

Christian County Commission



INVITATION TO BID

Return bid no later than:

Product or Services Requested: ITB Chadwick Rd Slope Stability Project

(Please provide two (2) summary copies and one unbound original of your detailed bid proposal)

Bid Opening Date: March 11, 2019

Bid Opening Time: 10:00 am (Bids Received No Later Than 9:45 am)

For Plans, Bid Documents & Specifications:

Contact: Christian County Highway Department
1106 W Jackson St
Ozark, MO 65721

Phone: 417-582-4381

Email: ashley@christiancountymo.gov

Sealed bids shall be submitted to:

Contact: Christian County Commission
100 W. Church Street Room 100
Ozark, MO 65721

Phone: 417-582-4300 Fax: 417-581-5924

BIDDER CHECKLIST

If submitting the bid by mail, it is to be completed, executed, and submitted in a sealed envelope addressed to Christian County Commission.

Provide the vendor name, vendor address, vendor number, county, route and project number on the outside of the envelope.

Please read all items in the bidding document carefully. For paper bids, complete all items in ink or by typing in the information.

Sign this bidding document properly. If submitted in the name of a firm or corporation, the legal name of the firm or corporation should appear in the space designated and be signed for by one or more persons legally qualified to execute papers in the name of said firm or corporation. Affix Corporate Seal if the Bidder is a Corporation.

Acknowledge the receipt of addenda, if issued, on Bid Form (Note: The "BID FORM" and "ITEMIZED BID FORM" are one document and shall be submitted together).

For paper bids submit the provided bid bond executed by bidder and surety or attach cashier's check to the bid bond form.

For paper bids, staple addenda to the bid in the appropriate part of the bid. The letter accompanying the addenda should be stapled to the inside of the back cover of the bid and returned. The bidder should retain a duplicate copy.

For submittal of paper bids, the complete set of bidding documents includes all information through the DBE form. The Technical Specifications/Job Special Provisions are for the bidder's information only and is not to be returned with the bid.

The bidding documents that must be completed and returned consist of, but are not necessarily limited to, the following:

Submit the completed Signature and Identity of Bidder.

Submit the completed Bid Form (Including "ITEMIZED BID FORM") with acknowledgement of Addenda and amount of bid in both words and figures.

Submit a bid bond executed by bidder and surety or attach cashier's check to the bid bond form.

Submit the Subcontractor Disclosure Form within three (3) business days of the Bid Opening.

All questions concerning the bid can be directed to the Christian County Highway Department at 417-582-4381.

NOTICE TO CONTRACTORS

Sealed bids for this project will be received at: Christian County Commission, 100 W Church Street, Room 100, Ozark, Missouri 65721, until 9:45 o'clock A.M. (Prevailing Local Time) on the 11th day of March, 2019, at the office of the Christian County Commission, and at 10:00 am will be publicly opened and read. All bids shall be submitted as a Hard Copy.

PROPOSED WORK:

The proposed work, hereinafter called the work, includes:

Provide all material, equipment and labor to construct slope stability improvements on Chadwick Road, Chadwick, Christian County, Missouri, per the provided plans and quantities.

COMPLIANCE WITH CONTRACT PROVISIONS:

The bidder, having examined and being familiar with the local conditions affecting the work, and with the contract, contract documents, including the Missouri Highways and Transportation Commission's "Missouri Standard Specifications for Highway Construction, 2018," and "Missouri Standard Plans for Highway Construction, 2018", their revisions, and the request for bid, including appendices, the special provisions and plans, hereby proposes to furnish all labor, materials, equipment, services, etc., required for the performance and completion of the work. All references are to the Missouri Standard Specifications for Highway Construction, as revised, unless otherwise noted.

PERIOD OF PERFORMANCE:

If the bid is accepted, the bidder agrees that work shall be diligently prosecuted at such rate and in such manner as, in the judgment of the Christian County, is necessary for the completion of the work within the time specified as follows:

Calendar Days: 90

Completion Date: TBD and Provided on Notice to Proceed

LIQUIDATED DAMAGES:

The bidder agrees that, should the bidder fail to complete the work in the time specified or such additional time as may be allowed by the design profession under the contract, the amount of liquidated damages to be recovered shall be as follows:

Liquidated damages per day: \$200

Liquidated damages will be assessed until the project has been accepted by the Owner.

BONDING & GUARANTEE REQUIREMENTS:

The following minimum requirements must be met and submitted with bid:

1. A bid guarantee equivalent to five (5) percent of the bid price must be submitted. The bid guarantee must consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying the bid as assurance that the bidder will, upon acceptance of the bid, execute such contractual documents as may be required within the time specified.
2. A performance bond for 100% of the contract price.
3. A payment bond for 100% of the contract price.

PREVAILING WAGE RATE REQUIREMENTS (STATE ONLY):

This contract requires payment of the prevailing hourly rate of wages for each craft or type of worker required to execute the contract as determined by the Missouri Department of Labor and Industrial Relations. The applicable State Wage Rates for this contract are detailed in "Annual Wage Order 25." It shall be conclusively presumed that they are in the bidder's possession, and they have been reviewed and used by the bidder in the preparation of any bid submitted on this project.

OSHA TEN HOUR TRAINING REQUIREMENTS:

Missouri Law, 292.675 RSMO, requires any awarded contractor and its subcontractor(s) to provide a ten-hour Occupational Safety and Health Administration (OSHA) Construction Safety Program (or a similar program approved by the Missouri Department of Labor and Industrial Relations as a qualified substitute) for their onsite employees (laborers, workmen, drivers, equipment operators, and craftsmen) who have not previously completed such a program and are directly engaged in actual construction of the improvement (or working at a nearby or adjacent facility used for construction of the improvement). The awarded contractor and its subcontractor(s) shall require all such employees to complete this ten-hour program, pursuant to 292.675 RSMO, unless they hold documentation on their prior completion of said program.

ADDENDUM ACKNOWLEDGEMENT:

The undersigned states that the all addenda (if applicable) have been received, acknowledged and incorporated into their bid, prior to submittal. For paper bids, staple addenda to the bid in the appropriate part of the bid.

SIGNATURE AND IDENTITY OF BIDDER:

The undersigned states that the following provided information is correct and that (if not signing with the intention to bind themselves to become the responsible and sole bidder) they are the agent of, and they are signing and executing this, as the bid of

_____, which is the correct LEGAL NAME as stated on the Contractor Questionnaire, if applicable.

(a) The organization submitting this bid is a(n) (1) individual bidder, (2) partnership, (3) joint venture (whether individuals or corporations, and whether doing business under a fictitious name), or (4) corporation. Indicate by marking the appropriate box below.

- sole individual partnership joint venture
 corporation, incorporated under laws of state of _____

(b) If the bidder is doing business under a fictitious name, indicate below by filling in the fictitious name

Executed by bidder this _____ day of _____ 20_____.

Name of individual, all partners, or joint venturers:

Address of each:

Doing business under the name of:

(If using a fictitious name, show this name above in addition to legal names.)

Address of principal place of business in Missouri:

(If a corporation, show its name above)

THE BIDDER CERTIFIES THAT THE BIDDER AND ITS OFFICIALS, AGENTS, AND EMPLOYEES HAVE NEITHER DIRECTLY NOR INDIRECTLY ENTERED INTO ANY AGREEMENT, PARTICIPATED IN ANY COLLUSION, OR OTHERWISE TAKEN ANY ACTION IN RESTRAINT OF FREE COMPETITIVE BIDDING IN CONNECTION WITH THIS BID, AND THAT THE BIDDER INTENDS TO PERFORM THE WORK WITH ITS OWN BONAFIDE EMPLOYEES AND SUBCONTRACTORS, AND DID NOT BID FOR THE BENEFIT OF ANOTHER CONTRACTOR.

THE BIDDER ACKNOWLEDGES THAT THIS IS AN UNSWORN DECLARATION, EXECUTED UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE UNITED STATES AND/OR FALSE DECLARATION UNDER THE LAWS OF MISSOURI, AND ANY OTHER APPLICABLE STATE OR FEDERAL LAWS. THE FAILURE TO PROVIDE THIS CERTIFICATION IN THIS BID MAY MAKE THIS BID NON-RESPONSIVE, AND CAUSE IT TO BE REJECTED.

THE BIDDER CERTIFIES THAT THE BIDDER'S COMPANY KNOWINGLY EMPLOYS ONLY INDIVIDUALS WHO ARE AUTHORIZED TO WORK IN THE UNITED STATES IN ACCORDANCE WITH APPLICABLE FEDERAL AND STATE LAWS AND ALL PROVISIONS OF MISSOURI EXECUTIVE ORDER NO. 07-13 FOR CONTRACTS WITH THE CONTRACTING AUTHORITY.

Check this box ONLY if the bidder REFUSES to make any or all of these certifications. The bidder may provide an explanation for the refusal(s) with this submittal.

Signature of Bidder's Owner, Officer, Partner or Authorized Agent

Please print or type name and title of person signing here

Attest:

Secretary of Corporation if Bidder is a Corporation

Affix Corporate Seal (If Bidder is a Corporation)

NOTE: If bidder is doing business under a fictitious name, the bid shall be executed in the legal name of the individual, partners, joint ventures, or corporation, and registration of fictitious name filed with the secretary of state, as required by sections 417.200 to 417.230 RSMo. If the bidder is a corporation not organized under the laws of Missouri, it shall procure a certificate of authority to do business in Missouri, as required by section 351.572 et seq RSMo. A certified copy of such registration of fictitious name or certificate of authority to do business in Missouri shall be filed with the Missouri Highways and Transportation Commission, as required by the standard specifications.

PROJECT AWARD:

This project will be awarded to the lowest, most responsive, most responsible bidder.

SALES AND USE TAX EXEMPTION:

Christian County Commission, a tax-exempt entity, will furnish a Missouri Project Exemption Certificate as described in Section 144.062 RSMo to the awarded contractor who in turn may use the certificate to purchase materials for a specific project performed for the tax exempt entity. Only the materials and supplies incorporated or consumed during the construction of the project are exempt. The certificate will be issued to the contractor for a specific project for a defined period of time.

INTERPRETATION OR CORRECTION OF CONTRACT DOCUMENTS:

All questions about the meaning or intent of the contract documents shall be submitted to the Owner in writing. Replies will be issued by written addenda to all parties on the planholder list. Only questions answered by formal written addenda will be binding. Any alternate material shall be approved prior to the bid opening and in sufficient time to issue an addendum. No alternates will be approved unless approved in a written addendum. Questions must be received by the Owner at least four (4) working days prior to the bid opening. No addenda will be issued less than two (2) working days prior to the bid opening.

ITEMIZED BID:

The bidder proposes to furnish all labor, materials, equipment, services, etc. required for the performance and completion of the work, as described in the following Bid Form and Itemized Bid Sheets.

BID FORM

CHADWICK RD SLOPE STABILITY PROJECT

We, the undersigned BIDDER, do hereby agree, if this Bid is accepted, to enter into an agreement with Christian County Commission in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents and Specifications for the Bid Price and within the Period of Performance indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

BIDDER accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for sixty (60) days after the day of Bid opening. BIDDER will sign and deliver the required number of counterparts of the Agreement with the Bonds and other documents required by the Bidding Requirements within ten (10) days after the date of Christian County Commission Notice of Award.

In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:

BIDDER has examined and carefully studied the Bidding Documents and any addenda, as acknowledged below.

BIDDER has visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance and furnishing of the Work;

BIDDER is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress, performance and furnishing of the Work.

BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.

BIDDER has given Christian County written notice of all conflicts, errors, ambiguities or discrepancies that BIDDER has discovered in the Contract Documents and the written resolution thereof by Christian County is acceptable to BIDDER, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this Bid is submitted.

This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself any advantage over any other Bidder or over Christian County Commission.

BIDDER will complete all work on the described project for the Christian County Commission in accordance with the Contract Documents for the price(s) stated below.

The Bidder agrees to include the items listed in the Itemized Bid Sheet(s) attached to this Bid Form in the Base Bid.

- Note 1 Bidder agrees and understands that by this submission that items required to construct and complete the project in accordance with the accompanying plans, but not shown on this proposal, shall be included in the bid price for other related items of construction so as to not cause an unbalanced bid.
- Note 2 The undersigned submits the following Itemized Bid Sheet(s) and hereby authorizes the Christian County Commission to correct any multiplication of "Unit Price" by "Quantity" as shown under "Amount" when copying the Itemized Bid Sheet(s) into any Contract.
- Note 3 It is understood that this bid becomes a part of the specifications upon the signing of the contract and that failing to comply with any part of this bid will be taken as a failure to comply with said specifications and will be just cause for rejection of work.
- Note 4 In submitting this bid, it is understood that the right is reserved by the Christian County Commission to reject any and all bids, to waive any irregularities in the bidding, and to increase or decrease the amount of any class or portion of the work.
- Note 5 In submitting this proposal, contractor certifies that no employee, member, or officer of the firm or corporation is a salaried officer or employee of the Christian County Commission or any of its boards or agencies, and that no salaried officer or employee of the Christian County Commission has any financial interest, direct or indirect, in this Contract. The Christian County Commission will award the bid to the lowest, responsive, responsible bidder.
- Note 6 The Christian County Commission will award the bid to the lowest, responsive, responsible bidder. Priority of consideration will be based upon the bids received in the following priority of consideration:
1. Base Bid
 2. Base Bid + (Alternate 1, Alternate 2... Alternate X)
- Alternates will be awarded in cumulative numerical order presented. No alternate will be awarded out of order. The Owner reserves the right to award the bid based upon priorities scheduled above that fall within the financial constraints of the project.
- Note 7 The scope of the work to be performed under the various unit price items of the contract proposal (where linear or volumetric measurement of quantities is involved) and the method of measurement and basis of payment for quantities in connection with such items, together with the scope of various lump sum items of the contract proposal is in general, defined and described under the respective applicable specification sections. It is the intent of the Bid Form and the Job Special Provisions that the total bid as submitted shall cover all work shown by the Contract Drawings and as required by the attached specifications and other Contract Documents. All costs, in connection with the work, and payment therefore, shall be included in and based on the unit and lump sum prices named in the Bid Form. No item of work that is required by the Contract documents for the proper and successful completion of the Contract shall be paid for outside of or in addition to the prices submitted in the Bid Form, as all work not specifically set forth in the Bid Form as a pay item shall be considered a subsidiary obligation of the Contractor and all cost in connection therewith shall be included in the unit or lump sum prices named in the Bid Form.

Note 8 It is understood by the bidder that the quantities given in the following itemized bid form are not guaranteed by the owner and are used solely for the purpose of comparing bids and awarding the contract and may or may not represent the actual quantities encountered on the job; and that the sum of the products of the quantities listed in the following itemized bid form, multiplied by the unit price bid shall constitute the gross sum bid.

Contractor Information

Contractor: _____

Address: _____

Phone: _____

Fax: _____

Email: _____

Total Base Bid: Proposal for the Construction of the Chadwick Road Low Water Crossing Project (to agree with the "ITEMIZED BID FORM")

\$ _____
(in numbers)

\$ _____
(in words)

(In case of discrepancy, the amount shown in words will govern)

Contractor acknowledges receipt of Addenda No(s), if required:

Signature:

Title:

Date:

ITEMIZED BID FORM

Christian County, MO
 Chadwick Road Slope Stability Project

BASE BID					
<i>Item No.</i>	<i>Description</i>	<i>Unit</i>	<i>Quantity</i>	<i>Unit Cost</i>	<i>Total Cost</i>
0.1	Mobilization	1	LS		
0.2	Erosion & Traffic Control	1	LS		
SITE 1 (WEST SITE)					
1.1	Unclassified Excavation	50	SY		
1.2	Precast Block Wall	384	SF		
1.3	18" CMP	2	EA		
1.4	Pavement Section Restoration	200	SF		
1.5	Type A Guardrail with End Terminals	120	FT		
1.6	Aggregate (All Types)	200	TON		
SITE 2 (EAST SITE)					
2.1	Unclassified Excavation	130	SY		
2.2	18" CMP	2	EA		
2.3	Pavement Section Restoration	600	SF		
2.5	Shot Rock Armoring	2500	TON		
PROJECT TOTAL (SITE 1 & 2)					

PAY ITEM NOTES:

Item No. 0.1:

Bid item shall include the preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the project site, for the establishment of all facilities necessary for work on the project, except as provided in the contract as separate pay items, payment for the actual cost of the contract bond and liability insurance and for all other work and operations that must be performed or costs incurred prior to beginning work on the various items on the project site.

Item No. 0.2:

Bid item shall include cost for all erosion control measures required, including but not limited to silt fence, straw bales, rock ditches. This pay item shall also include final seeding/straw of disturbed areas. This work shall also consist of furnishing, installing, operating, maintaining, cleaning, relocating and removing temporary traffic control devices and equipment, and the removal and relocation or covering and uncovering of existing signs and other traffic control devices in accordance with the contract documents or as directed by the County. For purposes of this specification, the work zone will be defined as the area between the first and last temporary traffic control device as shown on the plans for the work being performed. All traffic control devices shall be in accordance with the MUTCD and any applicable safety and design codes. All temporary traffic control devices authorized for installation by the County will be paid for under this pay item.

Item No. 1.1, 2.1:

Bid item shall include cost of unclassified excavation and embankment/fill in place as well as all clearing and grubbing. This work shall consist of the necessary excavation for the foundations of all structures, removal and disposal of all excavated material, backfilling around the completed structures, and all related work. Excavated material that is unsuitable for backfill and embankments, and excess material not required for either, shall be disposed of at the sole expense of the Contractor. Excavated material shall not be dumped into the channel of the stream.

Item No. 1.2:

The work consists of supplying and installing all aspects of the MagnumStone™ Precast Mechanically Stabilized Earth (MSE units as specified in the construction drawings or as established by the Owner, Architect or Engineer. The cost for this item shall also include the required concrete leveling pad, as shown on the plans. Specifications are detailed in Job Special Provisions, Sections 17, 18 & 19.

Item No. 1.3, 2.2:

Bid item shall consist of furnishing and installing 18" corrugated metal pipe as shown on the plans. The cost shall include all bedding and backfill required. Contractor must meet all conditions of Section 725, Missouri Standard Specifications for Highway Construction, July 2018.

Item No. 1.4, 2.3:

Bid item shall consist of sawcutting, removal and full depth restoration of the pavement sections required to be removed as part of the construction. In addition, this item shall cover any and all costs associated with the pavement widening shown on

the plans. This shall include furnishing, installing and meeting Christian County standards for subgrade, base (aggregate and asphalt), tack coats, and hot mix asphalt. Contractor must meet all conditions of Section 613, as applicable, Missouri Standard Specifications for Highway Construction, July 2018.

Item No. 1.5:

Bid item shall consist of furnishing and placing Type A guardrail and two end terminals that comply with MoDOT Engineering Policy Guide Section 606 in locations shown on the plans and quantity shown in the Contract bid items. Contractor must meet all conditions of Section 606, Missouri Standard Specifications for Highway Construction, July 2018.

Item No. 1.6, 2.4:

Bid item shall consist of furnishing and placing one or more courses of aggregate in accordance with these specifications, and as shown on the plans or as directed by the County. The type of aggregate to be used will be specified on the plans and in the Contract bid items. This item shall contain all aggregate and fill not included in the specifications for items 1.2, 1.3, 2.2, 1.4, 2.3, and 2.5. Contractor must meet all conditions of Section 304, Missouri Standard Specifications for Highway Construction, July 2018.

Item No. 1.5:

Bid item shall consist of furnishing and placing shot rock stone in the quantity shown on the plans in the Contract bid items. Rock shall be placed in lifts to achieve maximum strength and connection. Contractor must meet all conditions of Section 611.30, Missouri Standard Specifications for Highway Construction, July 2018.

JOB SPECIAL PROVISIONS

CHADWICK RD SLOPE STABILITY PROJECT

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JOB SPECIAL PROVISIONS

1. GOVERNING SPECIFICATIONS AND DEFINITION CHANGES

The general requirements, provisions and technical specifications governing the completion of the work contemplated shall be those known and designated as the "Missouri Standard Specifications for Highway Construction, 2018", and all revisions up until the date shown on the executed contract. The general requirements together with General and Job Special Provisions, if any, and other State and Federal requirements contained in the contract documents. In the event of conflict between the above referenced specifications and special provision, the Job Special Provisions shall have precedence, followed in descending priority by the General Special Provisions, and the MoDOT Standard Specifications. In the event of a disagreement between the Job Special Provisions and the Plans, the Plans shall have precedence.

All reference to the "County," "State" or "Owner" shall be interpreted as the Christian County Highway Department, Christian County, Missouri. All references to "Engineer" shall be interpreted as "Christian County".

2. INSURANCE

The Contractor shall provide liability insurance in the type and amount specified in Section 107.13 of the MoDOT Standard Specifications, as summarized in the table below.

	Minimum Coverage Per Claimant	
Worker's Compensation Insurance*		
Commercial General Liability Insurance	\$500,000.00	\$3,000,000.00
Commercial Auto Liability Insurance	\$500,000.00	\$3,000,000.00
Jones Act Insurance**	\$2,000,000.00	\$2,000,000.00
US Longshore & Harbor Worker's Compensation Act Insurance**	\$2,000,000.00	\$2,000,000.00
Railroad Protective Liability Insurance***	As Specified in Contract Documents	As Specified in Contract Documents

* Required for all Contractors and all Subcontractors.

** Required if work is on or adjacent to any waters classified as "navigable waters of the United States by the USACOE.

*** Required if any work is to be performed in railroad right-of-way.

3. SUBLETTING OF CONTRACT

Subletting of the contract shall be in accordance with Missouri Standard Specifications for Highway Construction Section 108.1 and shall be modified to include the following:

The Contractor shall include the names of DBE and other subcontractors to be utilized on the project on the proposal forms. Prior to commencing work, the Contractor shall provide the Christian County with the names of all subcontractors for approval. The subcontractors listed shall be those who will actually accomplish the work and second-tier subcontracting will not be permitted. Should for any reason a subcontractor not be able to perform the work indicated, the Contractor shall notify the Christian County and obtain approval for assigning such work to another subcontractor before accomplishing the work.

4. CHANGE ORDERS AND ADDITIONAL WORK

Change orders and additional work of the contract shall be in accordance with Missouri Standard Specifications for Highway Construction Section 109.12 and shall be modified to include the following:

There will be no consideration given to claims for undocumented extras or overruns at the completion of the project. Change orders shall go through the appropriate approval process before the work outside of the original contract is done. Work done outside of the original contract without going through the appropriate approval process will not be considered for payment.

5. CONTRACT PLANS AND SHOP DRAWINGS

The Contractor shall be supplied with up to three (3) sets of approved plans and contract assemblies including the job special provisions. Additional sets of approved plans and contract assemblies including special provisions may be purchased at a fee of \$40 per set for 11x17 size plans with contract documents. Larger sets may be printed per the request of Contractor at a fee of an additional \$ 1 per sheet at the larger size. One (1) set of approved plans and contract documents including special provisions shall be kept available on the job site at all times. If an approved set is unavailable on the job site then work may be stopped until such time one is produced. All shipping of plans and specifications shall be done at standard shipping cost with no-mark ups.

Shop drawings shall be prepared in advance of fabrication and give the complete information necessary for the fabrication of the component parts of the structure. The Contractor shall submit a minimum of two (2) sets of required shop drawings to Christian County. Upon receipt of the shop draw drawings, Christian County will notify the Contractor that shop drawings have been received. Contractor shall allow two (2) weeks for initial review. If an Intermediate submittal is necessary, the process will be the same as the initial submittal. Allow two (2) weeks for reprocessing each submittal. No extension of Contract Time will be authorized because of failure to transmit submittals to Christian County. One set of drawings will be returned to the Contractor with Comments. No precast structure may be set in place until shop drawings are approved in writing.

The following information must be present on the shop drawings:

Project Name/Bridge Number (Must have Federal Project No. if applicable)

Date

Name and Address of the Christian County Firm

Name and Address of the Contractor

Name and Address of Subcontractor (if applicable)

Name and Address of Supplier

A 4" X 5" space for the approval markings.

A copy of the Christian County's drawings will not be accepted as shop drawings.

Accuracy of the shop drawings is the responsibility of the fabricator. The approval will cover only the general design features, and in no case shall this approval be considered to cover errors or omission in the shop drawings.

6. EMERGENCY PROVISIONS AND INCIDENT MANAGEMENT

The Contractor shall have communication equipment on the construction site or immediate access to other communication systems to request assistance from the police or other emergency agencies for incident management. In case of traffic accidents or the need for police to direct or restore traffic flow through the job site, the Contractor shall notify police or other emergency agencies immediately as needed. The Christian County Highway Department shall also be notified when the Contractor requests emergency assistance.

HIGHWAY ADMINISTRATOR:

Name: Miranda Beadles

Phone Number: (417) 582-4394

This list is not all inclusive. Notification of the need for wrecker or tow truck services will remain the responsibility of the appropriate police agency.

The Contractor shall notify law enforcement and emergency agencies before the start of construction to request their cooperation and to provide coordination of services when emergencies arise during the construction at the project site. When the Contractor completes this notification with law enforcement and emergency agencies, a report shall be furnished to Christian County on the status of incident management.

No direct pay will be made to the Contractor to recover the cost of the communication equipment, labor, materials or time required to fulfill the above provisions.

7. COOPERATION WITH UTILITIES

The Contractor shall make suitable and timely written request to all utility owners, all pipe line owners, or other parties affected, and endeavor to have all locations determined and any necessary adjustments of public or private utility fixtures, pipe lines, and other appurtenances within or adjacent to the limits of construction, made as soon as practicable. One (1) copy of all requests shall be submitted to Christian County.

The Contractor is responsible for contacting all utility companies on the site for locations of their facilities and for protecting the utilities and coordinating his activities with any required relocations.

The utilities shown on the plans may not be accurate and may have been relocated. The Contractor shall contact all utilities to obtain plans showing their relocation and contact Missouri One-Call (1-800-344-7483) and the utility companies for field locates.

Some of the utilities may not be clear of the project when the Notice to Proceed is issued. It shall be the Contractor's responsibility to contact the utilities, and coordinate work around the utility companies' schedules. The Contractor shall make

every effort to coordinate his work in such a manner as to expose possible utility conflicts ahead of Contractor's work. In the event a conflict is found, the Contractor shall contact and coordinate with the utility involved and Christian County to resolve the conflict.

The Contractor agrees that any effects of the presence of the utilities, their relocation, Contractor's coordination of work with the utilities and any delay in utility relocation shall not be compensable as a suspension of work, extra work, a change in the work, as a differing site condition or otherwise including but, without limitation, delay, impact, incidental or consequential damages. The Contractor's sole remedy for the effects of the presence of utilities, delay in their relocation or any other effects shall be an excusable delay as provided in Section 105.7.3. The Contractor waives, for itself, its subcontractors and suppliers the compensability of the presence of utilities, delay in their relocation and any cost to the Contractor, its subcontractors and suppliers in any claim or action arising out of or in relation to the work under the contract.

The Contractor shall be solely responsible and liable for incidental and consequential damage to any utility facilities or interruption of the service caused by it or its subcontractors operation. The Contractor shall hold and save harmless the Commission from damages to any utility facilities interruption of service by it or its subcontractor's operation.

In the event utility services are interrupted as a result of breakage within the project limits, the Contractor is to notify the appropriate utility authorities and cooperate with them until service has been restored.

The Contractor shall call Missouri One Call System prior to start of construction. Missouri One Call can be reached at 1-800-DIG-RITE (800-344-7483). A copy of all correspondence between the Contractor and Missouri One Call System shall be forwarded to Christian County.

8. UTILITY CONFLICTS

The Contractor shall make every effort to locate all underground pipe lines and conduits by contacting owners of underground utilities, by prospecting, or otherwise, in advance of trench excavation operations. Certain pipelines, water mains, propane gas, petroleum lines, telephone cables, power lines, cable television, and other existing underground and above ground installations and structures in the vicinity of the work to be done hereunder are indicated on the plans according to the best information made available to the Christian County and the Owner. Neither the Christian County nor the Owner guarantees the accuracy of such information, however.

Connections from the mains to the houses or businesses for sanitary sewers, water and gas services, and other utility lines are not indicated on the plans. Any conflict with these service lines from the house to the main, not specified as part of the utilities relocations, will be the responsibility of the Contractor to either relocate or work around at no cost to the project.

Any delay or extra cost to the Contractor caused by utilities or pipe lines or other underground structures or obstructions not shown by the plans or found in locations different than those indicated shall not constitute a claim for extra work, additional payment, or damages.

The Contractor will be solely responsible for any or all damages whether direct, indirect or consequential to underground or above ground utilities and pipelines and the surroundings and shall indemnify and hold harmless the Owner and Christian County for any and all claims, or judgments whenever made as a result of his actions.

9. CONSTRUCTION STAKES, LINES AND GRADES

Construction stakes, lines and grades shall be in accordance with Missouri Standard Specifications for Highway Construction Section 105.8 and set by contractor.

This initial construction layout staking shall consist of the following items being staked:

- Temporary Easement
- Right of Way
- Stationing and Offsets for Roadway
- Fill Face of the Proposed Structure

The Contractor shall make whatever additional measurements and alignments he may find necessary or convenient to enable him to construct each element of the work in the correct position to correspond to the information shown on the plans and given by Christian County during the progress of the work. Elevations shown on the plans and referred to in the specifications are based on benchmarks shown. The Contractor shall employ competent personnel for making position, gradient and alignment determinations and measurements.

10. INSPECTION OF WORK

Inspection of Work shall be in accordance with Missouri Standard Specifications for Highway Construction Section 105.10 and shall be modified to include the following:

Inspections and job control tests will generally be made by Christian County and/or the Engineer of Record on the following items of work. It shall be the responsibility of the Contractor to notify Christian County 24 hours preceding any operations which affects the following items:

- Initial Layout
- Removal of Existing Structure
- Utility Relocation
- Trench Excavation
- Footing Excavation
- All Asphalt Operations
- Embankment Fill and Compaction
- Rock Blanket Placement
- Precast Wall Placement
- Seeding and Mulching

If any operation which affects the above mentioned items is to be performed on a Monday, notification must be made to Christian County by 12:00 p.m. (noon) of the preceding Friday. If any operation which affects the above mentioned items is to be performed on a Saturday or Sunday, notification must be made to the Christian County by 3:00 p.m. of the preceding Thursday. The lack of observation or inspection by the Christian County or Christian County shall not relieve the Contractor of the responsibility to construct the project in accordance with the plans and specifications. Any work that is performed or materials used without authorization by the Christian County may be ordered removed and replaced at Contractors Expense. Failure to notify Christian County as stated above will result in one of the following actions:

Removal of Work
Work Stoppage
No Payment made for that Item
Partial Payment being made for that Item.

The Contractor shall further notify Christian County of the timeframe during which he intends to perform the work being tested. From the time that the Contractor requests that Christian County or his appointed representative be on-site, the Contractor shall have a 2 (two) hour window during which to begin the task being observed / tested. If the Contractor is not able to begin the work within this 2 (two) hour window, the additional time that Christian County or his representative is on-site due to the delay in beginning the work shall be reimbursed to the Owner by reducing the Contractor's pay request in an amount equal to the Owner's cost.

11. UNAUTHORIZED AND DEFECTIVE WORK

All construction and materials which have been rejected or declared unsatisfactory shall be remedied or removed and replaced in a manner acceptable to Christian County by the Contractor at the Contractor's expense. It shall be the Contractor's responsibility to properly dispose of rejected material in a manner acceptable to the Christian County. All expense incurred by the owner due to corrections, or removal and replacement of rejected construction materials shall be borne by the Contractor. Upon failure of the Contractor to remedy or remove and properly dispose of rejected materials or work, or to replace them immediately after receiving written notice from Christian County, the Owner may employ labor to rectify the work, and the cost of rectification will be deducted from any payment due or which may become due to the Contractor. All decisions regarding rejection and remedied construction or materials shall be the final decision of the Christian County. All expenses including labor time incurred by Christian County will be billed to the Contractor at Standard Billing Rates for the Project. Failure by Contractor to follow Christian County's direction regarding unauthorized or defective work will result in a work stoppage.

Please refer to Missouri Department of Transportation State Standard Specifications 105.1.1 for Authority of Christian County regarding Defective work.

12. CONTROVERSIES AND CLAIMS FOR ADJUSTMENT

If any conditions arise which in the Contractor's opinion will require him to make any claims or demands for extra or additional compensation above that fixed by the Contract, or on which he contemplates bringing claims for such extra compensation, he shall promptly and before incurring any expense, notify in writing the Christian County of the conditions and circumstances and that he proposes to make such claims. The Contractor agrees that any claims made without such advance notice, and not presented in such manner as to enable Christian County to observe conditions as they occur and to verify expenses as they occur and to determine with certainty the correctness of such claims and of the expenses involved, are waived and shall be null and void. No extra compensation shall be awarded in any event without prior written approval from the Owner. The Contractor shall have a maximum of ten (10%) markup on materials and subcontractors for overhead, profit and coordination. Christian County reserves the right to request documentation of materials and subcontractor costs from the Contractor and/or any subcontractors.

If any conditions arise which in the Contractor's opinion will require him to make any claims or demands for extra or additional completion time above that fixed by the contract, he shall notify in writing the Christian County of the conditions and circumstances and that he proposes to make such claims within one (1) calendar day of the delay. The Contractor agrees that any claims made without such notice, and not presented in such manner as to enable the Christian County to observe conditions as they occur and to verify delays as they occur and to determine with certainty the correctness of such claims and of the delay involved, are waived and shall be null and void. No extra completion time shall be awarded in any event without written approval by the Owner and Christian County within five (5) days of the occurrence.

All written request from Contractor must be made in a professional manner, personal attacks, slander, or derogatory or threatening tone will be automatically rejected. All written request from Contractor shall contain in the title the County, Bridge No. and Federal Project No. In addition, all written request must be signed by the Contractor.

13. SITE CONDITIONS

The Contractor shall view the site of the work and make his own determination of the conditions to be encountered in accomplishing the work. The submission of a bid shall be considered proof that the bidder has made his own examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the plans and specifications.

14. SAMPLES, TESTS, AND CERTIFICATION

The Contractor shall submit certifications and substantiating test reports, furnished by the supplier or fabricator for all materials incorporated into the work, certifying that material and manufacturing procedures conform to the specifications. All sampling and testing required by the specifications shall be performed by the supplier in accordance with these specifications, and the results shall be signed, sealed and stamped according to laws related to professional engineers. There shall be no direct charge to the Owner 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.

All submittals for samples, tests, and certification shall bear the name and address of the Contractor and supplier; the name of the project, including Federal Project Number and the specification reference for the material being submitted. Submittals not bearing this information will be rejected and returned without further review.

The testing laboratory to be used shall be subject to the approval of the Christian County. The name of the testing laboratory shall be submitted to the Christian County at least 10 calendar days prior to any testing.

The Contractor shall require his suppliers to provide the following testing and material certifications:

Plant mix bituminous base and plant mix bituminous surface: Name of supplier, source of materials used in the mix, mix design to be used, and supplier's certification.

Precast Wall: Name of source and supplier and supplier's certification.

Tests and sampling shall be done in accordance with the Specifications, General Special Provisions or Job Special Provision. Three copies of all test reports and certifications shall be submitted to the Christian County for review. The Christian County reserves the right to waive certain tests or to require additional tests should job conditions or workmanship warrant. Such additional tests will be provided at the Contractor's expense except as otherwise provided for in Defective Work.

If material is rejected for whatever reason, the Contractor shall pay for all retesting until a suitable material is found.

The Contractor will notify Christian County and Christian County in advance of work requiring field inspection or testing in accordance with the section entitled "Inspection of Work" of these Job Special Provision Sections.

Unless otherwise specified, all materials shall be subject to visual inspection and job control tests, as determined by the Christian County, and shall be certified by the material supplier that the material supplied conforms to the requirements of these specifications. All certifications shall make reference to the specific project name, Federal Project Number and shall contain the supplier's name and address.

15. PERMITS, EASEMENTS, AND RIGHT-OF-WAY

Unless specifically stated otherwise, the easements and rights-of-way for the construction will be provided by the Owner. The Contractor shall confine his construction operations to the immediate vicinity of the location shown on the plans and shall use due care so as to cause the least possible damage to property. All work shall be completed within the right-of-way and easements.

All licenses, permits, certificates, etc., required for and in connection with the work to be performed under the provisions of these contract documents shall be secured by the Contractor entirely at his own expense.

The Contractor shall not park, store materials, or equipment, etc. off of the right-of-way or temporary construction easement without written permission from the property owner. A copy of such written permission shall be given to Christian County. The Contractor shall be fully responsible for any damages to property. The Contractor shall use caution when working in the temporary easement area so as not to unnecessarily damage any existing features on the properties. At the completion of the project, areas of temporary easement shall be restored to a condition equivalent to prior to construction and a release signed by the property owners.

16. TRAFFIC CONTROL PROVISIONS

Work Zone Traffic Management shall be in accordance with appropriate portions of Division 100 and Division 600 of the Missouri Standard Specifications for Highway Construction 2018, and specifically as follows:

All signing and barricades shall conform to the current edition of the Manual on Traffic Control Devices published by the Federal Highway Administration, including any revisions thereto. Where Type III barricades are required, they shall be an 8-foot minimum rather than the 2-foot minimum shown in the Traffic Control Manual.

Traffic control devices shall be set up prior to the start of construction and construction shall not begin until the signing and barricading has been reviewed by Christian County. All traffic control devices shall be properly maintained for the project duration. They shall remain in place only as long as they are needed and shall be removed immediately thereafter. When

operations are performed in stages, there shall be in place only those devices that apply to the conditions present during the stage in progress.

Signs that do not apply to conditions present shall be removed, covered, or turned so as not to be readable by oncoming traffic. Contractor shall be responsible for providing and maintaining all traffic control devices and flag-persons as necessary to protect the work area and safeguard and direct traffic around the work.

The traffic control provisions called for on the Traffic Control Plans are the minimum requirements for traffic control and the Contractor shall implement additional measures as deemed appropriate by the Christian County. Cost of all traffic control measures used, including but not limited to flag-persons, channelizer barrels, cones, barricades, flashers, and temporary striping requirements shall be considered covered by the contract amount for the pay items, "traffic control." Upon failure of the Contractor to comply with any traffic control directive given by Christian County, the Owner shall have the authority to cause said conditions to be corrected and to deduct the associated cost from any payment due, or which may become due, the Contractor.

The Contractor shall not begin a phase of the project that will detour or close the roadway to traffic until the Contractor has all materials necessary for that phase of the work delivered to the site or readily available to him, all necessary equipment and manpower readily available, and is prepared to perform the work with due diligence, so as not to impede traffic for an unnecessary amount of time.

The Contractor shall submit any variations or different concepts for the Traffic Control Plans to Christian County in writing and drawing format. The variations will only be allowed if approved by Christian County in writing. Failure to maintain the traffic management plan shall be grounds for Christian County to issue a stop work order. No further work will be allowed on site until all requirements of the traffic management plan as shown in the plans are in place. The time that work is stopped will not be a basis for extension of the day count. The days for which work is stopped will count toward the days called for in the contract.



CORNERSTONE
WALL SOLUTIONS, INC.

MagnumStone™ Specifications
Geogrid Reinforced



SPECIFICATION FOR MAGNUMSTONE™ GEOGRID REINFORCED Mechanically Stabilized Earth (MSE) SYSTEM

PART 1: GENERAL

1.01 Description

The work consists of supplying and installing all aspects of the MagnumStone™ Precast Mechanically Stabilized Earth (MSE) units as specified in the construction drawings or as established by the Owner, Architect or Engineer.

1.02 Related Work

- A. Section 02100 Site Preparation
- B. Section 02200 Earthwork
- C. Section 02070 Geosynthetic Reinforcement Walls
- D. Section 02832 MSE Walls
- E. Section 01270 Unit Prices

1.03 Reference Standards

- A. Engineering Design
 - AASHTO M288 Geotextile Specification for Highway Applications
 - AASHTO Standard Specifications for Highway Bridges
 - ASTM C 140 Sample & Testing Concrete Masonry Units
 - ASTM C 1262 Evaluation the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units
 - ASTM C 1372 Standard Specification for Mechanically Stabilized Earth (MSE) Units
- B. Geosynthetic Reinforcement
 - ASTM D 4595 Tensile Properties of Geosynthetics by the Wide Width Strip Method
 - ASTM D 5262 Evaluating the Unconfined Creep of Geosynthetics
 - ASTM D 6638 Grid Connection Strength (MSEU-1)
 - ASTM D 6916 Grid Shear Strength (MSEU-2)
 - GRI GG 1 Single Rib Geogrid Tensile Strength
 - GRI GG 4 Determination of Long Term Design Strength of Geogrids
 - GRI GG 5 Determination of Geogrid (soil) Pullout
 - GRI GG 6 Determination of Geotextile (soil) Pullout
- C. Soils
 - ASTM D 698 Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort
 - ASTM D 422 Gradation Analysis of Soil Particles
 - ASTM D 4318 Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
 - ASTM D 51 Testing Methods for Measuring pH of Soil
 - ASTM D 2487 Standard Classification of Soils (Unified Soil Classification System)
- D. Drainage Pipe
 - ASTM D 3034 Specification for Type PSM Polyvinyl Chloride (PVC) pipe

- ASTM D 1248 Corrugated Plastic Pipe
- The Owner or Owner's Representative shall determine the final application if the specifications and reference documents conflict.

1.04 Design Submittals

- A. Material installation and description data should be submitted for each product specified
- B. The MSE designs and drawings should include geosynthetic layout, bottom and top of wall elevation, drainage details and any other unique applications.
- C. Design Method and Calculations should be in accordance with the AASHTO Standard Specifications for Highways. Global stability analysis should be calculated as part of the final design.
- D. Samples of the MSE units, color and texture should be submitted as per design specifications. Geosynthetic sample should also be furnished as per design.
- E. All test reports should be in accordance with ASTM C 140 and performed by an independent laboratory.
 - a. Delivery, Storage and Handling
- F. The Contractor shall inspect all materials delivered to the site to ensure proper type and grade of materials have been received as per the project specifications.
- G. The Contractor shall ensure proper storage, handling and protection from damage of the materials. Damaged materials shall not be used in the construction of the Mechanically Stabilized Earth.
- H. The Contractor shall prevent excessive mud, wet concrete, and like materials from coming in contact with the wall materials.

PART 2: MATERIALS

2.01 Concrete Mechanically Stabilized Earth (MSE) units

- A. MSE concrete units shall be MagnumStone™ units as manufactured by licensed _____ producer in accordance with NPCA, ASTM or AASHTO standards and conform as per project engineer specifications.
- B. MagnumStone™ units shall have a minimum 28 days compressive of equal to 25 MPA (or greater if specified) and a maximum absorption of 5 pcf (or less if specified) (ASTM C 140). Final compressive strength shall be 40 MPA min average for 3 units. (Suggested air content of 5 +_ 1 % with slump 50 +- 20 mm)
- C. Color for the MagnumStone™ units shall be _____
- D. ASTM C 1262 shall be standard for areas subject to many freeze-thaw cycles.
- E. The maximum water absorption shall be less than 5% and the height dimensions from front to back plus or minus 1/8th of an inch and end to end will not vary more than plus or minus 1/4 of an inch over 4 feet. All other specifications must meet the ASTM C 1372.
- F. The MagnumStone™ 2-4 units shall have a face area of 8 sq ft (.75 sq m) and MagnumStone™ 1-4 units shall have a face area of 4 sq ft (.37.5 sq m)
- G. The MagnumStone™ unit weight shall be approximately +-1400 lbs with a combined unit/gravel infill of +-800 lbs.
- H. The MagnumStone™ units shall be sound and free of cracks, chips or other defects that may prevent the contractor from properly installing the wall units or reduce the long term strength of the wall structure.
- I. MagnumStone™ capping units shall be a regular unit with 8 inches of the back of the unit removed to allow for soil materials placed over the hollow units and up against the back of the front face.
- J. Concrete sample in accordance with AASHTO T-141, Compression test in accordance with AASHTO T-23 and AASHTO T-22, Air content testing in accordance with AASHTO T-152 or AASHTO T-196, Slump test in accordance with AASHTO T-119, 28 day testing in accordance with AASHTO T-23 and AASHTO T-22 or as specified by the project engineer.

- K. Reinforcing Mesh – Reinforcing mesh (if required) shall be shop-fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A-82 (AASHTO M-32) and shall be welded into the finished mesh fabric in accordance with ASTM A-185 (AASHTO M-55). Galvanization shall be applied after the mesh is fabricated and conform to the minimum requirements of ASTM A-123 (AASHTO M-111). Connector bars shall be fabricated of cold drawn steel wire conforming to the requirements of ASTM A-82 (AASHTO M-32) and galvanized in accordance with ASTM A-123 (AASHTO M-111).
- L. Electrochemical Requirements if applicable will follow the AASHTO specifications.

2.02 Geosynthetic Reinforcements

- A. Geosynthetic reinforcements shall be high tensile Geogrid or Geotextile manufactured for soil reinforcement applications.
- B. The construction design and drawings shall show the type, strength and location of the geosynthetics. Manufacturers specifications shall be used for test data and installation procedures.
- C. Geosynthetics shall be evaluated in accordance with the AASHTO specifications.

2.03 Foundation Soil

- A. The foundation soils shall be undisturbed native site soils.
- B. The foundation soils shall be inspected and tested by an engineer before installing base leveling gravel.
- C. Disturbed or unsuitable foundation soils shall be properly compacted or replaced with expectable soils as specified by the engineer.

2.04 Backfill Soil

- A. Backfill soils shall be free of organic materials and other unsuitable materials.
- B. Soils classified as GP, GW, SP, SW, or SM types and accordance with ASTM D 2487 are suitable. All soils shall be approved by the engineer.
- C. The plasticity of the backfill soils shall have fine fraction of less than 20.

2.05 Base Leveling Materials

- A. The base leveling gravel shall be well graded compacted gravel (GW)
- B. Unreinforced concrete base leveling pad can also be used if specified.
- C. AASHTO specifications will be followed when constructing concrete footing for DOT projects.

2.06 Drainage and Unit Infill Aggregate

- A. Drainage Aggregate shall be clean crushed gravel meeting the gradation in accordance with ASTM D 448.
- B. Drainage Aggregates shall be placed in all unit voids and 6” to 12” behind the wall units with uniform particle size less than 1” (25mm) and not more than 5% passing through the No. 200 sieve.

2.07 Drainage Pipe

- A. Drainage pipe shall be perforated PVC or corrugated HDPE pipe with a minimum size of 4” in diameter.
- B. Geotextiles wrap around the drainage pipe shall be used as specified by the engineer if required.
- C. Drainage pipe shall be manufactured in accordance with ASTM D 3034 and/or ASTM D 1248.

- 2.08 Geotextile Fabric
- A. The Geotextiles shall be non-woven as specified by the specifications and construction drawings.
 - B. The Geotextiles when used as a soil separator shall be permeable allowing water to effectively pass through the fabric openings.

2.09 AASHTO

When constructing DOT projects all AASHTO and ASTM specifications should be followed unless otherwise specified by the engineer.

PART 3 WALL DESIGN

3.01 Design Standard

- A. The wall design engineer and/or geotechnical engineer shall consider the internal, local stability, external stability, bearing capacity and global stability of the soil mass above, behind and below the wall structure.
- B. Geosynthetic reinforcement vertical spacing shall not exceed 4 feet or 2 units.
- C. Geosynthetic reinforcement shall be 100% horizontal coverage parallel to the length of the wall unless specified by the engineer.
- D. The MagnumStone™ wall system shall be designed in accordance to the Design Manual for Mechanically Stabilized Earths, in accordance to AASHTO. The minimum factors of safety shall be (or greater if specified by engineer)

External Stability; Base Sliding = 1.5, Overturning = 2.0, Bearing Capacity = 2.0, Global Stability = 1.3

Internal Stability; Tensile Overstress = 1.0, Pullout = 1.5, Internal Sliding = 1.5

Local Stability; Facing Shear = 1.5, Connection = 1.5

3.02 Soil Standards

- A. The following soil design parameters shall be used (or specified by engineer)
- B. **Drainage/Unit Fill;** Soil Unit Weight = _____ lb/cub ft (KN/cub m), Friction Angle = _____ degree, Cohesion = _____ lbs/sq ft (0 kPa)
- C. **Reinforced Backfill;** Soil Unit Weight = _____ lb/cub ft (KN/cub m), Friction Angle = _____ degree, Cohesion = _____ lbs/sq ft (0 kPa)
- D. **Base Leveling Pad;** Soil Unit Weight = _____ lb/cub ft (KN/cub m), Friction Angle = _____ degree, Cohesion = _____ lb/sq ft (0 kPa)

3.03 Project Design

- A. The site grades and information will determine the length, height and overall elevations for the MagnumStone™ retaining wall requirements.
- B. The design height (H) shall be measured from the top of the base leveling pad to the top of the wall cap units.
- C. The above and below slopes of the wall details will be on the site construction drawings.
- D. The minimum embedment depth of the wall shall be no less than 1/2 unit (12”) or H/10 or as specified by the site construction drawings.
- E. Geosynthetic minimum length shall not be less than 60% of the height of the wall (H/.6).

PART 4 CONSTRUCTION

4.01 Qualifications

Contractor and site supervisor shall have proven qualified experience to complete the installation of the Mechanically Stabilized Earth system.

4.02 Excavation

- A. The contractor shall excavate to the lines and grades shown on the project grading plans.
- B. Back excavated cut shall be notched benches of 5 feet vertical for every 2 feet horizontal bench or as per the engineers specifications.
- C. Over excavated or filled areas shall be well compacted and inspected by an engineer.
- D. Excavated materials that are used for backfilling reinforcement zone shall be protected from the weather.
- E. All organic or other non gravel materials shall not be used in the backfilled reinforcement zone.

4.03 Foundation Preparation

- A. Foundation trench shall be excavated to the dimensions indicated on the construction drawings.
- B. The reinforced zone and leveling pad foundation soil shall be examined by the on site engineer to ensure proper bearing strength.
- C. Soils not meeting required strength shall be removed and replaced with proper materials.
- D. Foundation materials shall be compacted to a minimum of 95% Standard Proctor dry density or greater, before placing leveling pad. (ASTM D 698)

4.04 Base Leveling Pad

- A. Granular aggregate materials, minimum 6 inches thick and 2 (48") times the width of the wall unit, shall be placed and compacted to a minimum of 95% Standard Proctor dry density or greater. (a un-reinforced concrete pad may be used)
- B. The base leveling pad shall be level horizontally and back to front to ensure the first course of units are level.
- C. Top of base leveling pad elevation and installation of granular materials shall be in accordance of the specifications and construction drawings. The toe of the wall burial depth shall be constructed as shown on the construction drawings.
- D. A concrete reinforced footing should be placed below the frost level and constructed in accordance to the specification and construction drawings.

4.05 Units Installation

- A. The first course of MagnumStone™ units shall be carefully placed on a well graded gravel or concrete leveling pad.
- B. The first row of units shall be level form unit to unit and from back to front.
- C. A string line can be used to align a straight wall or PVC flex pipes can be used to establish smooth convex or concave curved walls.
- D. Use the smooth back of the units for alignment and measuring to ensure smooth curves and straight walls.
- E. The second course of units shall have the concrete connecting lugs in the unit voids of the first course below and pulled forward resting the lugs against the front edge of the 2 lower unit voids.
- F. All units shall be laid snugly together and parallel to the straight or curved lines.
- G. The MagnumStone™ units shall be swept clean of all dirt or rocks before installing the next layer of units or placing the geosynthetics.
- H. After laying each course, perform a visual or string line straightness check.

Drainage Gravel

- A. MagnumStone™ unit voids and the drainage chimney 6 to 12 inches behind the wall shall be filled with a free-draining granular material, such as ¾" clear rock (clean gravel).
- B. Clear gravel (clean gravel) shall be placed into the unit voids and behind the wall each course before placing the geosynthetic reinforcement layer.
- C. Clear gravel (clean gravel) does not need any mechanical compaction.

4.06 Backfill

- A. The reinforced backfill materials shall be placed in maximum lifts of 12" and shall be compacted to a minimum 95% Standard Proctor density or greater, in accordance with ASTM D 698
- B. Only hand-operated compaction equipment shall be used within 2 feet of the back of the wall.
- C. Soil density testing shall not be taken within the 2 foot area.
- D. The backfill shall be smooth and level so that the geosynthetic lays flat with no dips or bumps.
- E. The toe of the wall shall be filled and compacted as the wall is being constructed.

4.07 Cap Installation

- A. The MagnumStone™ full size cap units should be placed in the same installation procedures as the regular MagnumStone™ units.
- B. Geotextiles should be used as a soil separator between the final layer of backfill and drainage materials and the top soil materials to prevent fines from migrating into the drainage gravel or through the wall face.
- C. A special MagnumStone™ 6" high cap can be used to complete the top of the wall. Concrete adhesive should be used to glue the cap units to the regular units.

PART 5 CONSTRUCTION QUALITY CONTROL AND ASSURANCE

5.01 Construction Quality Control

- A. The wall project installer is responsible to ensure that all installation and materials meet the quality specified in the construction drawings.
- B. A qualified independent party will be responsible to verify that installation procedures have been installed in accordance with the specifications and construction drawings.
- C. All site construction tolerances for vertical alignment, horizontal locations for elevations, corner and radius locations, wall batter and minimum bulging will be with in AASHTO specifications.

5.02 Quality Assurance

- A. The owner is responsible to engage testing and inspection services to provide independent quality construction assurance.
- B. Compaction testing of the reinforcement backfill soils shall be performed every 2 vertical feet of material installation.
- C. The tests shall be done a minimum of every 50 lineal feet along the wall at each level of testing.
- D. Testing shall not be closer than 3 feet from the back of the wall and done at a variety of locations to cover the entire reinforced soil zone.
- E. Independent inspection professionals shall ensure all parameters and construction specifications have been followed in accordance to the design drawings and specifications.

PART 6 PAYMENT

6.01 Payment for the installation of the MagnumStone™ wall shall be based on the unit price per square face foot (square face meter) of wall product installed. The shipping and delivery slips shall be verified by both Contractor and Owner or Owner representative at the time of product delivery to the site and this will be the bases of the final count or product used.

GEOSYNTHETIC SOIL REINFORCEMENT

PART 1 GENERAL

1.01 Description

The work consists of supplying and installing geosynthetic reinforcements and the reinforcement backfill zone as specified in the construction drawings or as established by the Owner, Architect or Engineer.

1.02 Related Work

- A. Section 02832 Mechanically Stabilized Earth Retaining Wall
- B. Section 02200 Site Preparation
- D. Section 02300 Earthwork
- E. Section 02070 Geosynthetic Reinforcement Walls

1.03 Reference Standard Geosynthetic Reinforcement

- A. ASTM D 4595 Tensile Properties of Geosynthetics
- B. ASTM D 5262 Evaluating the Unconfined Creep of the Geosynthetics
- C. GGI GG -1 Single Rib Geosynthetic Tensile Strength
- D. GGI GG -5 Geogrid Pullout
- E. GGI GG -6 Geotextile Pullout

1.04 Reference Standards for Soils

- A. ASTM D 698 Moisture Density Relationship for Soils
- B. ASTM D 422 Gradation of Soils
- C. ASTM D 424 Atterberg limits of Soils
- D. ASTM D G51 Soil Ph

1.05 Delivery, Storage and Handling

- A. The Contractor shall inspect all geosynthetic products delivered to the site to ensure for the proper type and strength.
- B. Geosynthetics shall be stored in accordance with the manufactures specifications.
- C. Geosynthetics shall be protected from the weather and any other conditions that could damage the material.

PART 2 MATERIALS

2.01 Geosynthetic Products

- A. Geogrid products specifically produced for the use of soil reinforcement and consisting of high-density polyethylene or polypropylene.
- B. Geotextiles are woven fabrics produced for the use of soil reinforcement.
- C. The manufactured specifications shall be used for test data and installation procedures.
- D. Approved Geosynthetics as per MagnumStone™ specification and approved testing.
- E. All products shall be approved by the site Engineer.

PART 3 CONSTRUCTION

3.01 Qualification

Refer to Section 02832 Mechanically Stabilized Earth Wall

3.02 Excavation

Refer to Section 02832 Mechanically Stabilized Earth Wall

3.03 Foundation Preparation

Refer to Section 02832 Mechanically Stabilized Earth Wall

3.04 Leveling Pad

Refer to Section 02832 Mechanically Stabilized Earth Wall

3.05 Unit Installation

Refer to Section 02832 Mechanically Stabilized Earth Wall

3.06 Installation of Geosynthetics Reinforcement

- A. The construction plans shall show the type, strength and location of the geosynthetics.
- B. Manufacturer's specifications shall be used for test data and installation procedures.
- C. The geosynthetics shall be cut to the correct length and laid in the orientation as specified by the manufacturer.
- D. The MagnumStone™ unit voids, drainage chimney and backfill zone are filled, compacted and leveled correctly before placing the geosynthetics.
- E. Ensure that the drainage materials directly behind the wall units are flush or slightly higher than the top of the units so that the geosynthetics will not be sheared on the back of the unit's sharp edge.
- F. The units shall be swept clean of all dirt or rocks before placing the geosynthetics.
- G. Shimming of units shall not be allowed on the geosynthetic layers.
- H. The geosynthetics shall be placed as far forward on the MagnumStone™ units as possible without revealing materials on the face of the wall.
- I. Loosely lay geosynthetics toward the back of the compacted backfill zone.
- J. Gently pull the geosynthetics toward the back of the compacted backfill zone after placing the next row of MagnumStone™ units on top of the geosynthetics and on top of the lower units.
- K. Use stakes or gravel materials to maintain tension on the geosynthetics. Excessive tension may alter the alignment of the wall units.

3.07 Backfill

- A. Contractor shall not drive equipment directly on the exposed geosynthetics.
- B. Backfill the reinforced zone by placing materials from the back of the wall towards the end of the geosynthetics in order to maintain tension on the reinforcement.
- C. Contractor shall leave 12" trench between the back of the wall and backfill materials to allow for drainage clean gravel drainage materials. This process will prevent undue soil pressures that could rotate the MagnumStone™ units forward and reduce the set back of the wall while compacting the backfill materials.
- D. Once the MagnumStone™ units, geosynthetics and backfill materials have been placed, fill the unit voids and the drainage chimney with clear rock.
- E. Continue the construction of the wall based on the previously outlined steps placing and compacting soils as specified.
- F. When completing the final layer of backfill materials and drainage gravel, and before placing the planting soil, place a layer of geosynthetic soil separation fabric. The fabric shall be placed no less than 4 feet behind the wall and up the back side of the wall up to the cap unit. The fabric will prevent the planting soil fines from migrating into the drainage gravel and from staining the wall face.

3.08 Cap Installation

Refer to Section 02832 Mechanically Stabilized Earth Wall



PART 4 PAYMENT

4.01 Payment for the placement of the geosynthetics shall be based on the unit price per square yard (square meter) installed or as per contract agreement.



CORNERSTONE
WALL SOLUTIONS, INC.

MagnumStone™ Specifications
Gravity

SPECIFICATION FOR MAGNUMSTONE™ GRAVITY MECHANICALLY STABILIZED EARTH SYSTEM

PART 1: GENERAL

.01 Description

The work consists of supplying and installing all aspects of the MagnumStone™ Precast Concrete Mechanically Stabilized Earth (MSE) units as specified in the construction drawings or as established by the Owner, Architect or Engineer.

.02 Related Work

- A. Section 02100 Site Preparation
- B. Section 02200 Earthwork
- C. Section 02832 Interlocking Block Retaining Walls
- D. Section 01270 Unit Prices

.03 Reference Standards

- A. Engineering Design
 - AASHTO M288 Geotextile Specification for Highway Applications
 - AASHTO Standard Specifications for Highway Bridges
 - ASTM C 140 Sample & Testing Concrete Masonry Units
 - ASTM C 1262 Evaluation the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units
 - ASTM C 1372 Standard Specification for Mechanically Stabilized Earth (MSE) Units
- B. Soils
 - ASTM D 698 Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort
 - ASTM D 422 Gradation Analysis of Soil Particles
 - ASTM D 4318 Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
 - ASTM D 51 Testing Methods for Measuring pH of Soil
 - ASTM D 2487 Standard Classification of Soils (Unified Soil Classification System)
- C. Drainage Pipe
 - ASTM D 3034 Specification for Type PSM Polyvinyl Chloride (PVC) pipe
 - ASTM D 1248 Corrugated Plastic Pipe
- D. The Owner or Owner's Representative shall determine the final application if the specifications and reference documents conflict.

.04 Design Submittals

- A. Material installation and description data should be submitted for each product specified
- B. The MSE designs and drawings should include, bottom and top of wall elevation, drainage details and any other unique applications.
- C. Design Method and Calculations should be in accordance with the AASHTO Standard Specifications for Highways. Global stability analysis should be calculated as part of the final design.
- D. Samples of the MSE units, color and texture should be submitted as per design specifications.
- E. All test reports should be in accordance with ASTM C 140 and performed by an independent laboratory.

- a. Delivery, Storage and Handling
- F. The Contractor shall inspect all materials delivered to the site to ensure proper type and grade of materials have been received as per the project specifications.
- G. The Contractor shall ensure proper storage, handling and protection from damage of the materials. Damaged materials shall not be used in the construction of the Mechanically Stabilized Earth.
- H. The Contractor shall prevent excessive mud, wet concrete, and like materials from coming in contact with the wall materials.

PART 2: MATERIALS

- .01 Concrete Mechanically Stabilized Earth (MSE) units
 - a. MSE concrete units shall be MagnumStone™ units as manufactured by licensed _____ producer in accordance with ASTM or AASHTO standards and conform to as per project engineer specifications.
 - b. MagnumStone™ units shall have a minimum 28 days compressive of equal to 25 MPA (or greater if specified) and a maximum absorption of 5 pcf (or less if specified) (ASTM C 140). Final compressive strength shall be 40 MPA min average for 3 units. (Suggested air content of 5 +_ 1 % with slump 50 +- 20 mm)
 - c. Color for the MagnumStone™ units shall be _____
 - d. ASTM C 1262 shall be standard for areas subject to many freeze-thaw cycles.
 - e. The maximum water absorption shall be less than 5% and the height dimensions from front to back plus or minus 1/8th of an inch and end to end will not vary more than plus or minus 1/4 of an inch over 4 feet. All other specifications must meet the ASTM C 1372.
 - f. The MagnumStone™ 2-4 units shall have a face area of 8 sq ft (.75 sq m) and MagnumStone™ 1-4 units shall have a face area of 4 sq ft (.37.5 sq m)
 - g. The MagnumStone™ unit weight shall be approximately +-1400 lbs with a combined unit/gravel infill of +-800 lbs.
 - h. The MagnumStone™ units shall be sound and free of cracks, chips or other defects that may prevent the contractor from properly installing the wall units or reduce the long term strength of the wall structure.
 - i. MagnumStone™ capping units shall be a regular unit with 8 inches of the back of the unit removed to allow for soil materials placed over the hollow units and up against the back of the front face.
 - j. Concrete sample in accordance with AASHTO T-141, Compression test in accordance with AASHTO T-23 and AASHTO T-22, Air content testing in accordance with AASHTO T-152 or AASHTO T-196, Slump test in accordance with AASHTO T-119, 28 day testing in accordance with AASHTO T-23 and AASHTO T-22 or as specified by the project engineer.
 - k. Reinforcing Mesh – Reinforcing mesh (if required) shall be shop-fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A-82 (AASHTO M-32) and shall be welded into the finished mesh fabric in accordance with ASTM A-185 (ASSHTO M-55). Galvanization shall be applied after the mesh is fabricated and conform to the minimum requirements of ASTM A-123 (AASHTO M-111). Connector bars shall be fabricated of cold drawn steel wire conforming to the requirements of ASTM A-82 (AASHTO M-32) and galvanized in accordance with ASTM A-123 (AASHTO M-111).
 - l. Electrochemical Requirements if applicable will follow the AASHTO specifications.
- .02 Foundation Soil
 - A. The foundation soils shall be undisturbed native site soils.
 - B. The foundation soils shall be inspected and tested by an engineer before installing base leveling gravel.
 - C. Disturbed or unsuitable foundation soils shall be properly compacted or replaced with expectable soils as specified by the engineer.
- .03 Backfill Soil

- A. Backfill soils shall be free of organic materials and other unsuitable materials.
 - B. Soils classified as GP, GW, SP, SW, or SM types and accordance with ASTM D 2487 are suitable. All soils shall be approved by the engineer.
 - C. The plasticity of the backfill soils shall have fine fraction of less than 20.
- .04 Base Leveling Materials
- A. The base leveling gravel shall be well graded compacted gravel (GW)
 - B. Unreinforced concrete base leveling pad can also be used if specified.
 - C. AASHTO specifications will be followed when constructing concrete footing for DOT projects.
- .05 Drainage and Unit Infill Aggregate
- A. Drainage Aggregate shall be clean crushed gravel meeting the gradation in accordance with ASTM D 448.
 - B. Drainage Aggregates shall be placed in all unit voids and 6” to 12” behind the wall units with uniform particle size less than 1” (25mm) and not more than 5% passing through the No. 200 sieve.
- .06 Drainage Pipe
- A. Drainage pipe shall be perforated PVC or corrugated HDPE pipe with a minimum size of 4” in diameter.
 - B. Geotextiles wrap around the drainage pipe shall be used as specified by the engineer if required.
 - C. Drainage pipe shall be manufactured in accordance with ASTM D 3034 and/or ASTM D 1248.
- .07 Geotextile Fabric
- A. The Geotextiles shall be non-woven as specified by the specifications and construction drawings.
 - B. The Geotextiles when used as a soil separator shall be permeable allowing water to effectively pass through the fabric openings.
- .08 AASHTO

When constructing DOT projects all AASHTO and ASTM specifications should be followed unless otherwise specified by the engineer.

PART 3 WALL DESIGN

- .01 Design Standard
- A. The wall design engineer and/or geotechnical engineer shall consider the internal, local stability, external stability, bearing capacity and global stability of the soil mass above, behind and below the wall structure.
 - B. The MagnumStone™ wall system shall be designed in accordance to the Design Manual for Mechanically Stabilized Earths, in accordance to AASHTO. The minimum factors of safety shall be (or greater if specified by engineer)

External Stability; Base Sliding = 1.5, Overturning = 2.0, Bearing Capacity = 2.0, Global Stability = 1.3
Internal Stability; Tensile Overstress = 1.0, Pullout = 1.5, Internal Sliding = 1.5
Local Stability; Facing Shear = 1.5, Connection = 1.5

- .02 Soil Standards

- A. The following soil design parameters shall be used (or specified by engineer)
- B. **Drainage/Unit Fill;** Soil Unit Weight = _____lb/cub ft (KN/cub m), Friction Angle = ____degree, Cohesion = lbs/sq ft (0 kPa)
- C. **Reinforced Backfill;** Soil Unit Weight = _____ lb/cub ft (KN/cub m), Friction Angle = _____degree, Cohesion = _____lbs/sq ft (0 kPa)
- D. **Base Leveling Pad;** Soil Unit Weight = _____lb/cub ft (KN/cub m), Friction Angle = ____degree, Cohesion = lbs/sq ft (0 kPa)

.03 Project Design

- A. The site grades and information will determine the length, height and overall elevations for the MagnumStone™ retaining wall requirements.
- B. The design height (H) shall be measured from the top of the base leveling pad to the top of the wall cap units.
- C. The above and below slopes of the wall details will be on the site construction drawings.
- D. The minimum embedment depth of the wall shall be no less than 1/2 unit (12”) or H/10 or as specified by the site construction drawings.

PART 4 CONSTRUCTION

.01 Qualifications

Contractor and site supervisor shall have proven qualified experience to complete the installation of the Mechanically Stabilized Earth system.

.02 Excavation

- A. The contractor shall excavate to the lines and grades shown on the project grading plans.
- B. Back excavated cut shall be notched benches of 5 feet vertical for every 2 feet horizontal bench or as per the engineers specifications.
- C. Over excavated or filled areas shall be well compacted and inspected by an engineer.
- D. Excavated materials that are used for backfilling reinforcement zone shall be protected from the weather.
- E. All organic or other non gravel materials shall not be used in the backfilled reinforcement zone.

4.03 Foundation Preparation

- A. Foundation trench shall be excavated to the dimensions indicated on the construction drawings.
- B. The reinforced zone and leveling pad foundation soil shall be examined by the on site engineer to ensure proper bearing strength.
- C. Soils not meeting required strength shall be removed and replaced with proper materials.
- D. Foundation materials shall be compacted to a minimum of 95% Standard Proctor dry density or greater, before placing leveling pad. (ASTM D 698)

.04 Base Leveling Pad

- A. Granular aggregate materials, minimum 6 inches thick and 2 (48”) times the width of the wall unit, shall be placed and compacted to a minimum of 95% Standard Proctor dry density or greater. (a un-reinforced concrete pad may be used)
- B. The base leveling pad shall be level horizontally and back to front to ensure the first course of units are level.
- C. Top of base leveling pad elevation and installation of granular materials shall be in accordance of the specifications and construction drawings. The toe of the wall burial depth shall be constructed as shown on the construction drawings.

- D. A concrete reinforced footing should be placed below the frost level and constructed in accordance to the specification and construction drawings.

.05 Units Installation

- A. The first course of MagnumStone™ units shall be carefully placed on a well graded gravel or concrete leveling pad.
- B. The first row of units shall be level from unit to unit and from back to front.
- C. A string line can be used to align a straight wall or PVC flex pipes can be used to establish smooth convex or concave curved walls.
- D. Use the smooth back of the units for alignment and measuring to ensure smooth curves and straight walls.
- E. The second course of units shall have the concrete connecting lugs in the unit voids of the first course below and pulled forward resting the lugs against the front edge of the 2 lower unit voids.
- F. All units shall be laid snugly together and parallel to the straight or curved lines.
- G. The MagnumStone™ units shall be swept clean of all dirt or rocks before installing the next layer of units or placing the geosynthetics.
- H. After laying each course, perform a visual or string line straightness check.

Drainage Gravel

- A. MagnumStone™ unit voids and the drainage chimney 6 to 12 inches behind the wall shall be filled with a free-draining granular material, such as ¾" clear rock (clean gravel).
- B. Clear gravel (clean gravel) shall be placed into the unit voids and behind the wall each course.
- C. Clear gravel (clean gravel) does not need any mechanical compaction.

.06 Backfill

- A. The reinforced backfill materials shall be placed in maximum lifts of 12" and shall be compacted to a minimum 95% Standard Proctor density or greater, in accordance with ASTM D 698
- B. Only hand-operated compaction equipment shall be used within 2 feet of the back of the wall.
- C. Soil density testing shall not be taken within the 2 foot area.
- D. The toe of the wall shall be filled and compacted as the wall is being constructed.

.07 Cap Installation

- A. The MagnumStone™ full size cap units should be placed in the same installation procedures as the regular MagnumStone™ units.
- B. Geotextiles should be used as a soil separator between the final layer of backfill and drainage materials and the top soil materials to prevent fines from migrating into the drainage gravel or through the wall face.
- C. A special MagnumStone™ 6" high cap can be used to complete the top of the wall. Concrete adhesive should be used to glue the cap units to the regular units.

PART 5 CONSTRUCTION QUALITY CONTROL AND ASSURANCE

.01 Construction Quality Control

- A. The wall project installer is responsible to ensure that all installation and materials meet the quality specified in the construction drawings.
- B. A qualified independent party will be responsible to verify that installation procedures have been installed in accordance with the specifications and construction drawings.

- C. All site construction tolerances for vertical alignment, horizontal locations for elevations, corner and radius locations, wall batter and minimum bulging will be with in AASHTO specifications.

.02 Quality Assurance

- A. The owner is responsible to engage testing and inspection services to provide independent quality construction assurance.
- B. Compaction testing of the reinforcement backfill soils shall be performed every 2 vertical feet of material installation.
- C. The tests shall be done a minimum of every 50 lineal feet along the wall at each level of testing.
- D. Testing shall not be closer than 3 feet from the back of the wall and done at a variety of locations to cover the entire reinforced soil zone.
- E. Independent inspection professionals shall ensure all parameters and construction specifications have been followed in accordance to the design drawings and specifications.

PART 6 PAYMENT

- .01 Payment for the installation of the MagnumStone™ wall shall be based on the unit price per square face foot (square face meter) of wall product installed. The shipping and delivery slips shall be verified by both Contractor and Owner or Owner representative at the time of product delivery to the site and this will be the bases of the final count or product used.



CORNERSTONE
WALL SOLUTIONS, INC.

MagnumStone™ Specifications
Positive Connection

SPECIFICATION FOR MAGNUMSTONE™ POSITIVE MECHANICALLY STABILIZED EARTH SYSTEM

PART 1: GENERAL

.01 Description

The work consists of supplying and installing all aspects of the MagnumStone™ Precast Concrete Mechanically Stabilized Earth (MSE) units as specified in the construction drawings or as established by the Owner, Architect or Engineer.

.02 Related Work

- A. Section 02100 Site Preparation
- B. Section 02200 Earthwork
- C. Section 02070 Geosynthetic Reinforcement Walls
- D. Section 02832 Interlocking Block Retaining Walls
- E. Section 01270 Unit Prices

.03 Reference Standards

- A. Engineering Design
 - AASHTO M288 Geotextile Specification for Highway Applications
 - AASHTO Standard Specifications for Highway Bridges
 - ASTM C 140 Sample & Testing Concrete Masonry Units
 - ASTM C 1262 Evaluation the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units
 - ASTM C 1372 Standard Specification for Mechanically Stabilized Earth (MSE) Units
- B. Geosynthetic Reinforcement
 - ASTM D 4595 Tensile Properties of Geosynthetics by the Wide Width Strip Method
 - ASTM D 5262 Evaluating the Unconfined Creep of Geosynthetics
 - ASTM D 6638 Grid Connection Strength (NCMA MSEU-1)
 - ASTM D 6916 Grid Shear Strength (NCMA MSEU-2)
 - GRI GG 1 Single Rib Geogrid Tensile Strength
 - GRI GG 4 Determination of Long Term Design Strength of Geogrids
 - GRI GG 5 Determination of Geogrid (soil) Pullout
 - GRI GG 6 Determination of Geotextile (soil) Pullout
- C. Soils
 - ASTM D 698 Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort
 - ASTM D 422 Gradation Analysis of Soil Particles
 - ASTM D 4318 Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
 - ASTM D 51 Testing Methods for Measuring pH of Soil
 - ASTM D 2487 Standard Classification of Soils (Unified Soil Classification System)
- D. Drainage Pipe
 - ASTM D 3034 Specification for Type PSM Polyvinyl Chloride (PVC) pipe
 - ASTM D 1248 Corrugated Plastic Pipe

- E. The Owner or Owner's Representative shall determine the final application if the specifications and reference documents conflict.
- .04 Design Submittals
- A. Material installation and description data should be submitted for each product specified
 - B. The MSE designs and drawings should include geosynthetic layout, bottom and top of wall elevation, drainage details and any other unique applications.
 - C. Design Method and Calculations should be in accordance with the AASHTO Standard Specifications for Highways. Global stability analysis should be calculated as part of the final design.
 - D. Samples of the MSE units, color and texture should be submitted as per design specifications. Geosynthetic sample should also be furnished as per design.
 - E. All test reports should be in accordance with ASTM C 140 and performed by an independent laboratory.
 - a. Delivery, Storage and Handling
 - F. The Contractor shall inspect all materials delivered to the site to ensure proper type and grade of materials have been received as per the project specifications.
 - G. The Contractor shall ensure proper storage, handling and protection from damage of the materials. Damaged materials shall not be used in the construction of the Mechanically Stabilized Earth.
 - H. The Contractor shall prevent excessive mud, wet concrete, and like materials from coming in contact with the wall materials.

PART 2: MATERIALS

- .01 Concrete Mechanically Stabilized Earth (MSE) units
- a. MSE concrete units shall be MagnumStone™ units as manufactured by licensed _____ producer in accordance with ASTM or AASHTO standards and conform to as per project engineer specifications.
 - b. MagnumStone™ units shall have a minimum 28 days compressive of equal to 25 MPA (or greater if specified) and a maximum absorption of 5 pcf (or less if specified) (ASTM C 140). Final compressive strength shall be 40 MPA min average for 3 units. (Suggested air content of 5 +_ 1 % with slump 50 +- 20 mm)
 - c. Color for the MagnumStone™ units shall be _____
 - d. ASTM C 1262 shall be standard for areas subject to many freeze-thaw cycles.
 - e. The maximum water absorption shall be less than 5% and the height dimensions from front to back plus or minus 1/8th of an inch and end to end will not vary more than plus or minus 1/4 of an inch over 4 feet. All other specifications must meet the ASTM C 1372.
 - f. The MagnumStone™ 2-4 units shall have a face area of 8 sq ft (.75 sq m) and MagnumStone™ 1-4 units shall have a face area of 4 sq ft (.37.5 sq m)
 - g. The MagnumStone™ unit weight shall be approximately +-1400 lbs with a combined unit/gravel infill of +-800 lbs.
 - h. The MagnumStone™ units shall be sound and free of cracks, chips or other defects that may prevent the contractor from properly installing the wall units or reduce the long term strength of the wall structure.
 - i. MagnumStone™ capping units shall be a regular unit with 8 inches of the back of the unit removed to allow for soil materials placed over the hollow units and up against the back of the front face.
 - j. Concrete sample in accordance with AASHTO T-141, Compression test in accordance with AASHTO T-23 and AASHTO T-22, Air content testing in accordance with AASHTO T-152 or AASHTO T-196, Slump test in accordance with AASHTO T-119, 28 day testing in accordance with AASHTO T-23 and AASHTO T-22 or as specified by the project engineer.
 - k. Reinforcing Mesh – Reinforcing mesh (if required) shall be shop-fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A-82 (AASHTO M-32) and shall be welded into the finished mesh fabric in accordance with ASTM A-185 (ASSHTO M-55). Galvanization shall be applied after the mesh is fabricated and conform to the minimum requirements of ASTM A-123 (AASHTO M-111). Connector bars shall be

fabricated of cold drawn steel wire conforming to the requirements of ASTM A-82 (AASHTO M-32) and galvanized in accordance with ASTM A-123 (AASHTO M-111).

1. Electrochemical Requirements if applicable will follow the AASHTO specifications.
- .02 Geosynthetic Reinforcements & positive connection
- A. Geosynthetic reinforcements shall be high tensile Geogrid or Geotextile manufactured for soil reinforcement applications.
 - B. The construction design and drawings shall show the type, strength and location of the geosynthetics. Manufacturers specifications shall be used for test data and installation procedures.
 - C. Geosynthetics shall be evaluated in accordance with the AASHTO specifications.
 - D. MagnumStone™ Positive Mechanical Connection shall be installed in accordance to MagnumStone™ specifications.
- .03 Foundation Soil
- A. The foundation soils shall be undisturbed native site soils.
 - B. The foundation soils shall be inspected and tested by an engineer before installing base leveling gravel.
 - C. Disturbed or unsuitable foundation soils shall be properly compacted or replaced with expectable soils as specified by the engineer.
- .04 Backfill Soil
- A. Backfill soils shall be free of organic materials and other unsuitable materials.
 - B. Soils classified as GP, GW, SP, SW, or SM types and accordance with ASTM D 2487 are suitable. All soils shall be approved by the engineer.
 - C. The plasticity of the backfill soils shall have fine fraction of less than 20.
- .05 Base Leveling Materials
- A. The base leveling gravel shall be well graded compacted gravel (GW)
 - B. Unreinforced concrete base leveling pad can also be used if specified.
 - C. AASHTO specifications will be followed when constructing concrete footing for DOT projects.
- .06 Drainage and Unit Infill Aggregate
- A. Drainage Aggregate shall be clean crushed gravel meeting the gradation in accordance with ASTM D 448.
 - B. Drainage Aggregates shall be placed in all unit voids and 6” to 12” behind the wall units with uniform particle size less than 1” (25mm) and not more than 5% passing through the No. 200 sieve.
- .07 Drainage Pipe
- A. Drainage pipe shall be perforated PVC or corrugated HDPE pipe with a minimum size of 4” in diameter.
 - B. Geotextiles wrap around the drainage pipe shall be used as specified by the engineer if required.
 - C. Drainage pipe shall be manufactured in accordance with ASTM D 3034 and/or ASTM D 1248.
- .08 Geotextile Fabric
- A. The Geotextiles shall be non-woven as specified by the specifications and construction drawings.
 - B. The Geotextiles when used as a soil separator shall be permeable allowing water to effectively pass through the fabric openings.

.09 AASHTO

When constructing DOT projects all AASHTO and ASTM specifications should be followed unless otherwise specified by the engineer.

PART 3 WALL DESIGN

.01 Design Standard

- A. The wall design engineer and/or geotechnical engineer shall consider the internal, local stability, external stability, bearing capacity and global stability of the soil mass above, behind and below the wall structure.
- B. Geosynthetic reinforcement vertical spacing shall not exceed 4 feet or 2 units.
- C. Geosynthetic reinforcement shall be 100% horizontal coverage parallel to the length of the wall unless specified by the engineer.
- D. The MagnumStone™ wall system shall be designed in accordance to the Design Manual for Mechanically Stabilized Earths, in accordance to AASHTO. The minimum factors of safety shall be (or greater if specified by engineer)

External Stability; Base Sliding = 1.5, Overtuning = 2.0, Bearing Capacity = 2.0, Global Stability = 1.3

Internal Stability; Tensile Overstress = 1.0, Pullout = 1.5, Internal Sliding = 1.5

Local Stability; Facing Shear = 1.5, Connection = 1.5

.02 Soil Standards

- A. The following soil design parameters shall be used (or specified by engineer)
- B. **Drainage/Unit Fill;** Soil Unit Weight = _____lb/cub ft (KN/cub m), Friction Angle = ____degree, Cohesion = lbs/sq ft (0 kPa)
- C. **Reinforced Backfill;** Soil Unit Weight = _____ lb/cub ft (KN/cub m), Friction Angle = _____degree, Cohesion = _____lbs/sq ft (0 kPa)
- D. **Base Leveling Pad;** Soil Unit Weight = _____lb/cub ft (KN/cub m), Friction Angle = ____degree, Cohesion = lb/sq ft (0 kPa)

.03 Project Design

- A. The site grades and information will determine the length, height and overall elevations for the MagnumStone™ retaining wall requirements.
- B. The design height (H) shall be measured from the top of the base leveling pad to the top of the wall cap units.
- C. The above and below slopes of the wall details will be on the site construction drawings.
- D. The minimum embedment depth of the wall shall be no less than 1/2 unit (12”) or H/10 or as specified by the site construction drawings.
- E. Geosynthetic minimum length shall not be less than 60% of the height of the wall (H/.6).

PART 4 CONSTRUCTION

.01 Qualifications

Contractor and site supervisor shall have proven qualified experience to complete the installation of the Mechanically Stabilized Earth system.

.02 Excavation

- A. The contractor shall excavate to the lines and grades shown on the project grading plans.

- B. Back excavated cut shall be notched benches of 5 feet vertical for every 2 feet horizontal bench or as per the engineers specifications.
- C. Over excavated or filled areas shall be well compacted and inspected by an engineer.
- D. Excavated materials that are used for backfilling reinforcement zone shall be protected from the weather.
- E. All organic or other non gravel materials shall not be used in the backfilled reinforcement zone.

4.03 Foundation Preparation

- A. Foundation trench shall be excavated to the dimensions indicated on the construction drawings.
- B. The reinforced zone and leveling pad foundation soil shall be examined by the on site engineer to ensure proper bearing strength.
- C. Soils not meeting required strength shall be removed and replaced with proper materials.
- D. Foundation materials shall be compacted to a minimum of 95% Standard Proctor dry density or greater, before placing leveling pad. (ASTM D 698)

.04 Base Leveling Pad

- A. Granular aggregate materials, minimum 6 inches thick and 2 (48") times the width of the wall unit, shall be placed and compacted to a minimum of 95% Standard Proctor dry density or greater. (a un-reinforced concrete pad may be used)
- B. The base leveling pad shall be level horizontally and back to front to ensure the first course of units are level.
- C. Top of base leveling pad elevation and installation of granular materials shall be in accordance of the specifications and construction drawings. The toe of the wall burial depth shall be constructed as shown on the construction drawings.
- D. A concrete reinforced footing should be placed below the frost level and constructed in accordance to the specification and construction drawings.

.05 Units Installation

- A. The first course of MagnumStone™ units shall be carefully placed on a well graded gravel or concrete leveling pad.
- B. The first row of units shall be level form unit to unit and from back to front.
- C. A string line can be used to align a straight wall or PVC flex pipes can be used to establish smooth convex or concave curved walls.
- D. Use the smooth back of the units for alignment and measuring to ensure smooth curves and straight walls.
- E. The second course of units shall have the concrete connecting lugs in the unit voids of the first course below and pulled forward resting the lugs against the front edge of the 2 lower unit voids.
- F. All units shall be laid snugly together and parallel to the straight or curved lines.
- G. The MagnumStone™ units shall be swept clean of all dirt or rocks before installing the next layer of units or placing the geosynthetics.
- H. After laying each course, perform a visual or string line straightness check.

Drainage Gravel

- A. MagnumStone™ unit voids and the drainage chimney 6 to 12 inches behind the wall shall be filled with a free-draining granular material, such as 3/4" clear rock (clean gravel).
- B. Clear gravel (clean gravel) shall be placed into the unit voids and behind the wall each course before placing the geosynthetic reinforcement layer.
- C. Clear gravel (clean gravel) does not need any mechanical compaction.

.06 Backfill

- A. The reinforced backfill materials shall be placed in maximum lifts of 12” and shall be compacted to a minimum 95% Standard Proctor density or greater, in accordance with ASTM D 698
- B. Only hand-operated compaction equipment shall be used within 2 feet of the back of the wall.
- C. Soil density testing shall not be taken within the 2 foot area.
- D. The backfill shall be smooth and level so that the geosynthetic lays flat with no dips or bumps.
- E. The toe of the wall shall be filled and compacted as the wall is being constructed.

.07 Cap Installation

- A. The MagnumStone™ full size cap units should be placed in the same installation procedures as the regular MagnumStone™ units.
- B. Geotextiles should be used as a soil separator between the final layer of backfill and drainage materials and the top soil materials to prevent fines from migrating into the drainage gravel or through the wall face.
- C. A special MagnumStone™ 6” high cap can be used to complete the top of the wall. Concrete adhesive should be used to glue the cap units to the regular units.

PART 5 CONSTRUCTION QUALITY CONTROL AND ASSURANCE

.01 Construction Quality Control

- A. The wall project installer is responsible to ensure that all installation and materials meet the quality specified in the construction drawings.
- B. A qualified independent party will be responsible to verify that installation procedures have been installed in accordance with the specifications and construction drawings.
- C. All site construction tolerances for vertical alignment, horizontal locations for elevations, corner and radius locations, wall batter and minimum bulging will be with in AASHTO specifications.

.02 Quality Assurance

- A. The owner is responsible to engage testing and inspection services to provide independent quality construction assurance.
- B. Compaction testing of the reinforcement backfill soils shall be performed every 2 vertical feet of material installation.
- C. The tests shall be done a minimum of every 50 lineal feet along the wall at each level of testing.
- D. Testing shall not be closer than 3 feet from the back of the wall and done at a variety of locations to cover the entire reinforced soil zone.
- E. Independent inspection professionals shall ensure all parameters and construction specifications have been followed in accordance to the design drawings and specifications.

PART 6 PAYMENT

- .01 Payment for the installation of the MagnumStone™ wall shall be based on the unit price per square face foot (square face meter) of wall product installed. The shipping and delivery slips shall be verified by both Contractor and Owner or Owner representative at the time of product delivery to the site and this will be the bases of the final count or product used.

GEOSYNTHETIC SOIL REINFORCEMENT

PART 1 GENERAL

.01 Description

The work consists of supplying and installing geosynthetic reinforcements and the reinforcement backfill zone as specified in the construction drawings or as established by the Owner, Architect or Engineer.

.02 Related Work

- A. Section 02832 Modular Block Retaining Wall
- B. Section 02200 Site Preparation
- C. Section 02300 Earthwork
- D. Section 02070 Geosynthetic Reinforcement Walls

.03 Reference Standard Geosynthetic Reinforcement

- A. ASTM D 4595 Tensile Properties of Geosynthetics
- B. ASTM D 5262 Evaluating the Unconfined Creep of the Geosynthetics
- C. GGI GG -1 Single Rib Geosynthetic Tensile Strength
- D. GGI GG -5 Geogrid Pullout
- E. GGI GG -6 Geotextile Pullout

.04 Reference Standards for Soils

- A. ASTM D 698 Moisture Density Relationship for Soils
- B. ASTM D 422 Gradation of Soils
- C. ASTM D 424 Atterberg limits of Soils
- D. ASTM D G51 Soil Ph

.05 Delivery, Storage and Handling

- A. The Contractor shall inspect all geosynthetic products delivered to the site to ensure for the proper type and strength.
- B. Geosynthetics shall be stored in accordance with the manufactures specifications.
- C. Geosynthetics shall be protected from the weather and any other conditions that could damage the material.

PART 2 MATERIALS

.01 Geosynthetic Products

- A. Geogrid products specifically produced for the use of soil reinforcement and consisting of high-density polyethylene or polypropylene.
- B. Geotextiles are woven fabrics produced for the use of soil reinforcement.
- C. The manufactured specifications shall be used for test data and installation procedures.
- D. Approved Geosynthetics as per MagnumStone™ specification and approved testing.
- E. All products shall be approved by the site Engineer.

PART 3 CONSTRUCTION

.01 Qualification

Refer to Section 02832 Modular Block Retaining Wall

.02 Excavation

Refer to Section 02832 Modular Block Retaining Wall

.03 Foundation Preparation

Refer to Section 02832 Modular Block Retaining Wall

.04 Leveling Pad

Refer to Section 02832 Modular Block Retaining Wall

.05 Unit Installation

Refer to Section 02832 Modular Block Retaining Wall

.06 Installation of Geosynthetics Reinforcement

- A. The construction plans shall show the type, strength and location of the geosynthetics.
- B. Manufacturer's specifications shall be used for test data and installation procedures.
- C. The geosynthetics shall be cut to the correct length and laid in the orientation as specified by the manufacturer.
- D. The MagnumStone™ unit voids, drainage chimney and backfill zone are filled, compacted and leveled correctly before placing the geosynthetics.
- E. Ensure that the drainage materials directly behind the wall units are flush or slightly higher than the top of the units so that the geosynthetics will not be sheared on the back of the unit's sharp edge.
- F. The units shall be swept clean of all dirt or rocks before placing the geosynthetics.
- G. Shimming of units shall not be allowed on the geosynthetic layers.
- H. The geosynthetics shall be placed as far forward on the MagnumStone™ units as possible without revealing materials on the face of the wall.
- I. Loosely lay geosynthetics toward the back of the compacted backfill zone.
- J. Gently pull the geosynthetics toward the back of the compacted backfill zone after placing the next row of MagnumStone™ units on top of the geosynthetics and on top of the lower units.
- K. Use stakes or gravel materials to maintain tension on the geosynthetics. Excessive tension may alter the alignment of the wall units.

.07 Backfill

- A. Contractor shall not drive equipment directly on the exposed geosynthetics.
- B. Backfill the reinforced zone by placing materials from the back of the wall towards the end of the geosynthetics in order to maintain tension on the reinforcement.
- C. Contractor shall leave 12" trench between the back of the wall and backfill materials to allow for drainage clean gravel drainage materials. This process will prevent undue soil pressures that could rotate the MagnumStone™ units forward and reduce the set back of the wall while compacting the backfill materials.
- D. Once the MagnumStone™ units, geosynthetics and backfill materials have been placed, fill the unit voids and the drainage chimney with clear rock.
- E. Continue the construction of the wall based on the previously outlined steps placing and compacting soils as specified.
- F. When completing the final layer of backfill materials and drainage gravel, and before placing the planting soil, place a layer of geosynthetic soil separation fabric. The fabric shall be placed no less than 4 feet behind the wall and up the back side of the wall up to the cap unit. The fabric will prevent the planting soil fines from migrating into the drainage gravel and from staining the wall face.

.08 Positive Connection

- A. When a higher geosynthetic to block connection strength is required to meet the higher safety requirements, a positive MagnumStone™ connection system can be used.
- B. When building a Positive MagnumStone™ wall system, follow the same basic construction procedures as when building MagnumStone™ gravity or geosynthetic reinforced or steel concrete walls.
- C. Cut the 2 foot wide geosynthetic reinforcement to twice the length plus 2 feet of the design of a single geosynthetic length specified by the engineer designs. Roll one end of the geosynthetic into a tight roll to the point where the length of a single length is still left. Place the roll into the horizontal core centered on the joint of the two units and making sure that the correct length of geosynthetic is placed at right angles to the wall on top of the well compacted backfill.
- D. Place the second row MagnumStone™ unit centered on top of the two units below and over the roll of geosynthetic sitting inside the horizontal core. Continue to cut and place

- the 2 foot wide rolls of geosynthetics in the same steps as above and then place all the MagnumStone™ units on the second row along the full length of the wall.
- E. Backfill and compact the gravel materials and 12 inches of drainage gravel behind the wall typical of basic wall construction procedures. Make sure the gravel backfill is flush with the top of the second row of units and that the fabric soil barrier is tight and secure.
 - F. Reach down into the hollow core of the second row unit and roll out the second length of the 2 foot wide geosynthetic up the inside back unit and then back at right angle to the wall on top of the compacted backfill materials. This creates the incredible 100% positive connection system. Insure that the second end of the geosynthetic reinforcement is tensioned to remove any slack and then secure by staking the end into the gravel.
 - G. Place the third row MagnumStone™ unit on top of the second row of units centered to the two units below and centered to the 2 foot geosynthetic reinforcement.
 - H. Repeat the above steps until the full length of the wall geosynthetics and wall units have been properly installed. Do not drive equipment on top of the exposed geosynthetic reinforcement.
 - I. Repeat the above step by step installation when installing the next row of MagnumStone™ wall units. Each double row of geosynthetic reinforcements is placed in such away that there is 100% coverage of reinforcements on each row and each MagnumStone™ unit has two lengths of reinforcements attached to them to create a total positive reinforcement/unit connection.

.09 Cap Installation
Refer to Section 02832 Modular Block Retaining Wall

PART 4 PAYMENT

4.01 Payment for the placement of the geosynthetics shall be based on the unit price per square yard (square meter) installed or as per contract agreement.

20. POLLUTION, EROSION AND SEDIMENT CONTROL

Pollution, erosion and sediment control shall be in accordance with Missouri Standard Specifications for Highway Construction Section 806 and shall be modified to include the following:

21. PROTECTION AND MAINTENANCE OF PUBLIC AND PRIVATE PROPERTY

The Contractor shall protect, shore, brace, support and maintain any underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by the construction work performed by him. All pavement, surfacing driveways, curbs, walks, buildings, utility poles, guy wires, and other surface structures affected by construction operations in connection with the performance of this contract, together with all trees and shrubs in yards adjacent to the construction limits, shall be maintained and, if removed or otherwise damaged, shall be restored to the original condition whether within or outside the easement. All replacements of such underground construction and surface structures, or parts thereof, shall be made with new materials conforming to the requirement of these specifications, or if not specified, as approved by the Christian County, at this Contractor's expense.

The Contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, or other public or private property or facility, regardless of location or character, which may be caused by moving, hauling or otherwise transporting equipment, materials, or men to or from the work or any part or site thereof whether by him or his subcontractors. The Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property or facility concerning its repair or replacement or payment of costs incurred in connection with said damage.

No fence outside of the right-of-way or easement limits shall be removed without the prior written consent of the property owner of the lot or tract of land on which such fence is located. A copy of such written permission shall be given to the Christian County. Any damage or disturbance to any item, whether publically or privately owned, which is not noted to be disturbed shall be fixed or replaced to the satisfaction of the Owner and Christian County at the Contractor's expense.

22. TOILET FACILITY LOCATIONS

The Contractor shall provide portable toilets at a minimum of one location on the project, to be placed near the majority of the work in progress. No direct payment will be made for furnishing and maintaining toilet facilities.

23. CONSTRUCTION SITE CLEANUP

Cleanup shall follow immediately after and at the same rate as construction. Cleanup shall not be delayed until the entire project is finished. Contractor shall clean all right-of-way and easement areas that were disturbed or occupied by him in connection with the construction. All disturbed brush and trees, all rubbish, excess materials, temporary structures, equipment, etc. shall be removed and the area left in a neat and presentable condition. If at any time during construction Christian County determines that cleanup is not being accomplished, Christian County may direct that no additional work be accomplished without meeting certain requirements. If so directed, no claim for additional time will be allowed. There will be no direct payment for construction site cleanup as it shall be considered completely covered by the total contract amount.

24. TAX EXEMPT

This project will be tax exempt. The Owner will furnish the necessary information for this project to be considered tax exempt.

25. ACCESS

The road will be closed for the duration of the project. The Contractor shall coordinate with local law enforcement, emergency services, schools, etc. to ensure that the public is aware that the road will be closed for the duration of construction. A letter confirming that all actions were taken to ensure the public was aware shall then be submitted to Christian County prior to proceeding with construction.

26. SEEDING

Seeding shall be in accordance with Missouri Standard Specifications for Highway Construction Section 805 and shall be modified to include the following:

This work shall consist of preparing, liming and fertilizing the seed bed, and furnishing and sowing the specified seed mixture and mulching. The seed mixture shall be applied at a rate specified elsewhere in this contract.

It shall be the responsibility of the Contractor to notify Christian County a minimum of 24 hours prior to beginning any final seeding operation. If such operations are to be performed on a Saturday, Sunday, or Monday, notification must be made to the Christian County by 12:00 PM of the preceding Friday. The Contractor shall receive approval from the Christian County of each area to be seeded prior to beginning any seeding activity. The lack of observation or inspection by the Christian County shall not relieve the Contractor of the responsibility to construct the project according to the plans and specifications. Any work performed or materials used without authorization by the Christian County may be ordered removed and replaced at the Contractor's expense.

The following seed mixtures shall be applied at the locations and rates specified:

TYPICAL MIX – For all land between Right of Way lines and temporary construction easement.

Mixture Rate

Perennial Rye Grass 60% 120 lbs/acre

Red Fescue

TOTAL

**Must be seeded by the Broadcast and Roll method.

27. FINAL ACCEPTANCE AND PAYMENT

If the final documents are not completed and ready for project closeout, within 60 calendar days of final acceptance of the project, the Contractor shall pay to the Contracting Authority the amount specified as liquidated damages and as a penalty for each Calendar Day until the final payment documents are completed and ready for final payment. The amount of liquidated

damages shall be deducted from any payments due or to become due to the Contractor. Final documentation shall include but not be limited to the following:

1. An affidavit, on the form prescribed by the Contracting Authority, to the effect that all payments have been made and all claims have been released for all material, labor and other items covered by the contract bond.
2. A Certification, on the form prescribed by the Contracting Authority, showing the actual final DBE participation on the project including name of DBE, type of work and amount paid to each DBE firm.
3. An affidavit, on the form prescribed by the Contracting Authority, to the effect that all workers have been paid in compliance with prevailing wage requirements within the contract.
4. Any other documents that may be required by the contract.