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	<p>Construction of Bridge No. 33100041                  In Boone County, MO                   Date Prepared: 8/29/2014</p>
Date: August 29 <sup>th</sup> , 2014	
Only the following items of the Job Special Provisions are authenticated by this seal: ALL	

A. GENERAL

**1.0** Except as may be otherwise provided for by the Job Special Provisions and the plans, the work shall be done in accordance with the Missouri Standard Specifications for Highway Construction, dated 2011, and its revisions. Said Specifications are part and parcel of this Contract and are incorporated in this Contract as fully and effectively as if set forth in detail herein.

B. WORK ZONE TRAFFIC MANAGEMENT PLAN

**1.0 Description.** Work zone traffic management shall be in accordance with applicable portions of Division 100 and Division 600 of the Standard Specifications, and specifically as follows.

**2.0 Traffic Management Schedule.**

**2.1** Traffic management schedules shall be submitted to the engineer for review prior to the start of work and prior to any revisions to the traffic management schedule. The traffic management schedule shall include the proposed traffic control measures, hours traffic control will be in place, and work hours.

**2.2** The contractor shall notify the Engineer **TWO WEEKS** prior to road closures or shifting traffic onto detours.

**2.3** The engineer shall be notified as soon as practical of any postponement due to weather, material or other circumstances.

**2.4** In order to ensure minimal traffic interference, the contractor shall schedule road closures for the absolute minimum amount of time required to complete the work. Roads shall not be closed until material is available for continuous construction and the contractor is prepared to diligently pursue the work until the closed road is opened to traffic.

**3.0 Work Hour Restrictions.**

**3.1** There will be no work hour restrictions with this project.

**4.0 Detours and Lane Closures.**

**4.1 Furnishing of Signs and Devices.** All traffic control signs and devices for closing the road and marking the detour as shown on the plans shall be furnished by the contractor.

**4.2 Installation of Signs and Devices.** All traffic control signs and devices for closing the road and marking the detour as shown on the plans shall be installed by the contractor.

**5.0 Basis of Payment.** Payment will be made to the contractor to recover the cost of equipment, labor, materials or time required to fulfill the above provisions by the square foot of Construction Signs and per each for Type III Moveable Barricade and Type III Moveable Barricade (w/light).

C. TIME FOR COMPLETION OF WORK

**1.0 Description.** Completion of this contract shall be in accordance with Sec. 108.7 and will be administered on a completion date as well as a working day basis.

**1.1** For the entirety of this project, Section 108.8.1.3(a) shall not apply.

**1.2** Regardless of when the work is begun on this contract, all work shall be completed on or before the date(s) specified below. Completion by these dates shall be in accordance with the requirements of Sec. 108.7 and the Job Special Provisions.

Substantial Completion Date:	January 15, 2015
Final Completion Date:	May 1, 2015

**1.3** Substantial completion shall be defined as work being completed such that the proposed bridge and roadway are complete and open to traffic, per the approval of the engineer.

**1.4** Final completion shall be defined as work being completed related to final seeding and restoration or any other items which are part of the contract that do not necessarily fall under the category of substantial completion as stated above and per the approval of the engineer.

**2.0 Working Days.** The count of working days will begin on the date the contractor sets up traffic control and begins demolition of the existing facilities. The count of working days will end once it has been determined that the work has reach the substantial completion stage as defined above.

**Working Days = 25**

**3.0** Should the contractor, or in case of default, the surety, fail to complete the work within the above specified working days or the substantial completion date, whichever occurs first, a deduction of the amount shown below will be made for each day that the contract remains uncompleted as defined under Section 1.3 and Section 2.0 of this special provision. Furthermore, deductions of the amount shown below will be made for each day that the contract remains uncompleted beyond the final completion date. Deductions shall be in accordance with the requirements of Sec 108.8 except as stated otherwise.

Liquidated Damages per Day: \$700.00

The amount of liquidated damages are specified elsewhere in the contract. The amount stated as part of this provision is not in addition to that amount.

D. MAINTENANCE AND REMOVAL OF TEMPORARY BYPASS

**1.0 Description.** This specification covers the temporary bypass built to facilitate access for local traffic.

**2.0 Construction Requirements.** Upon Notice to Proceed, the contractor shall be responsible for the maintenance of the temporary bypass and any structures installed for the construction of the temporary bypass.

**2.1** Once the bypass is no longer required, per the approval of the engineer, the contractor shall remove the temporary bypass. The material placed in areas that fall below the Ordinary High Water elevation are to be completely removed once the bypass is no longer necessary.

**2.2** The Special Fill for Grading is to be placed between the Ordinary High Water elevations on both sides of the stream as shown on the plans. Special Fill for Grading shall be rock fill equivalent to Type 2 Rock Blanket. The rock required to bring the temporary bypass up to grade shall be in accordance with Sec. 303.2. The special fill may be reused as Type 2 Rock Blanket once the Temporary Bypass is no longer needed. The basis of payment for Furnishing Type 2 Rock Blanket will be based on the plan quantity as specified in the contract regardless of where the material is obtained. The basis of payment for Placing Type 2 Rock Blanket will be in accordance with Sec 611.30.5.3.

**2.3** The pay item for "Removal of Temporary Bypass" will include all work necessary to remove all added material from the stream and return the ground line to existing conditions. Any fill material added to fulfill this condition shall be properly compacted per Sec. 203. No payment will be made until it has been deemed by the engineer that these requirements have been met.

**2.4** The driving surface for the temporary bypass shall be Type 1 or Type 5 aggregate or similar material per the approval of the engineer. Aggregate driving surface material for the temporary bypass is completely separate from the "4" Thick Gravel Pavement" pay item and shall not be included therein. Furnishing and placing the aggregate driving surface shall be completely covered under the lump sum pay item for "Maintenance of Temporary Bypass".

**2.5** Geotextile fabric shall be installed to separate the driving surface from the Special Fill and shall extend 10 feet past the limits of the Special Fill in the longitudinal direction.

**2.6** Geotextile fabric shall be placed to separate the normal fill and the existing embankment from the Special Fill at locations where these materials meet.

**2.7** The temporary bypass shall be installed in such a manner so as to avoid conflict with existing utilities.

**2.8** Any existing survey monuments which existed prior to the construction of the temporary bypass shall be relocated per the approval of the engineer.

### **3.0 Traffic Control.**

**3.1** The contractor will be responsible for maintaining one-way only traffic on the temporary bypass at all times during construction operations.

**3.2** This requirement is necessary due to the fact that the driving surface of the bypass is only wide enough to accommodate traffic in one direction at any given time.

**4.0 Method of Measurement.** No measurements will be made for the pay items "Maintenance of Temporary Bypass" or "Removal of Temporary Bypass".

**5.0 Basis of Payment.** The items above will be paid for at the contract lump sum price for each item and shall include all material, labor and other work required to maintain and remove the temporary bypass.

E. PAVEMENT AND INCIDENTAL GRADING AT BRIDGE APPROACHES

**1.0 Description.** This work shall apply to replacing, repairing or modifying existing pavement, on existing subgrade, that is disturbed during construction operations. It also applies to pavement, aggregate base or grading required for the purpose of transitioning onto the new bridge surface elevation including paving over the Geosynthetic Reinforced Soil System.

**2.0 Construction Requirements.** It shall be the contractor's responsibility to minimize impacts to the existing roadway approach to the bridge during construction operations. The limits of the disturbed pavement areas will be reviewed and approved by the engineer.

**2.1** The contractor shall comply with Sec 304 for aggregate base course and Sec 401 through 403 for the asphalt pavement.

**2.2** If the contractor chooses to perform paving operations during a part of the year when asphalt is unavailable, then a similar thickness of concrete pavement shall be provided at no additional cost above the square yard cost for "8" Thick Asphalt Pavement". The contractor shall likewise comply with Sec 304 for aggregate base course and Sec 501 and 502 for concrete pavement. No reduction in the thickness of the aggregate base course will be allowed and no adjustment will be made to the pay item for "Type 5 Aggregate for Base 4 in. Thick". Concrete pavement will not be allowed on the approaches (i.e. over the Integration Zone) to this structure.

**3.0 Method of Measurement.** No measurement of disturbed or proposed pavement areas as described above and as shown on the plans shall be made.

**3.1** Final measurement of "8" Thick Asphalt Pavement" and "4" Thick Gravel Pavement" will not be made except for authorized changes during construction. Where required, measurement of the pavement, complete in place, will be made to the nearest 0.1 square yard. The revision or correction will be computed and added to or deducted from the contract quantity.

**3.2** No measurement will be made for any grading required to construct the typical sections and profile as shown on the plans.

**4.0 Basis of Payment.** Replacing, repairing or modifying existing pavement disturbed by the contractors operations, including but not limited to, any incidental grading, pavement milling, tack coat, repair or replacement of existing aggregate base layers, furnishing and placing new aggregate base layers, or any seeding and mulching will be completely paid for at the contract unit price for "8" Thick Asphalt Pavement".

**4.1** Payment for items required to construct the pavement and base (excluding any grading), as shown on the plans will be considered completely covered by the contract unit prices for each item. No distinction will be made if a concrete pavement is chosen and, as such, any pavement will be paid for with the pay item for "8" Thick Asphalt Pavement".

**4.2** No direct payment will be made for any labor, materials, or other items necessary for any grading required to construct the roadway as shown on the plans, outside of the limits of the GRS abutment. Payment for any labor, materials or other items required to properly grade the roadway over the GRS abutment will be considered completely covered by the lump sum price for "Geosynthetic Reinforced Soil System (GRS)".

F. REMOVAL OF EXISTING STRUCTURE

**1.0 Description.** This work shall consist of complete removal and disposal of the existing bridge as required by the project.

**2.0 Removal Requirements.**

**2.1** All removals shall be in accordance with Sec 216. Any debris and material that falls into the creek, shall be removed as approved by the engineer at the contractor's expense.

**2.2** Disposal of materials shall be in accordance with Sec 202.

**3.0 Method of Measurement.** No measurement will be made for removals and disposals.

**4.0 Basis of Payment.** Removal and disposal of the existing structure will be considered completely covered by the contract lump sum price for "Removal of Bridges (3310004)".

G. DESIGN OF PRE-ENGINEERED SUPERSTRUCTURE

**1.0 Design Parameters.** This provision contains general design parameters for pre-engineered precast structures.

**2.0 Design.**

**2.1** The superstructure shall be designed for the design loading and additional parameters shown on the bridge plans in accordance with the current *AASHTO Standard Specifications for Highway Bridges*, except as modified herein and in the bridge plans.

**2.2** Minimum design concrete compressive strength shall be 5000 psi (35 MPa).

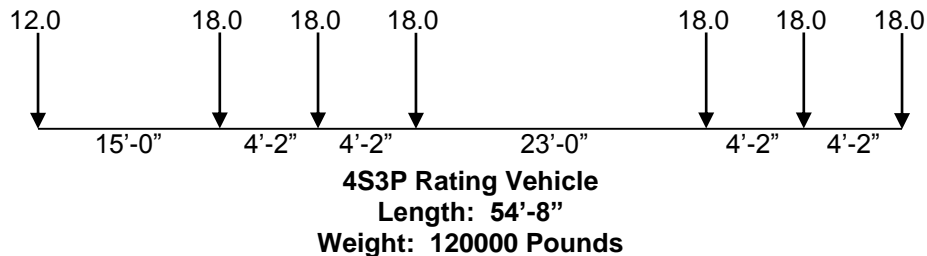
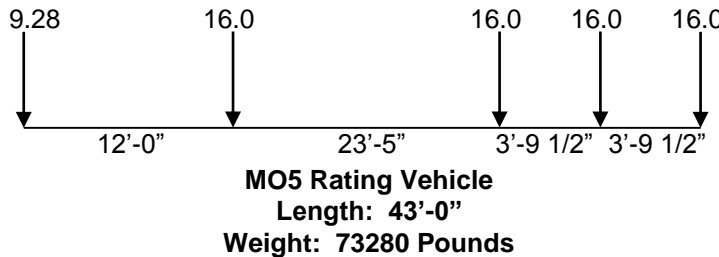
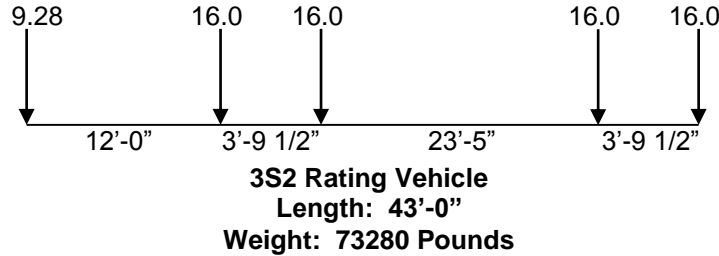
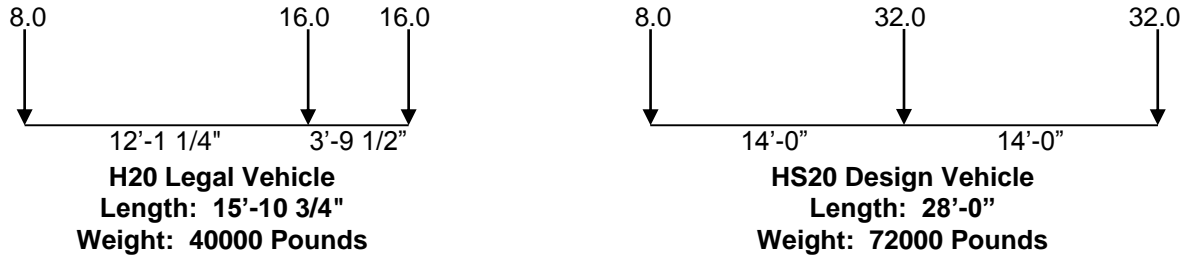
**2.3** Reinforcing steel splicing and spacing requirements shall be in accordance with the current *AASHTO Standard Specifications for Highway Bridges* and the manufacturer's recommendation.

**2.4** The precast beams shall be designed for a 75-year design life.

**3.0 Load Rating.** Load rating computations shall be performed using the Load Factor Method and shall be done in accordance with the current version of the *AASHTO Manual for Condition Evaluation and Load and Resistance Factor Rating of Highway Bridges*. Single and multiple lane rating values with and without impact shall be provided for the HS20, MO5, 4S3P, 3S2, and H20 Legal vehicles. The structure shall have a minimum inventory load rating of 36 tons for an HS20 design. Rating results shall be summarized in a tabular format listing the resulting value in tons for the different scenarios on each rating vehicle. A diagram outlining the rating vehicles follows.

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### MoDOT Load Rating Vehicles



#### 4.0 Submittals.

4.1 The contractor shall submit to the engineer for approval the following items signed, sealed and stamped by a registered professional engineer in the state of Missouri in accordance with Authentication of Certain Documents in [Sec 107](#):

- (a) Three copies of design and load rating computations. Design computations that are computer-generated shall be accompanied by longhand examples of the design methodology that completely addresses all components of the superstructure.
- (b) Five sets of shop drawings. Shop drawings shall be of sufficient detail and clarity to provide a permanent record of the superstructure for future reference. Shop drawings shall include the county and bridge number on each sheet. Shop drawings shall include all notes, details, dimensions and quantities necessary to construct and erect the superstructure.

**4.2** The contractor shall submit computations on CD in Adobe Acrobat Reader version 7.0 or greater. Each submitted CD shall contain an index file that is labeled accordingly. The index file shall contain links to the computations that are contained within.

**4.3** The contractor shall submit shop drawings on CD.

**4.4** Construction or manufacture of any component of the superstructure shall not begin until written approval of computations and shop drawings have been received from the engineer.

**4.5** During construction, the contractor shall submit to the engineer construction change recommendations to resolve any constructability issues. Construction of any required modification shall not begin until written approval of the construction change recommendations have been received from the engineer.

**4.6** After construction, the contractor shall submit final shop drawings on CD. Final shop drawings shall include construction changes made to shop drawings during construction.

**4.7** Shop drawings shall be in accordance with Specifications of Computer Deliverable Contract Plans in the MoDOT Engineering Policy Guide.

**5.0 Method of Measurement.** No measurement will be made.

**6.0 Basis of Payment.** Payment for the above described work will be considered completely covered by the contract Lump Sum price for "Pre-Engineered Superstructure".

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H. GEOSYNETHIC REINFORCED SOIL INTEGRATED BRIDGE SYSTEM (GRS-IBS)

**1.0 Description.** This work shall consist of furnishing materials and the construction of a Geosynthetic Reinforced Soil Integrated Bridge System (GRS-IBS) meeting the approval of the engineer. Additional information on the material and construction requirements for GRS-IBS construction can be found on the FHWA website at the following:

<https://www.fhwa.dot.gov/publications/research/infrastructure/structures/11026/11026.pdf>

**2.0 GRS-IBS Components:**

The GRS-IBS Abutment consists of the following components:

- Leveling Course
- Concrete Encasement
- CMU Facing Blocks
- Geosynthetic Reinforcement
- Select Granular Fill Material
- Deadman Anchorage System

**2.1.0 Leveling Course.**

**2.1.1** Setting the first course of the facing blocks level and to grade is critical in maintaining wall alignment for the entire height of the abutment. A fine aggregate, similar to the gradation of the Select Granular Fill for the GRS abutment and conforming to the material requirements of Sec. 1007.3 or other approved material, shall be placed to provide a suitable surface for placing the lowest layer of the facing blocks. The fine aggregate level course shall be compacted in accordance with Sec 304.

**2.1.2** The leveling course shall be kept as close as possible to the minimum thickness stated on the plans.

**2.1.3** Leveling course shall be extended a minimum of 6 inches to each side of the facing blocks and the exposed portion shall be encased in concrete as shown on the plans and as described below.

**2.2.0 Concrete Encasement.** This work shall consist of forming and pouring concrete which will serve to keep the level course from being scoured away by the adjacent stream.

**2.2.1** The concrete encasement shall be poured directly after the first two rows of facing blocks have been properly set and checked for level and plumb.

**2.2.2** The concrete encasement is to be 4" thick minimum.

**2.2.3** Encasement is to be placed to the limits shown on the plans and more specifically shall extend to the edge of the rock excavation or a minimum of 3" beyond the limits of the leveling course as it applies. The edges of the encasement that are not confined by the rock excavation limits shall be formed so a straight face is provided. The concrete shall be consolidated and struck off to the required thickness. After the concrete has set sufficiently, the forms shall be removed, and where necessary, the contractor shall backfill adjacent to the concrete with suitable material, compacted and finished per the approval of the engineer.

**2.3.0 CMU Facing Blocks.** This work shall consist of furnishing materials and the construction

of a block wall as part of the Geosynthetic Reinforced Soil System which meets the approval of the engineer.

**2.3.1.0 Acceptance of Block Wall Components.** Acceptance will be based upon manufacture test results compliant with the following requirements. All components associated with the block wall shall be approved by the engineer before delivery to the jobsite. The components shall meet the minimum material requirements set forth in Sec 1052 (excluding sections 1052.40.2.2 and 1052.40.2.3) and these Job Special Provisions.

**2.3.1.1 Lot Definition.** A production lot will be defined as a group of blocks produced using the same materials, concrete mix design, manufacturing process, and curing method and shall consist of no more than 10,000 units.

**2.3.1.2** Dry cast blocks shall be in accordance with the requirements of ASTM C-1372. Blocks shall be tested for a minimum of one production lot in accordance with the below table.

Table of Minimum Required Properties of Cementitious Material for CMU Blocks		
Test	Method	Requirement
Compressive Strength (psi)	ASTM C140	4000 psi (min.)
Water Absorption (%)	ASTM C140	5 % (max.)
Freeze-Thaw Loss (%)	ASTM C1262-10 <sup>[1]</sup>	
40 cycles (5 of 5 samples)		1.0% (max.) <sup>[2]</sup>
50 cycles (4 of 5 samples)		1.5% (max.) <sup>[2]</sup>

<sup>[1]</sup> Blocks are not required to be tested with the 3% saline solution.

<sup>[2]</sup> Test results that meet either of the listed requirements for Freeze-Thaw loss are acceptable.

**2.3.1.3** Block dimensions shall vary no more than  $\pm 1/8$ " from the standard values published by the manufacturer in accordance with ASTM C1372. The nominal block height shall not exceed the reinforcement spacing shown on the plans.

**2.3.2.0 Construction Requirements.** Refer to FHWA GRS-IBS Implementation Guide Section 7 for guidance on construction of the block wall component of the abutments.

**2.3.2.1** Geotextile fabric used with the Type 2 Rock Blanket (Rip-Rap) shall be placed between the facing blocks to provide a frictional connection for the first 2 rows above the concrete encasement.

**2.3.2.2** Each layer of the block wall shall be constructed entirely before beginning the next layer.

**2.3.2.3** A running bond pattern shall be maintained between layers of blocks. Blocks are to be staggered, including corners, to ensure there are no vertical joints greater than one block in height.

**2.3.2.4** Place CMU blocks side by side for the full length of each course of the wall. Check wall plumbness a minimum of every 3 layers and correct deviations greater than  $1/4$ ". Correct misaligned, improperly seated or out of level CMU blocks. Assure that the tops of all CMU blocks are free of loose material prior to the placement of the next layer of geotextile and CMU blocks.

**2.3.2.5** Block wall systems shall be built in accordance with the dimensions and elevations

specified on the plans and in accordance with the requirements of the manufacturer. Dimensional tolerances shall be as specified by the manufacturer or as specified in Sec 720.4.8.

**2.3.2.6 Mortar (or Grout)** conforming to the requirements of Sec. 1066 shall be used for the following:

- Coping used to cover top of front face of block wall as shown on the plans
- To fill and secure the top 3 layers of blocks for the entire block wall
- To fill and secure the full height of the corners of the block wall.

**2.3.3.0 Material Requirements.** Blocks shall be a splitface design or other aesthetic design per the approval of the engineer. Block colors shall be as stated below for zones A and B.

**2.3.3.1 Hollow-Core Concrete Masonry Block (Gray):** This item shall consist of furnishing and placing Hollow-Core Concrete Masonry Units (CMU) with nominal dimensions of 8" x 8" x 16". Blocks shall be gray in color and have a splitface or other approved aesthetic design. These blocks are to be placed in Zone A as shown on the plans.

**2.3.3.2 Solid Concrete Masonry Block (Red):** This item shall consist of furnishing and placing Solid Concrete Masonry Units (CMU) with nominal dimensions of 8" x 8" x 16". Blocks shall be red in color and have a splitface or other approved aesthetic design. These blocks are to be placed in Zone B as shown on the plans.

**2.3.4.0 Submittals.** The contractor shall submit to the Engineer for approval, the following items prior to construction of the GRS abutments:

**2.3.4.1** ASTM C1262 Freeze-Thaw test results.

**2.3.4.2** Specifications of block system chosen including but not limited to:

- 1). Block dimensions for the solid and hollow blocks
- 2). Verification of minimum compressive strength
- 3.) Verification of maximum absorption rates

**2.3.5 Method of Measurement.** No measurement will be made.

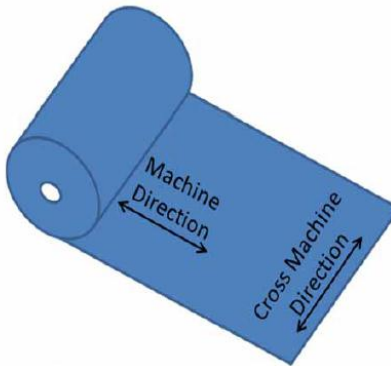
**2.3.6 Basis of Payment.** Payment for the above described work will be considered completely covered by the contract lump sum price for "Geosynthetic Reinforced Soil System (GRS)".

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**2.4.0 Geosynthetic Reinforcement.** This work consists of a suitable geotextile or geogrid material meeting the requirements as stated below and on the plans. All Type A and Type B geosynthetic reinforcement shall be prequalified and approved before the contract is awarded. To apply for prequalification or prequalification requirements, the supplier or manufacturer shall submit a request to the engineer along with certification that the geosynthetic reinforcement has the following minimum properties:

Table of Minimum Required Properties of Geosynthetic Reinforcement				
	Biaxial Material		Uniaxial Material	
	MD <sup>1</sup>	CMD <sup>2</sup>	MD <sup>1</sup>	CMD <sup>2</sup>
<b>Type A Reinforcement</b>				
<sup>4</sup> Wide Width Tensile Strength (lbs/ft)	4800	4800	<sup>3</sup>	4800
<sup>5</sup> Tensile Strength @ 2% Strain (lbs/ft)	960	1000	<sup>3</sup>	1000
<sup>6</sup> Minimum apparent opening size	#40 U.S. Sieve		#40 U.S. Sieve	
<b>Type B Reinforcement</b>				
<sup>4</sup> Wide Width Tensile Strength (lbs/ft)	2400	2400	N/A	N/A
Required permittivity for Separation Geotextile				
<b>Separation Geotextile</b>				
<sup>7</sup> Minimum permittivity (sec <sup>-1</sup> )	1.0		1.0	

1. MD= Machine Direction
2. CMD= Cross Machine Direction
3. per manufacturer
4. Wide width tensile strength (per ASTM D-6637 or ASTM D-4595)
5. Tensile strength at 2% strain (per ASTM D-6637 or ASTM D-4595)
6. Apparent opening size (per ASTM D-4751)
7. Permittivity (per ASTM D-4491)



**2.4.1.0** For the Main (Type A) Geosynthetic Reinforcement, it is preferred to have the higher strength properties to run in the cross machine direction (as shown in the above table). This way the reinforcement can be rolled out along the front face of the block wall and the required properties will be perpendicular to the block wall. Care must be taken to ensure that the material is laid out in the proper orientation.

**2.4.1.1** A biaxial material is required for the Type B reinforcement.

**2.4.1.2** The separation geotextiles shall meet the requirements of Sec 1011. Separation geotextiles are to be placed in the Integration Zone and wrapped behind the block wall as shown on the plans.

**2.4.1.3** The geosynthetic layers shall extend between the layers of facing blocks to provide a frictional connection. Pull the geosynthetic taut prior to backfilling to remove any wrinkles.

**2.4.1.4** To limit construction damage to the geosynthetic, construction equipment shall not drive directly over the geosynthetic until a minimum aggregate thickness of 6" has been placed over the geosynthetic material. This requirement does not apply to walk behind vibratory plate compactors.

**2.4.1.5** No lapping of geosynthetic fabric shall be permitted along the face. Where lapped elsewhere, a 1/4" thickness of stone shall be spread between layers of fabric.

**2.4.2.0 Integration Zone Placement.** Following placement of the superstructure, Separation Geotextile layers are to be placed behind the superstructure. The maximum lift height shall be 6" and the maximum layer thickness shall be 12".

**2.4.2.1** The top of the final wrap in the integration zone should allow at least 2" of aggregate cover over the geotextile to protect it from the hot mix asphalt.

**2.5.0 Select Granular Fill Material.** Select granular fill material for GRS shall conform to the following requirements.

**2.5.1.0** Select granular fill material shall be clean and crushed angular stone, meet the open-graded backfill specifications of AASHTO No. 89, and conform to the following gradation limits determined by AASHTO M-43:

Sieve Size	Percent Passing
1/2 inch	100
3/8 inch	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

**2.5.1.1** The Plasticity Index, as determined by AASHTO T-90, shall not exceed 6.

**2.5.1.2** The angle of internal friction for the select granular fill material shall be no less than 42°. Testing shall be in accordance with Sec 1010.3.5.

**2.5.1.3** The material shall substantially be free of shale or other soft, poor durability particles and shall have a magnesium sulfate soundness loss of less than 30 percent after four cycles (or a sodium value less than 15 percent after five cycles) as determined by AASHTO T-104.

**2.5.1.4** Select granular fill materials shall meet the electrochemical requirements in accordance with Sec. 1010.

**2.5.1.5** The contractor shall furnish to the engineer a Certificate of Compliance certifying the selected granular fill material complies with this section of the specifications. A copy of test results from an approved laboratory testing the material for all of the above requirements shall also be furnished to the engineer. Tests shall apply specifically to the material being used and shall not be more than twelve months old, if previously tested for another job and still applicable.

**2.5.1.6** Acceptance will be based on the Certificate of Compliance, accompanying test reports,

and any applicable tests performed by the engineer or its representative.

**2.5.2.0 Construction Requirements.**

**2.5.2.1** Delivery, storage, and handling of all GRS materials shall comply with requirements set forth in the Missouri Standards Specifications for Highway Construction.

**2.5.2.2** Subgrade surfaces beneath the GRS Systems shall be level, free from deleterious materials, loose or otherwise unsuitable soils. Prior to placement of geosynthetic reinforcement and granular fill material, the subgrade shall be proof-rolled to provide a uniform and firm surface. Any soft areas, as determined by the engineer, shall be excavated and replaced with suitable compacted materials. Foundation surface shall be inspected and approved by the engineer prior to fill placement. Bench the backcut into competent soil to improve stability per OSHA requirements.

**2.5.2.3** Geosynthetic reinforcement shall be installed within the layers of the compacted granular fill material in accordance with the manufacturer's recommendations and as shown on the plans. Type A Reinforcement is to be installed as described in Section 2.4.1.0 above. Geosynthetic reinforcement is to extend the lengths as shown on the plans unless otherwise directed by the engineer. Any required laps of geosynthetic reinforcement to cover each lift of granular fill shall be done in accordance with the manufacturer's recommendations and these special provisions. Any cutting of geotextile materials will be per the manufacturer's recommendations.

**2.5.2.4** Select granular fill shall be placed, spread, and compacted in such a manner to minimize the development of wrinkles and/or displacement of the geosynthetic reinforcement. Granular soils shall be compacted in a maximum loose lift thickness of 8 inches. The top layer of the geosynthetic reinforcement shall be 2 to 4 inches below the asphalt base course. Compaction shall be achieved with 3 to 5 passes of a walk-behind vibratory plate compactor within 3 feet of the fill face and by a ride-on vibratory roller in other areas. Compaction shall be visually inspected and approved by a qualified geotechnical engineer before construction on the next lift can begin. Select granular fill shall be graded away from the slope crest and rolled at the end of each work day to prevent ponding of water on surface of the GRS. Tracked construction equipment shall not be operated directly upon the geosynthetic reinforcement. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the geosynthetic reinforcement. Turning of tracked vehicles shall be kept to a minimum to prevent tracks from displacing the fill and the geosynthetic reinforcement. If approved by the engineer and subject to satisfactory performance, rubber-tired equipment may pass over the geosynthetic reinforcement at speeds no greater than 10 mph. Sudden braking and sharp turning shall not be allowed.

**2.5.2.5** The backfill material shall be placed behind each layer of facing blocks in a lift thickness not to exceed the height of the facing blocks in Zones A & B. (In the Integration Zone the lift thickness shall not exceed 12".)

**2.5.2.6** Placement of aggregate shall be from the facing blocks backward to prevent the formation of wrinkles in the geotextile.

**2.5.2.7** At the end of a day's operations, slope the last lift of backfill away from the wall face to direct surface runoff away from the facing blocks. Surface runoff shall not be allowed to enter the wall construction area.

**2.5.3.0 Beam Seat Construction.** The beam seat shall be constructed as described in Section 7.8.1 of the FHWA Implementation Guide. Beam seat elevations are as shown on the plans.

**2.5.3.1** The thickness of the beam seat sections are approximately 8" and consist of a minimum of two 4" layers of wrapped-face geotextile fabric.

**2.5.3.2** Place precut 4" thick  $\pm$  Closed Cell Foam on the top of the bearing bed reinforcement, butted against the back side of the facing blocks. Set half-height CMU blocks (solid) on top of the Foam. Wrap 4" lifts across the beam seat. Before folding the final wrap, it may be necessary to grade the surface aggregate of the beam seat slightly high, to about  $\frac{1}{2}$ ", to aid in seating the footing and to maximize contact with the bearing area.

**2.6.0 Deadman Anchorage System.** This work consists of providing steel plates below the layers of geosynthetic and granular backfill to secure the superstructure to the abutment. This work also consists of properly placing the anchor bolts in the field so that the superstructure will align with the anchor bolts during installation.

**2.6.1.0** Steel plates, anchor bolts and related items shall be coated as described in the contract plans.

**2.6.2.0 Construction Requirements.**

**2.6.2.1** Steel deadman plates shall be set at or below the elevations as shown on the plans.

**2.6.2.2** The initial placement of the anchor bolts shall be checked against the locations called out on the plans.

**2.6.2.3** Anchor bolt locations shall be checked after every lift of GRS aggregate layer above where anchor bolts are required.

**2.6.2.4** A total station or GPS survey equipment shall be used to initially locate the anchor bolts.

**3.0 Method of Measurement.** No measurement of materials or other items required for the construction of the Geosynthetic Reinforced Soil (GRS) System will be made. The estimated quantities shown on the plans are shown for informational purposes. The contractor should develop an independent analysis of materials and work effort required to construct the GRS system as shown on the plans and outlined in the Special Provisions.

**4.0 Basis of Payment.** Payment shall cover all GRS materials and labor, including but not necessarily limited to the items covered by this special provision. Excavation of any unsuitable materials, as directed by the engineer will have no direct payment. The GRS-IBS and related items will be paid for at the contract lump sum price for "Geosynthetic Reinforced Soil System (GRS)".

**I. RESEARCH TESTING AND INSTRUMENTATION**

**1.0 Description.** For Boone County Bridge 33100041 carrying Rustic Road over North Fork of Grindstone Creek, the University of Missouri, in conjunction with the Missouri Department of Transportation (MoDOT), will be performing research during the construction of this single-span, pre-engineered steel tub girder bridge with Geosynthetic Reinforced Soil Foundation (GRS). This research will include instrumentation devices integral with the GRS Abutments as well as monitoring and data collection both during and after construction.

**2.0 Coordination of Work.** Coordination of labor between the contractor and the University of Missouri will be required. Contractor will be required to provide labor and equipment necessary to install the instrumentation, in coordination with the University of Missouri, which will include but not be limited to excavating and trenching for the installation of instrumentation devices.

**2.1.** Contractor shall provide the University of Missouri with an anticipated construction schedule for the bridge, including, but not limited to, fabrication and construction of Bents No. 1 and 2, installation of steel tub girders, and completion of bridge construction. Specifically, the contractor shall notify University of Missouri five working days prior to beginning construction of the substructure elements for each End Bent.

**2.2.** No payment will be made for any inconvenience or time delays caused by testing and instrumentation. University of Missouri will make every effort to schedule and conduct research testing and instrumentation activities at minimal inconvenience to the contractor's work.

**3.0 University of Missouri Self Insurance.** University of Missouri is self-insured and as such will be responsible for any negligence by their own employees including those activities associated with testing and instrumentation.

**4.0 Access.** Contractor shall allow access to the job site to University of Missouri for the purposes outlined in this special provision.

**5.0 Instrumentation.** Locations and types of sensors, wiring, and data acquisition systems, are shown on the plans. Bridge elements to be instrumented include individual layers of the GRS Abutments (End Bents 1 and 2), as well as the facing blocks in front of the GRS as specified in this contract document. Sensors may potentially be installed in the roadway above the end bents.

**6.0 University of Missouri Contacts**

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**7.0 Method of Measurement.** No measurements will be made for the above provisions.

**8.0 Basis of Payment.** Items, labor and equipment related to instrumentation, installation of instrumentation and required products, to be provided by the contractor as stated herein and as shown on the plans, shall be subsidiary to the project.

J. RECYCLED BRIDGE MATERIAL

**1.0 Description.** The contractor shall have the option of using concrete rubble from the existing bridge in lieu of or as part of the quantity of Type 2 Rock Blanket.

**2.0 Construction Requirements.** This work shall be in accordance with Sec 611.30 as directed by the engineer and shall conform to the plans for Type 2 Rock Blanket. All concrete pieces shall



be free of exposed rebar. Any concrete rubble determined by the engineer to be unsuitable or excess shall become the property of the contractor or shall be disposed of in accordance with Sec. 216.

**3.0 Method of Measurement.** No final measurement of Furnishing Type 2 Rock Blanket will be made. The method of measurement for Placing Type 2 Rock Blanket will be in accordance with Sec 611.30.4.

**4.0 Basis of Payment.** The basis of payment for Furnishing Type 2 Rock Blanket will be based on the plan quantity as specified in the contract regardless of where the material is obtained. The basis of payment for Placing Type 2 Rock Blanket will be in accordance with Sec 611.30.5.3.

#### K. MATERIAL CERTIFICATION AND TESTING

The contractor shall submit certifications and substantiating test reports, furnished by the supplier or fabricator, certifying that material and manufacturing procedures conform to the specifications. There shall be no direct charge to the engineer for materials taken as samples, either for field tests or for laboratory tests. If a specification of a recognized national standard agency (ASTM, AASHTO, AWWA, AWS, etc.) is designated, the material may, unless otherwise specified, meet either the designated specification or the latest revision thereof in effect at the time of letting of the contract.

Written certification for all materials shall be provided to the engineer at least ten (10) days prior to subject material being incorporated into the work. The certification shall state the type, source, quantity, and other applicable information of the material and shall state that the material being supplied meets all provisions of the contract documents. This certification shall be signed by a responsible individual of the supplier.

Job control tests may be run by the engineer or its representative as the work progresses to assure the engineer that the project is constructed in compliance with the applicable specifications. Unless otherwise specified, all concrete shall be subject to visual inspection, job control tests, and compressive strength tests performed on job control samples. These inspections and job control tests and samples will be performed by the engineer, at no expense to the contractor.

The contractor shall conform to Sec 106.9 "Buy America Requirement" for all steel items required.

The lack of supervision or inspection by the engineer shall not relieve the contractor of the responsibility to construct the project according to the plans and specifications.

#### L. ACCEPTANCE OF MATERIALS

**1.0 Description.** The following procedures have been established for the acceptance of precast concrete/steel tub girders and other structural members.

**1.1** Shop drawings shall be submitted for review and approval to the engineer for the local public agency (LPA). The approval is expected to cover only the general design features,

and in no case shall this approval be considered to cover errors or omissions in the shop drawings.

**1.2** For the structural steel required for the tub girders, the contractor shall utilize a fabricator that meets the appropriate American Institute of Steel Construction (AISC) certification provisions as outlined in Sec 1080.3.1.6.

**1.3** All welding operations, including material and personnel, shall meet the American Welding Society (AWS) specifications. Primary welds shall meet the provisions of Sec 1080.3.3.5.2.

**1.4** The LPA or their engineer of record has the option of inspecting the prefabricated units during fabrication or requiring the fabricator to furnish a certification of contract compliance and substantiating test reports. In addition, the reports shown below shall be required.

- For any concrete required to construct the pre-engineered superstructure:
  - Certified mill test reports, including results of physical tests on reinforcing steel, as required.
  - Test reports on concrete cylinder breaks
  
- For any steel required to construct the pre-engineered superstructure:
  - Certified mill test reports, including results of chemical and physical tests on all structural steel as furnished.
  - Non-destructive testing reports.
  - Verification of the girder camber, sweep, and other blocking data.
  - Verification of coating operations.

**2.0 Basis of Payment.** Any costs associated with the above provision will be considered completely covered by the contract unit price for “Pre-Engineered Superstructure”.

#### M. GUIDELINES FOR OBTAINING ENVIRONMENTAL CLEARANCE

**1.0 Description.** This provision provides guidance for obtaining environmental clearance for construction activities including but not limited to borrow areas, burn pits and staging areas.

**1.1** The contractor shall refer to the MoDOT Engineering Policy Guide section 127.27 for details on the proper methods expected by MoDOT concerning environmental issues.

**2.0 Basis of Payment.** No direct payment will be made to cover the above provision.

#### N. CONTRACTOR FURNISHED SURVEYING AND STAKING

**1.0 Description.** This provision covers all construction activities related to surveying and staking to be provided by the contractor.

1.1 Construction surveying activities performed by the contractor shall be in accordance with Sec. 627.

**2.0 Basis of Payment.** Payment shall be in accordance with Sec. 627.4. Any costs associated with the above provision will be considered completely covered by the contract lump sum price for “Contractor Furnished Surveying and Staking”.

O. REMOVAL OF IMPROVEMENTS

**1.0 Description.** This provision covers the removal of items required to complete the construction of this project, as noted in the contract plans.

1.1 Items required, as stated above, include but are not necessarily limited to, removal and relocation of existing signs, removal and replacement of property fence and removal of any items not covered by other pay items.

**2.0 Method of Measurement.** No measurement will be made.

**3.0 Basis of Payment.** Payment for the above described work will be considered completely covered by the contract lump sum price for “Removal of Improvements”.

P. CLEARING AND GRUBBING

**1.0 Description.** This provision covers all construction activities related to clearing and grubbing.

1.1 Clearing and Grubbing shall be in accordance with Sec. 201 with the exclusion of subsections 201.3 and 201.4

**2.0 Method of Measurement.** No measurement will be made.

**3.0 Basis of Payment.** Payment for the above described work will be considered completely covered by the contract lump sum price for “Clearing and Grubbing”.

Q. RESTORATION

**1.0 – GENERAL**

**1.1 PROJECT DESCRIPTION**

The Contractor is responsible for installation of topsoil, lime, fertilizer, seed and mulch as shown and/or noted on the construction Plans and Specifications.

**1.2 PERFORMANCE-BASED SPECIFICATION**

- A. Restoration is a performance-based specification and bid item. The Contractor shall deliver permanent grass cover at a minimum of 70% density over 100% of the seeded area within 60 days of sowing.
- B. The seeded areas shall be maintained by the Contractor as necessary to assure permanent grass growth.

- C. During the one year correction period, if there are deficient areas where the grass died, where sheet and rill erosion occurred, or where gravel or other deleterious backfill material surfaces, upon notification by the County of such areas, the Contractor shall rework all such areas as necessary to bring the areas into conformance with the Specifications.
- D. In the event that upon notification of deficient areas, the Contractor fails to remedy the problems, the County shall have the work completed by other means and shall bill the charge against the Contractor's performance bond.

### 1.3 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

- A. No final measurement of Restoration will be made. Plan quantity will be used as the basis of compensation unless additional restoration areas are authorized to be installed by the Engineer.
- B. Payment for Restoration will be paid per installed Acre or Lump Sum as indicated on the Bid Form.
- C. Lime, fertilizer and Type 3 Mulch will be considered incidental to Restoration. No separate payment will be made for lime, fertilizer and mulch.
- D. No measurement of Topsoil will be made under this Contract. Payment will be incidental to Restoration unless indicated on the Bid Form.
- E. Disturbed areas outside of the authorized construction limits shall be restored at the Contractor's expense.

## 2.0 – PRODUCTS

### 2.1 TOPSOIL MATERIAL

- A. The source of topsoil material shall be furnished by the Contractor. The County shall approve the topsoil source prior to topsoil placement.

- 2.2 Topsoil shall be fertile, friable, and loamy soil of uniform quality, without admixture of subsoil material, and **shall be free** from material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1 inch in diameter, and any other similar impurities. Topsoil shall be relatively free from grass, roots, weeds and other objectionable plant material or vegetative debris undesirable or harmful to plant life or which will prevent the formation of suitable seedbed. **A minimum of 2" shall be placed on all disturbed areas unless indicated otherwise in the Plans or Special Provisions.**

### 2.3 LIME

- A. Lime shall be pelletized bagged lime or an agricultural lime with not less than 90 percent passing the No. 8 sieve and containing not less than 65 percent calcium carbonate equivalent.
- B. Agricultural lime shall be furnished from a source that has been tested and certified in accordance with the Missouri Agricultural Liming Materials Act. The quantity of material required to provide the specified pounds of effective neutralizing material (E.N.M.) per acre shall be determined from the producer or distributor's certification of analysis furnished by the Director of the Missouri Agriculture Experiment Station, Columbia,

Missouri in accordance with the Missouri Agricultural Liming Materials Act. The Contractor shall provide a copy of this certification to the engineer prior to application.

- C. If agricultural lime is furnished as a bagged product, pelletized or otherwise, with a guaranteed product analysis shown on the bag listing the elemental properties and gradation, the E.N.M. shall be provided to the engineer. Material may be accepted on the basis of bag label analysis.

#### 2.4 FERTILIZER

Fertilizer shall be a standard commercial product which, when applied at the proper rate, will supply the quantity of total nitrogen (N), available phosphoric acid ( $P_2O_5$ ) and soluble potash ( $K_2O$ ), required to meet the performance requirements of **Paragraph 1.2** of this Specification Section. Material may be accepted on the basis of bag label analysis or supplier's certification and shall comply with all applicable Missouri fertilizer laws.

#### 2.5 SEEDING MIX

- A. Seed shall comply with the requirements of the Missouri Seed Law. Commercially available seed will be permitted, however, the percentages for purity and germination as certified by the supplier shall be subject to the approval of the Engineer.
- B. The Contractor shall submit the supplier's certifications to the engineer. Seed may be accepted on the basis of bag labels. If seed is accepted on the basis of bag labels, the Contractor shall retain the bag labels and shall write a letter to the Engineer stating the amount and type of seed.
- C. **Permanent Seeding** mixture shall match the existing grass type for each property within the project limits. **No wheat will be allowed as part of the permanent seeding mixture.**
- D. **Temporary Seeding** mixture shall be determined by the Contractor as required to adequately perform as a temporary erosion and sediment control measure.

#### 2.5 TYPE 1 MULCH

- A. Vegetative mulch consisting of prairie hay or straw from oats, rye, wheat, or barley.
- B. Prairie Hay shall consist of any combination of Big Bluestem, Little Bluestem, Indian Grass, Sideoats Grama, and native wildflowers.
- C. Mulch shall be free of prohibited weed seed as stated in the Missouri Seed Law and shall be relatively free of all other noxious and undesirable seed.
- D. Mulch shall be clean and bright, relatively free of foreign material and be dry enough to spread properly.

#### 2.6 TYPE 3 MULCH

- A. Vegetative mulch with overspray consists of Type 1 Mulch as defined in **Section 2.5** of this Specification Section and overspray material consists of virgin wood cellulose fibers or recycled slick paper.

- B. Virgin Wood Cellulose Fibers shall be produced by either the ground or cooked fiber process and shall have a moisture content of 15 percent by weight.
- C. Recycled Slick Paper shall be produced from printer's slick paper containing wood cellulose and kaolin clay. Recycled newsprint or cardboard are not allowed. The material shall be free of other materials or filler and shall have maximum moisture content of 8 percent by mass and a pH between 4.5 and 6.5.
- D. The overspray shall not contain any germination or growth inhibiting substances.
- E. The overspray shall be green in color after application and shall be evenly dispersed and suspended when agitated in water.
- F. The overspray shall form an absorbent cover, allowing percolation of water to the underlying soil.
- G. The mulch shall be packaged in moisture resistant bags with the net weight of the packaged material plainly shown on each bag.
- H. The mulch fibers shall not be water soluble.

### 3.0 – EXECUTION

#### 3.1 SEEDBED PREPARATION AND TOPSOIL

- A. Avoid preparing the seedbed under excessively wet conditions.
- B. The surface on which the topsoil is to be placed shall be free from rills, washes and depressions, and shall conform to the cross section shown on the Plans. It shall be free of all loose rock and foreign material greater 1 inch. The surface shall be loosened with a disk, ripper, chisel, harrow or rake to a minimum depth of 2 inches just prior to being covered with topsoil.
- C. Topsoil shall be placed and spread to a minimum depth as specified in **Paragraph 2.1.B** of this Specification Section after settling over all disturbed areas not being paved. After spreading, all large clods and foreign material shall be removed by the Contractor.

#### 3.1 LIME

- A. Lime should be applied per soil test recommendations. Soils with a pH of six or higher need not be limed.
- B. When soil tests are not available, lime shall be applied evenly at a rate determined by the Contractor to meet the performance requirements of **Paragraph 1.2** of this Specification Section.
- C. Lime shall be thoroughly mixed into the soil to a minimum depth of 3 inches no more than 48 hours before the seed is sown unless authorized by the engineer.

#### 3.2 FERTILIZER

- A. Fertilizer should be applied per soil test recommendations.
- B. When soil tests are not available, the Contractor shall determine the fertilizer grade and spread rate necessary to meet the performance requirements of **Paragraph 1.2** of this Specification Section.

- C. Fertilizer shall be applied evenly and thoroughly mixed into the soil to a minimum depth of 3 inches no more than 48 hours before the seed is sown unless authorized by the engineer.
- D. Lime and fertilizer shall be applied separately, but may be incorporated into the soil in one operation.

### 3.3 SEEDING

- A. **Permanent Seeding** mix shall be applied evenly at a rate determined by the Contractor to meet the performance requirements of **Paragraph 1.2** of this Specification Section.
- B. **Temporary Seeding** mix shall be applied evenly at a rate determined by the Contractor as required to adequately perform as a temporary erosion and sediment control measure.
- C. Apply seed evenly with a broadcast seeder, drill, cultipacker seeder, or hydroseeder. Plant seed ¼ to ½ inches deep.
- D. Harrow, rake, or drag a chain to lightly incorporate broadcast seed. Mulch all seeded areas.
- E. Maintenance: Check seeding within 4 to 6 weeks of planting to determine if stands are of adequate thickness. Fertilize, reseed, and mulch bare and sparse areas.

### 3.4 TYPE 1 AND TYPE 3 MULCH APPLICATIONS

- A. All mulch shall be distributed evenly over the areas to be mulched within 24 hours following seeding operations.
- B. Following mulching operations, precautions shall be taken to prohibit foot or vehicular traffic over the mulched areas.
- C. Type I Mulch shall be applied evenly at a rate determined by the Contractor to meet the performance requirements of **Paragraph 1.2** of this Specification Section.
- D. Type 3 Mulch overspray shall be hydraulically applied over the vegetative mulch as a separate operation at a rate determined by the Contractor to meet the performance requirements of **Paragraph 1.2** of this Specification Section.
- E. Overspray mulch shall be mixed with water in a manner to provide a homogeneous slurry. The slurry mix shall be agitated during application to keep the ingredients thoroughly mixed.
- F. Maintenance: Any mulch that is displaced shall be replaced after the damaged area has been restored.