches to eight (8) inches deep (uncompacted) unless otherwise specified in the Contract. After placement, the Contractor shall compact each lift to 95% of maximum density in accordance with AASHTO T 180 (Modified Proctor), Method D (TTCP Modified). The Contractor shall compact the top lift in accordance with Section 207, "Subgrade Preparation." The Contractor may use vibratory compaction Equipment on initial layers of Material, if approved by the Project Manager.

The Contractor shall repair ruts occurring during construction by filling with additional Material and compacting to the specified density to maintain an even backfill surface and the minimum lift thickness over the geotextile.

The Contractor shall obtain the Project Manager's approval of geotextile placement before covering.

604.3.5 Subsurface Drainage Geotextiles

The Contractor shall place geotextiles in accordance with Section 605, "Drains," where specified.

The Contractor shall use subsurface drainage geotextiles against soil in an underground drainage system or in an edgedrain to allow for long-term passage of water into a subsurface drain system while retaining the in-situ soil. The primary function of the geotextile in subsurface drainage applications is filtration.

The Contractor shall provide one (1) soil sample to the Department for testing to confirm the applicable apparent opening size based on the percent of in-situ soil passing the No. 200 sieve and cohesiveness (PI).

The Contractor shall compact the aggregate with vibratory Equipment to a minimum compaction of 95% of maximum density in accordance with AASHTO T 180 (Modified Proctor), Method D (TTCP Modified). If a higher compactive effort is necessary, the Contractor shall substitute a geotextile suited for more severe installation conditions.

604.3.6 Sediment Control Geotextiles

The Contractor shall place geotextiles in accordance with Section 603, "Temporary Erosion and Sediment Control," where necessary.

The Contractor shall place and maintain sediment control geotextiles as a temporary control measure to prevent eroded soil from being transported off the construction site to rivers, streams, and impoundments and to prevent damage to private property from storm water runoff.

604.3.7 Erosion Control Geotextiles

The Contractor shall place geotextiles in accordance with Section 602, "Slope and Erosion Protection Structures," where necessary.

The Contractor shall use erosion control geotextiles between erosion control Structures (rip-rap and gabions) and the in-situ soil to prevent soil loss resulting in excessive scour and to

mitigate hydraulic uplift pressures that may cause instability of an erosion control Structure.

604.3.8 Separation/Stabilization Geotextiles

The Contractor shall use separation/stabilization geotextiles as a semi-permeable separator to prevent mixing of a Subgrade soil and sub-base or base Material.

The Contractor shall fold, overlap, sew, or join adjacent geotextile rolls in accordance with Table 604.3.8:1, "Minimum Overlap Requirements for Separation/Stabilization Geotextiles," unless manufacturer's recommendations or the Contract are more stringent.

Table 604.3.8:1
Minimum Overlap Requirements for Separation/Stabilization Geotextiles

Soil strength R-value	Un-sewn seams overlap (inch)	Sewn seams overlap (inch)
<10	—	9
10–15	40	8
15–20	30	3
>20	24	—

The Contractor shall ensure that both factory and field sewn or sealed seams meet or exceed the strength requirements as required by the manufacturer.

604.3.9 Repair of Damaged Geotextiles

To repair subsurface drainage, erosion control, and sediment control geotextiles, the Contractor shall clear the damaged area and repair in accordance with the manufacturer's recommendations. The Contractor shall obtain the Project Manager's approval of repairs.

To repair separation/stabilization geotextiles, the Contractor shall clear the damaged area plus an additional three (3) ft around the damaged area and repair in accordance with Table 604.3.8:1, "Minimum Overlap Requirements for Separation/Stabilization Geotextiles," unless manufacturer's recommendations or the Contract are more stringent. The Contractor shall replace removed cover Material and compact to the specified density.

604.4 METHOD OF MEASUREMENT

The Department will only measure the area of one (1) layer at geotextile overlaps.

604.5 BASIS OF PAYMENT

Pay Item	Pay Unit
Geotextile Class	Square Yard

Payment for achieving Subgrade preparation in accordance with Section 207, "Subgrade Preparation" will be paid as Subgrade Preparation.

604.5.1 Work Included in Payment

The following Work and items will be considered as included in the payment for the main item(s) and will not be measured or paid for separately:

1. Repair of damaged geotextile fabric as a result of the Contractor's negligence, improper shipping, handling, packaging, or storing;

2. Geotextile packaging, storage and handling; and
3. Overlaps, anchoring, splicing and seam assemblies.

SECTION 618: TRAFFIC CONTROL MANAGEMENT

618.1 DESCRIPTION

This Work consists of providing traffic control management in accordance with the Contract and the *MUTCD, current edition,* including supervision of personnel and installation, inspection, maintenance and field adjustment of traffic control devices on the Project.

618.2 REQUIREMENTS

The Contractor may assign more than one (1) traffic control supervisor (TCS) to provide traffic control management for the Project.

If assigning more than one (1) TCS to provide traffic control management, the Contractor shall submit to the Project Manager a weekly schedule identifying who shall be in charge of providing traffic control management each Day.

The Contractor shall provide the TCS with a set of traffic control Plans and a current copy of the *MUTCD.* The TCS shall possess these at all times.

If using a Subcontractor to provide traffic control management, the Contractor shall ensure that the TCS is in accordance with the Contract.

The Contractor may assign one (1) or more traffic control technician (TCT) to assist the TCS in inspection and maintenance of traffic control devices.

All Equipment, Materials, and/or vehicles stored within the ROW shall be outside of the clear zone as denoted in the Contract or per the AASHTO Roadside Design Guide (current version).

618.2.1 Certification

Before commencing Work that requires traffic control management, the Contractor shall submit to the Project Manager a copy of the “Work Zone Safety Supervisor” certificate for the TCS (wallet size card) issued by the American Traffic Safety Services Association (ATSSA), the Associated Contractors of New Mexico (ACNM), or an agency or firm approved by the Department.

Wallet size card or proof of certification shall be on the individual in the field while on the Project.

The Department will Accept the TCS certification by ATSSA, ACNM, or any agency or firm only if the following requirements are met:

1. Successful completion of a Department-approved Work-zone traffic control course;
2. Passing a written examination on a Work-zone traffic control course; and
3. At least one (1) year of full-time field experience, verified by the agency or firm, in Work zone traffic control; the Department may verify the experience at its discretion.

The TCT must only satisfy requirements 1 and 2, above.

Before commencing Work that requires flagger traffic control, the Contractor shall submit a copy of the “Flagger Training” certificate (wallet sized card) issued by ATSSA, ACNM, FHWA, or an agency or firm approved by the Department.

618.2.1.1 Re-certification

The Contractor shall renew the TCS's certification every four (4) years through the ATSSA, ACNM, or a Department-approved agency or firm.

The Contractor shall re-certify in the fourth year, before the expiration date of the current certification.

Flaggers must obtain refresher training which meets the requirements of ATSSA, ACNM, FHWA, or agency or firm approved by the Department prior to the fourth anniversary date shown on the current certificate.

618.2.2 Duties

The TCS's only responsibility is traffic control management. The Department may allow exceptions to this rule if the Project is small and requires limited traffic control. The Project Manager and the District Traffic Engineer will determine approval of the exception at the Pre-Construction Conference.

The TCS's primary duties include the following:

1. Providing management and supervision services at the Project site;
2. Preparing revisions requested by the Contractor to the traffic control Plan in the Contract and submitting the new traffic control Plan, in CAD format or hand drafted on a 12 inch × 18 inch piece of 20-pound paper using current drafting standards, to the Project Manager for approval by the District Traffic Engineer. Complex traffic control Plans require development by a registered professional Engineer prior to submittal to the Project Manager;
3. Coordinating the flagging and signing personnel training;
4. Supervising the flagging and signing personnel;
5. Coordinating traffic control operations for the duration of the Contract, including those of Subcontractors, utility companies, and Suppliers, to ensure that traffic control is in place and fully operational before the commencement of Work. When dealing with utility companies, the TCS shall coordinate concurrent utility traffic control with other construction traffic control to avoid conflicts;
6. Coordinating, in writing, Project activities with the appropriate individual traffic control, law enforcement, and fire control agencies;
7. Preparing and submitting statements concerning Road closures, Delays, and other Project activities to the news media, as necessary. Before submittal to the news media, the Contractor shall submit news releases to the Project Manager for review and approval;
8. Notifying the Project Manager of accidents related to the Project traffic control;
9. Recording time and date of accident notification in accordance with Section 618.2.2.1, "Traffic Control Diary;"
10. Attending the Pre-Construction Conference;
11. Maintaining, cleaning, and replacing traffic control devices in use per the current traffic control Plan during working and non-working hours; and
12. Throughout the Construction duration for Projects the Contractor shall be responsible to keep the Project Manager and the District Public Relations Officer informed of any information regarding construction activities.

618.2.2.1 Traffic Control Diary

The TCS shall maintain a Project traffic control diary in a bound book. The Contractor shall obtain the diary from the ACNM.

The TCS shall keep the traffic control diary current each Day and sign each daily entry.

The TCS shall make entries in ink, in a format approved by the Project Manager, without erasures or white-outs. The TCS shall strike out unacceptable entries and replace with Acceptable ones. The TCS may use photographs to supplement the written text.

The Contractor shall ensure that the traffic control diary is available for inspection by the Project Manager at all times and submit a copy of the diary to the Project Manager at the end of each week. Incident reports will be made available to the Project Manager upon request.

The traffic control diary will become the property of the Department at the completion of the Project. If the Contractor fails to submit the diary, the Department may withhold final payment until it is submitted.

618.2.2.2 Inspection of Traffic Control

The Contractor shall keep all traffic control equipment clean and in good repair. The TCS shall inspect traffic control devices every Day that traffic control devices are in use. The TCS shall provide for the immediate cleaning, repair, or replacement of traffic control devices that are not functioning as required to ensure the safety of the motorists and construction personnel.

The TCS shall conduct inspections of the traffic control devices at the beginning and end of each Day that traffic control devices are in use, and as scheduled or directed by the Project Manager during the Work Day.

The TCS shall inspect the traffic control devices during working and non-working hours on a schedule approved in writing by the Project Manager.

The TCS shall inspect traffic control devices that are in use for longer than seven (7) Days at least once a week during nighttime periods.

618.2.3 Availability of TCS

The Contractor shall provide traffic control management under the supervision and direction of the TCS on a 24-hour-per-Day basis throughout the duration of the Project, the TCS shall be on the Project whenever Work is in progress, and available by telephone to be on the Project with in one (1) hour at all times.

The provisions for availability of the TCS will also apply during times of Partial or full Project Suspension.

618.2.4 Signal Coordination and Operation

The Contractor shall be required to develop and maintain alternate traffic signal timing Plans within the Work zone and along detour routes and route affected by long-term closures temporary traffic control as defined in the Contract lasting longer than five (5) Calendar Days. The Work shall conform to the following process, and shall be developed and stamped by a licensed Professional Engineer in the State of New Mexico:

1. Prior to the start of construction, the Contractor shall schedule a coordination

meeting with the local agency responsible for maintaining the affected traffic signals;

2. Collect traffic count data at affected intersections. Collection procedure may use either mechanical equipment or staff;
3. Estimate addition or subtraction of vehicles based on change in traffic patterns due to Project;
4. New volume data shall be entered into a signal timing software for development of new Plans. Whenever possible, those Plans shall coordinate with the local agency timing plans through the use of identical cycle lengths;
5. Where the local agency maintains control of the signal throughout construction, new timing plans shall be delivered to local agency staff one (1) week before anticipated implementation;
6. Where the Contractor constructs a new traffic signal, either temporary or permanent, the Contractor shall ensure that the new timing Plan is entered into the signal controller prior to the first Day of the construction phase; and
7. After notification is received that the new Plans have been implemented, Contractor staff shall verify that the new Plan is working within desired parameters.

618.3 COMPLIANCE

618.3.1 Failure to Comply

If the Contractor fails to comply with the approved traffic control Plan or fails to immediately correct unsafe traffic conditions after written notification of the problem, the Project Manager may suspend all or part of the Contractor's operations.

If the Contractor does not take appropriate action to correct the problem, the Department may proceed with the corrective action and charge the Contractor for the additional cost incurred by the Department.

If the Department suspends the Contractor's operations, the Department will include the period necessary to correct these unsafe conditions and traffic control deficiencies in the normal assessment of Contract Time.

The Department will not relieve the Contractor of the responsibility to provide traffic control safety to the traveling public, if the Department fully or Partially Suspends the Project.

If the Department suspends the Project due to the Contractor's failure to comply with this Section, or the Contract is in liquidated damages, the Contractor shall continue to provide traffic control management, at no additional cost to the Department.

If the Contractor requests full or Partial Suspensions, the Contractor shall perform the additional traffic control management at no additional cost to the Department.

The Contractor shall reimburse the Department for the Department's incurred costs of such corrections plus an additional ten percent (10%) for administrative costs.

618.3.2 Project Manager Modifications

The Project Manager may change requirements for handling and controlling traffic during construction, with the approval of the District Traffic Engineer, due to actual field conditions. The Project Manager will make these changes and provide written notice to the Contractor.

618.4 METHOD OF MEASUREMENT—Reserved

618.5 BASIS OF PAYMENT

Pay Item	Pay Unit
Traffic Control Management	Lump Sum
Traffic Control Management	Calendar Day

618.5.1 Partial Payments

If the Department pays for *Traffic Control Management* by the Lump sum, the Department will make monthly partial payments for *Traffic Control Management* based on the rate of progress of the Project, less previous partial payments for this item. The Department will calculate partial payments in accordance with the following equation:

$$P = \left(\frac{A \times L}{B} \right) - C \qquad (1)$$

Where,

P is the partial payment

L is the Total Bid Amount for *Traffic Control Management*

A is the number of Days charged the Contractor toward completion of the Project

B is the original Contract Time

C is the total amount of previous partial payments for this item

The Department will negotiate payment for additional traffic control management resulting from an increase in Work beyond the scope of the Project. The Contractor shall not start Work until agreement on payment for additional *Traffic Control Management.*

For normal increases in Contract Items resulting in extensions of the Contract Time, the Department will increase the original Lump sum amount based on the ratio of actual additional Days used to the original Contract Time.

SECTION 702: CONSTRUCTION TRAFFIC CONTROL DEVICES

702.1 DESCRIPTION

This Work consists of providing and installing construction traffic control devices.

702.2 MATERIALS

702.2.1 Construction Signing

The Contractor shall provide sign substrate sufficiently durable to last the Project duration and rigid enough to hold the sheeting flat.

The Contractor shall provide Materials in accordance with Section 701.2.4.1, “Retroreflective Sheeting;” Section 701.2.4.2, “Sign Legends and Sheeting;” and Section 701.2.4.3, “Sign Backgrounds.”

The Contractor shall provide Type VIII or greater retroreflective sheeting for construction signing, flagger paddle, drums, cones, and channelization devices for legends and sign backgrounds, unless otherwise specified in the Contract.

The Contractor shall use black letters on a reflective fluorescent orange background for construction signing, unless otherwise specified in the Contract.

The Contractor shall provide Type XI or greater intensity retroreflective sheeting for background of regulatory signs.

702.2.1.1 Steel Posts and Base Posts for Construction Signing

The Contractor shall provide steel post and base post Material in accordance with Section 701.2.6, “Sign Structures and Hardware.”

702.2.1.2 Portable Sign Supports

The Contractor shall provide portable sign supports in accordance with the *MUTCD, current edition* and the Department’s *Approved Products List*.

702.2.2 Barricades and Channelization Devices

The Contractor shall provide traffic control devices in accordance with the Department’s *Approved Products List* for barricades and channelization devices, available from the State Maintenance Bureau.

Suppliers proposing traffic control devices for inclusion on the Department's *Approved Products List* must submit product certifications for approval. The Department will review and approve or deny the proposed certifications within 30 Days.

Unless stated otherwise, the Contractor shall submit, to the Project Manager, certification from the manufacturer stating that the traffic control devices proposed for use are in accordance with NCHRP *Report 350 and/or MASH*. The Contractor shall submit certification showing that the proposed traffic control devices are listed on the Department's *Approved Products List*.

The Contractor shall use traffic control devices from the following categories:

1. Category I Traffic Control Devices. Low mass, single piece traffic cones; tubular markers; pedestrian devices; single-piece drums; delineators; or similar devices without lights or signs.
2. Category II Traffic Control Devices. Vertical panels; Type I, II, and III barricades; temporary ADA pedestrian devices; moveable skid mounted sign stands; or similar devices.

702.2.2.1 Barricades

The Contractor shall use reflectorized barricades with orange and white retroreflective sheeting or recording in accordance with the *MUTCD, current edition* and Table 701.2.4.1.2:1, "Type IV Sheeting - Unmetallized Microprismatic Element," and Table 701.2.4.1.2:2, "Type VIII F Sheeting - Fluorescent Microprismatic Lens."

702.2.2.2 Vertical Panels

The Contractor shall use reflectorized vertical panels with orange and white retroreflective sheeting or recording in accordance with the *MUTCD, current edition* and Table 701.2.4.1.2:1, "Type IV Sheeting - Unmetallized Microprismatic Element," and Table 701.2.4.1.2:2, "Type VIII F Sheeting - Fluorescent Microprismatic Lens."

702.2.2.3 Traffic Markers

The Contractor shall provide traffic marker Materials in accordance with Section 703, "Traffic Markers."

702.2.2.4 Drums

The Contractor shall provide non-metal drums in accordance with the *MUTCD, current edition* and as approved by the Project Manager. The Contractor shall use only one (1) size drum on the Project.

The Contractor shall use reflectorized drums with fluorescent orange and white high-performance retroreflective sheeting or recording. The Contractor shall use horizontal, circumferential, fluorescent orange and white reflectorized stripes from four (4) inches to six (6) inches wide for drum marking. The Contractor shall ensure the number of alternating fluorescent orange and white reflectorized stripes and the amount of non-reflective drum surface space is in accordance with the *MUTCD, current edition*.

The Contractor shall provide drums that are a minimum 36 inches high and 18 inches diameter with a closed top, and either a sand-ballasted, preformed rubberized, or tire sidewall-collared base, in accordance with the manufacturer's recommendations.

702.2.2.4.1 Warning Lights

The Contractor shall provide either Type "A" low intensity, Type "B" high intensity, or Type "C" steady-burn warning lights in accordance with the MUTCD, current edition.

702.2.2.4.2 Flexible High-Performance Reflective Sheeting

The Contractor shall provide retroreflective sheeting and adhesive Materials in accordance with Section 701, "Traffic Signs and Sign Structures," except provide Type VIII or greater intensity retroreflective sheeting.

The Contractor shall provide sheeting with a pre-coated adhesive protected by a removable liner. The Contractor shall apply to channelization devices in accordance with manufacturer's recommendations.

702.2.2.4.2.1 Sheeting Flexibility

The Contractor shall use sheeting that does not exhibit cracking when bent around a 1/8 inch mandrel in one (1) second, after conditioning for 24 h at 32 °F with the liner removed. The Contractor shall test by spreading talcum powder on adhesive and bending with the adhesive side contacting the mandrel.

702.2.2.4.2.2 Adhesive

The Contractor shall provide pressure sensitive adhesives for use on substrates, other than plasticized PVC, in accordance with Section 701.2.4.1, "Retroreflective Sheeting."

702.2.2.4.2.3 Adhesive Backing Testing

The Contractor shall test pressure sensitive adhesive backing on flexible high performance sheeting in accordance with FHWA Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP-96), Section 718. Backing adhesive must support a 1 3/4 lb weight for five (5) min without peeling away more than one (1) inch if applied to a smooth aluminum surface.

702.2.2.4.2.4 Reflectivity

The Contractor shall provide flexible high-performance sheeting that meets or exceeds the minimum reflectivity requirements in Table 701.2.4.1.2:1, "Type IV Sheeting – Unmetallized Microprismatic Element," and Table 701.2.4.1.2:2, "Type VIII F Sheeting - Fluorescent Microprismatic Lens."

702.2.2.5 Traffic Cones

The Contractor shall provide traffic cones in accordance with the MUTCD, current edition and having a flexible cone (above the base) with an outer section made of a highly pigmented fluorescent orange polyvinyl compound.

The Contractor shall provide cones at least 28 inches tall weighing at least ten (10) lb with a base alone weighing seven (7) lb, with a distribution of cone weight effectively holding the traffic cones upright under traffic conditions.

If approved by the Project Manager, the Contractor shall use tubular traffic markers manufactured, installed, and maintained in accordance with Section 703, "Traffic Markers," instead of traffic cones.

702.2.3 Sequential Arrow Displays

The Contractor shall use a sequential arrow display consisting of a sign panel assembly and a power source. The Contractor shall mount the display on a two (2)-wheeled trailer or on a vehicle for mobile operations. The Contractor shall provide a sequential arrow display in accordance with the *MUTCD, current edition* Specifications for arrow displays. The Contractor shall use Type B panels for mobile operations and Type C panels for stationary traffic control. The Contractor shall provide a trailer in accordance with Section 702.2.4.5, "Trailer." The Contractor shall provide a display powered by diesel or solar power or one that connects to an external power supply. The Contractor shall ensure electrical connections meet or exceed the

applicable electrical code requirements. The Contractor shall provide solar-powered systems with a battery-backup power supply capable of maintaining operation for a minimum of 12 consecutive 24-hour Days.

702.2.3.1 Operating Modes

The Contractor shall ensure that displays are capable of the following operating modes (see the *MUTCD, current edition* Specifications for advance warning arrow display):

1. Pass Left - Three (3) chevrons of five (5) lamps each sequencing right-to-left;
2. Pass Right - Three (3) chevrons of five (5) lamps each sequencing left-to-right;
3. Pass Either Side - Two (2) outermost chevrons on each end of the panel pointing outward forming arrowheads with crossing lamp rows burning continuously. Do not burn the first lamp directly behind the point of each arrow, to define the arrow points; and
4. Caution - Four (4) lamps, one (1) at each corner of the panel.

702.2.4 Portable Changeable Message Signs

Portable changeable message signs will consist of a sign panel assembly, controller, power supply, and structural support system mounted on a two (2)-wheeled trailer. The Contractor shall supply new portable changeable message signs if the Contract specifies that the Department will retain the message signs upon Final Acceptance.

702.2.4.1 Sign Panel Assembly

The Contractor shall provide a sign panel consisting of a three (3)-line panel assembly. The Contractor shall ensure that each line contains eight (8) matrices capable of producing at least eight (8) individually changeable characters. The Contractor shall ensure that each character module uses, as a minimum, a five (5)-wide pixel by seven (7)-high pixel matrix, with each matrix measuring at least 18 inches high and nine (9) inches wide.

The Contractor shall ensure a clearly displayed message on the sign panel that is legible from a distance of 800 ft during daytime and nighttime operation at angles in accordance with the *MUTCD, current edition* Specifications for portable changeable message signs.

702.2.4.2 Controller

The Contractor shall provide a compact controller located to allow easy access to sign and message functions from a control cabinet on the trailer.

The Contractor shall provide a solid-state unit controller capable of generating and storing sign messages.

The Contractor shall provide a controller keyboard that allows the user to recall and use messages from permanent memory storage containing a library of standard messages. The controller will also have the capacity to store, recall, and use at least 50 additional messages generated by the operator.

The Contractor shall use a controller with a protective device that requires an entry code to access the memory and display messages to prevent unauthorized programming.

702.2.4.3 Power Supply

The Contractor shall provide a power unit capable of powering the message sign continuously for at least 21 consecutive 24-hour Days, with a fail-safe backup power supply system, and capable of being powered directly by a 120 V AC external power supply.

702.2.4.4 Structural Support Systems

The Contractor shall provide a structural support system with a mechanism capable of raising and lowering the sign panel at sustained wind speeds of 55 mph, and capable of operation by one (1) person without use of heavy Equipment. The Contractor shall ensure a clearance of at least seven (7) ft between the sign panel bottom and the pavement surface, when fully raised.

702.2.4.5 Trailer

The Contractor shall use a two (2) -wheel single-axle system trailer with a suspension rated at no less than 2,000 lb.

The Contractor shall provide a trailer equipped with the following:

1. Four (4) non-removable leveling jacks, one (1) at each corner of the trailer,
2. A tongue and either a towing eye, for use with the pintle hook, or a ball receptacle, for a ball-type trailer hitch. Fabricate a 2 1/2 inches inside diameter towing eye from one (1) inch round, solid steel. Size the ball receptacle to accept a standard two (2) inch ball;
3. Two (2) safety chains with 1/4 inch diameter links. Install one (1) chain on each side of the draw bar and extend 24 inches beyond the towing eye. Install a safety hook on the outer end of each chain;
4. Two (2) combination tail, turn, and stop lights;
5. A license plate bracket and illumination lamp;
6. A standard SAE seven (7)-way trailer light wire connector on a cable extending 24 inches beyond the towing eye; and
7. A means of securing a receptacle on the trailer tongue.

702.2.5 Temporary Signal Span

The Contractor shall provide poles and associated electrical items for temporary signal spans in accordance with Section 715, “Beacons and Temporary Signal Equipment.”

702.3 CONSTRUCTION REQUIREMENTS

702.3.1 General

The Contractor shall provide construction traffic control devices in accordance with *MUTCD, current edition* and NCHRP *Report 350*. Construction traffic control devices shall remain the property of the Contractor, unless otherwise specified in the Contract.

The Contractor shall install signs, steel posts, and base posts in accordance with the requirements of Section 701, “Traffic Signs and Sign Structures.” The Contractor shall provide drums equipped with Type “C” steady-burn warning lights on channelization recordings, if in night operation.

The Contractor shall install traffic markers in accordance with the requirements of Section 703, “Traffic Markers.”

The Contractor shall use Type A or Type B flashing warning lights and flags to call attention to advance warning construction signing.

The Contractor shall use Traffic Cones only during daylight hours.

The Contractor shall completely cover all conflicting signs within or in advance of the Work zone with an opaque non-light transmitting Material so as not to damage the sign. Failure to adhere to this requirement will result in the Contractor replacing the sign at no cost to the Department.

702.3.1.1 Portable Sign Support System

Portable sign stands for rigid signs must be capable of accommodating rigid signs, 30 in. X 30 in. to 48 in. X 48 in. Unit must be transportable as a secure unit. Base shall be adequate to support the stand and signs without bending and to be light weight. Retaining brackets shall be provided to adequately secure the sign to the portable sign support.

702.3.1.2 Temporary Signal Spans

The Contractor shall use temporary signal spans consisting of poles and associated electrical items in accordance with Section 715, “Beacons and Temporary Signal Equipment.”

The Contractor shall remove temporary signal spans after Project Detours are removed, or as directed by the Project Manager.

702.3.2 Maintenance

The Contractor shall maintain the traffic control plan and devices in accordance with Section 618, “Traffic Control Management.”

The Contractor shall keep construction traffic control devices clean so that the intended visibility is not diminished. The condition of construction traffic control devices is subject to Department approval.

702.4 METHOD OF MEASUREMENT—Reserved

702.5 BASIS OF PAYMENT

Pay Item	Pay Unit
Construction Signing	Square Foot
Steel Posts and Base Posts for Construction Signing	Linear Foot
Barricade, Type_____	Each
Vertical Panel, Type_____	Each
Construction Traffic Marker	Each
Portable Sign Support	Each
Channelization Device, Type_____	Each
Sequential Arrow Display	Each
Portable Changeable Message Sign	Each
Traffic Cone	Each
Temporary Signal Span	Lump Sum

702.5.1 Work Included in Payment

The following Work and items will be considered as included in the payment for the main items and will not be measured or paid for separately:

1. Supports required for vertical panels and poles, and all associated electrical and mechanical items for temporary signal span;
2. Moving of construction traffic control devices from one (1) location to another, maintenance, and repair or replacement of damaged or destroyed traffic control devices;
3. Additional traffic control device quantities approved and implemented solely for the Contractor's convenience;
4. Type “A” low-intensity warning lights, Type “B” high-intensity warning lights, or Type “C” steady-burn warning lights and signing which are attached to barricades, drums and construction signs;
5. Removal of signs and devices as well as all other items associated with and required for installation or function of devices used for construction traffic control devices;
6. Covering all conflicting signs within or in advance of the Work zone with an opaque non-light transmitting Material; and
7. In the event of a Compensable Delay, the devices owned by the Contractor are not eligible for additional compensation. Devices leased by the Contractor may be eligible for additional compensation based on actual costs incurred.

SECTION 704: PAVEMENT MARKINGS

704.1 DESCRIPTION

This Work consists of providing Materials, labor, and Equipment for placement of retroreflectorized painted markings high durable (HD) 100 % acrylic waterborne traffic paint in accordance with these Specifications, the manufacturer's Specifications, the current edition of the MUTCD, and in compliance with the lines, grades, dimensions, and details shown in the Contract.

704.2 MATERIALS

1. Traffic paint shall conform to the requirements of the Department's latest Specifications for Traffic paint, Designation M-TPC-WBACRHB. Copies of this Specification are available from Traffic Services Engineer.

2. Reflectorized glass beads shall conform to the requirements of the Department's latest specifications for glass beads, Designation MGRB, Type DAB. Copies of this Specification are available from Traffic Services Engineer.

704.2.1 Material Sampling, Testing, and Acceptance of Materials

The Contractor shall provide Certificates of Compliance and documentation that the State Materials Bureau has tested the batch of paint. At the discretion of the Project Manager, the Department may take random samples of the traffic paint for testing. The Department will reject traffic paint used before submitting the proper documentation, if the test results do not meet the Specifications.

The Contractor shall submit to the State Materials Bureau samples of traffic paint and glass beads as per NMDOT Traffic Paint Sampling and Testing Procedures. The State Materials Bureau will test samples for compliance and issue a report as designated in current Departments Specifications for Traffic Paint and Glass Beads. The Department reserves the right to have an inspector present to observe the sampling or manufacturing process. Copies of traffic paint sampling procedures are available from Traffic Services Engineer or State Materials Bureau.

The Contractor shall furnish each Project a certificate with reference to the State Materials Bureau test control number, indicating that Materials provided to the Project have been tested and accepted by the State Materials Bureau, verifications of the certification will be made by Project personnel checking the batch or lot number on the traffic paint or glass beads furnished to the Project.

704.3 CONSTRUCTION REQUIREMENTS

704.3.1 General Standard Procedures

The Contractor shall place the traffic paint and beads on the roadway surface using a pavement marking machine. Application shall be during daylight hours and when the pavement surface is dry and the weather is not foggy, rainy, excessively windy, or otherwise detrimental to the application of markings. The Contractor shall remove excess asphalt or other deleterious substances, dirt, debris, grease, motor oils, rocks, or chips from the pavement surface prior to applying markings. Pavement markings must be installed as per manufacturer's recommendation or as directed by Project Manager, this includes the use of cold weather additives.

The Contractor shall provide the necessary personnel and Equipment to divert traffic from the installation area while the Work is in progress and during the no track or drying time of the Pavement Marking Material.

704.3.2 Equipment for Painted Markings

The machine shall be self-propelled spray type and equipped with an arrow board and warning lights sufficient to aid in traffic control. The Department will allow placing temporary striping during construction with other Equipment designed for application of paint and glass beads as approved by the Project Manager.

1. The Contractor shall use a machine capable of applying clearly defined markings within the designated width as specified on Section 704.3.6, **"**Dimension Tolerances" on Project Plans or Standard Drawings.
2. The machine must be equipped with a device capable of producing various lengths of painted segments and gaps that do not vary more than six (6) inches for a 40 ft cycle.
3. The machine shall be equipped with air-operated paint and glass bead dispensers capable of producing markings as per 704.1.3.5, "Rates and Tolerances for Painted Markings."

704.3.3 Striping Operations Traffic Control Requirements

The Contractor shall submit a traffic control plan in accordance with the MUTCD, current edition, to the Project Manager for approval prior to placing markings unless the Contract already provides an approved Plan.

704.3.4 Number of Applications and Retroreflectivity

Permanent reflectorized painted markings consist of two (2) applications, unless otherwise specified in the Contract. The second application shall not be placed sooner than ten (10) Days after the first application. Subsequent applications, as called for in the Contract, shall not be placed sooner than one (1) Day after the previous application.

The Project Manager will, at their discretion, measure the retroreflectivity of the markings using 30-M geometry in units of mcd/m^2/lux. The markings will be measured within twenty-one (21) days of the final application. The measurements will be taken every ¼ mile per line and an average will be calculated for every-mile per line. See Table 704.3.4:1, "Minimum Reflective Values for Painted Markings for Tolerances."

Table 704.3.4:1
Minimum Reflective Values for Painted Markings for Tolerances

White Painted Markings (mcd/m2/lux)	Yellow Painted Markings (mcd/m2/lux)
250	150

704.3.5 Rates and Tolerances for Painted Markings

For Permanent markings, apply paint at a rate of 22 to 25 wet mills, (25.15 gal per mile of paint for a solid four (4) inch line 6.31 gal per mile for a broken four (4) inch line). The Contractor shall apply other widths of striping at appropriate multiples of these minimum rates for solid and broken paint stripes.

For Temporary markings, the Contractor shall apply paint at a rate of 15 wet mills (16.5 gal per mile of four (4) inch solid and 4.13 gallons per mile for broken four (4) inch line.)

Glass beads shall be applied at a minimum rate of six (6) lb to each gallon of paint for both permanent and temporary markings.

Measurement of the volume of paint and beads in the tanks per one (1) of the following measurement methods:

1. Strap measurement; a calibrated rod marked with the equivalent volumes. Provide certification for the volumes of the paint and bead tanks;
2. Calibrated, readable external tank marks indicating a volume equivalent for the tank; or
3. Electronic device (Data Logging System) capable of recording and reporting Material usage and application rates.

704.3.6 Dimension Tolerances

Transverse gap dimensions between centerline stripes for two (2) and combinations using a three (3) paint gun set up on striping machine:

1. Place the broken line on the centerline of the Roadway with the respective left and right no passing zone stripes placed with a two (2) inch gap between the broken and solid no passing zone stripes;
2. Eight (8) inch gap between standard double yellow markings, and two (2) inch gap for narrow double yellow;
3. Tolerance of four (4), six (6), eight (8), 12 and 24 inch lines shown on plans shall be plus or minus 1/8 inch. Legends and symbols shall be in accordance with the applicable shapes and sizes in the MUTCD, current edition;
4. Standard skip pattern is ten (10) foot stripe and thirty (30) foot gap (40-foot cycle) plus or minus six (6) inches per cycle, other cycles as per Departments Standard Drawings;
5. The pavement markings shall be placed in proper alignment with guidelines established on the Roadway, deviation from the alignment established shall not exceed two (2) inches per 200 feet of Roadway nor shall any deviation be abrupt; and
6. Markings shall be offset at least two (2) inches from longitudinal construction joints.

704.3.7 Repair and Replacement of Unacceptable or Damaged Striping

The Contractor shall remove, replace or repair the striping if:

1. Paint does not adhere to the pavement;
2. Glass beads do not adhere to the paint or if reflectivity is less than 50%; or
3. The second application of pavement markings is not placed over the first application of markings in accordance with Section 704.1.3.5, “Rates and Tolerances.”

The Contractor shall repair damage to pavement markings due to negligence or failure to maintain traffic control at no additional cost to the Department.

704.4 METHOD OF MEASUREMENT

No payment will be made for the number of skips (spaces) in long line pavement marking

applications.

The Department will measure permanent and temporary Retroreflectorized Painted Markings for four (4) inch, six (6) inch, eight (8) inch, 12 inch, and 24 inch widths using multiples of the standard four (4) inch width to calculate a total length. Legends, symbols and specialty markings will be paid by each.

The Department will measure each application for payment.

Table 704.4:1
Permanent Painted Markings Volume Control

Measured Rate of Application Paint-Gallons/Mile		**Reduction**
27.43 to 24.14		0%
24.13 to 20.85		10%
20.84 to 17.75		25%
<17.75		50%
Measured Rate of Application Glass Beads	**Pounds/Gal.**	**Reduction**
	6.0 – 5.0	0%
	4.9 – 4.0	17%
	3.9 – 3.0	33%
	<3.0	50%

704.5 BASIS OF PAYMENT

Pay Item Pay	**Unit**
Reflectorized Painted Markings____inch	Foot
Temporary Reflectorized Painted Markings____ inch	Foot
Reflectorized Painted Arrow, type____	Each
Reflectorized Painted Word (____)	Each
Reflectorized Painted Symbol, type____	Each
Retroreflectorized Painted Railroad Crossing	Each

704.5.1 Payments

The Department will not pay for striping until the Project Manager receives the required certification and documentation. If the Project Manager determines that the *volumes* of paint and glass beads were not installed as per Departments Specifications, the Department will reduce payment in accordance with Table 704.4.1, “Permanent Painted Markings Volume Control.“

At their discretion, the Project Manager will observe the striping at night to determine whether the striping is Acceptable or if re-striping is necessary. If striping is not Acceptable, it shall be restriped at no additional cost to the Department.

704.5.2 Work Included in Payment

The following Work and items will be considered as included in the payment for the main items and will not be measured or paid for separately:

1. Removal of temporary marking tape;
2. Repair or replacement of damaged striping due to Contractor’s negligence or

operations;

3. Standard surface preparation;
4. Maintaining and protecting the pavement markings from traffic during the marking operations;
5. Mobile traffic control operations for long line traffic marking operations;
6. Black out line for contrast markings; and
7. Cold weather additives.