Bear Butte Creek Embankment Repair

City of Sturgis
1040 Harley-Davidson Way
Sturgis, SD 57785

Notice for Bids

FOR

Bear Butte Creek Embankment Repair

City of Sturgis, South Dakota

Sealed bids will be received by the Finance Office, City of Sturgis, South Dakota, until 2:00 pm, MDT March 31, 2020 at the office of the City of Sturgis, 1040 Harley-Davidson Way, Sturgis, SD 57785, and will be publicly opened and read. All BIDS shall be made on forms provided by the City of Sturgis. Each bid envelope shall contain one Bid only, and be marked with the words, "Sealed Bid- City of Sturgis."

Plans and Specifications may be obtained from the City Engineer at 1040 Harley-Davidson Way, Sturgis, SD 57785 at 605-499-8177.

An optional pre-bid meeting will be held March 25, 2020 at 10 am in the Meade Room of the Sturgis Community Center at 1401 Lazelle Street, Sturgis SD 57785.

PROJECT DESCRIPTION: The project includes two different work areas. Project will include items and materials to remove the existing precast boxes, concrete road surface, and guard rail. The project will be to build the embankment back to original surface and build a section of asphalt road and a concrete bike path.

Each bid shall contain a certified check or a cashier's check, for five percent of the amount of the bid. Such check shall be certified or issued by either a state or a national bank and payable to the City of Sturgis. In lieu of a check, a bid may contain a bid bond for ten percent of the amount of the bid. Such bond is to be issued by a surety authorized to do business in South Dakota payable to the City of Sturgis, as a guaranty that the bidder will enter into a contract with the City of Sturgis.

The contract shall be awarded within thirty days of the bid opening by written notice to the lowest responsible and responsive bidder whose bid meets the requirements and criteria. The City will NOT award a contract to a contractor who is on the Sam.gov debarment list. The City of Sturgis may reject any and all bids and re-advertise for bids if none of the bids are satisfactory. The City of Sturgis may waive technical irregularities in the bid of the low bidder which irregularities do not alter the price, quality, or quantity of the services.

City of Sturgis

Publish Dates _____, _____, _____

Notice of Award

FOR

Between

Bear Butte Creek Embankment Repair

City of Sturgis (Owner)

1040 Harley-Davidson Way

Sturgis, SD 57785

And

(Contractor)

Date

The City of Sturgis has considered the Bid Proposal submitted by Contractor for the in response to Notice for Bidders, and has accepted your Bid for the amount of $.

PROJECT DESCRIPTION: The project includes two different work areas. Project will include items and materials to remove the existing precast boxes, concrete road surface, and guard rail. The project will be to build the embankment back to original surface and build a section of asphalt road and a concrete bike path.

You are required to execute the Contract Agreement and furnish the Performance and Payment Bond and certificates of insurance within ten business days from the date of this Notice.

City of Sturgis (Owner)

Authorized Signature_____

Printed Name and Title _____

Date _____

Contract Agreement

FOR

Bear Butte Creek Embankment Repair

between
City of Sturgis (Owner)
1040 Harley-Davidson Way
Sturgis, SD 57785
And
(Contractor)
Date

The Contractor will commence and complete the construction of PROJECT DESCRIPTION: The project includes two different work areas. Project will include items and materials to remove the existing precast boxes, concrete road surface, and guard rail. The project will be to build the embankment back to original surface and build a section of asphalt road and a concrete bike path.

The contractor will furnish all necessary labor, tools, material and equipment and other services necessary for the construction and completion of the project**.**

Bear Butte Creek Embankment Repair, Bike Path, and 7th street box removal sections must be completed by July 10, 2020. Liquidated damages begin July 13, 2020 at $500 /day. Liquidated damages increase to $1,000 / day beginning August 1, 2020. All work must be finished by September 30, 2020 to comply with the Corps Permit.

The Contractor agrees to perform all the work described in the Contract Documents and comply with the terms for the sum of $ as shown in the Bid Schedule.

The term Contract Documents means and includes the following:

Notice for Bids
Addenda #1
Bidders Proposal
Bid Schedule
Bid Bond
Contract Agreement
Performance Bond
EJDC C-700 Standard General Conditions of the Construction Contract (2007)

Special Provisions
Drawings
Notice of award
Notice to proceed
Change order
South Dakota Department of Transportation Specifications

The Owner will pay to the Contractor upon completion.

This Contract Agreement will be binding upon both parties.

In witness, the parties have executed this Contract Agreement.

City of Sturgis (Owner)

Authorized Signature_____

Printed Name and Title _____Daniel Ainslie, City Manager_____

Date _____

Contractor

Authorized Signature_____

Printed Name and Title _____

Contractor _____

Date _____

Notary attest

Printed Name _____

Date _____

Special Provisions

FOR

Bear Butte Creek Embankment Repair

City of Sturgis, South Dakota

SECTION 1 - GENERAL

PROJECT DESCRIPTION: The project includes three different work areas. Project will include items and materials to remove the existing precast boxes, and concrete pavement. The project will be to build the embankment back to original surface and build a section of asphalt road and a concrete bike path.

Standard Specifications shall be the South Dakota Department of Transportation Standard Specifications for Roads and Bridges, 2015 edition with current updates and revisions as modified herein or within the General Requirements in Division 1 and Contract Documents.

Bear Butte Creek Embankment Repair, Bike Path, and 7th street box removal sections must be completed by July 10, 2020. Liquidated damages begin July 13, 2020 at $500 /day. Liquidated damages increase to $1,000 / day beginning August 1, 2020. All work must be finished by September 30, 2020 to comply with the Corps Permit.

The City reserves the right to remove items from being constructed. Any items added would be by change order or addenda.

1.1 Submittals

The Contractor shall submit a list of all subcontractors to City Engineer. All subcontractors must be licensed by the City.

Where SDDOT has items on the approved products list, the contractor must use items or suppliers from that list.

Submittals are required for all materials at least 7 days prior to approval. Submittals will be accepted only from the Contractor.

1.2 Payments

The Contractor may submit invoices whenever convenient. The invoices must be received by the Monday before Council meetings to be approved before payment at the council meeting.

The engineer shall withhold 10% of the invoice until substantial completion which is everything except seeding.

1.3 ALL REMOVED ITEMS MUST BE DISPOSED OF LEGALLY. CITY WILL NOT WAIVE RUBBLE SITE FEES. ANY ITEMS DEPOSITED AT THE SITE MUST BE CLEANED OF SOIL AND ORGANIC MATERIAL.

SECTION 2 - WOODLAND DRIVE RECONSTRUCTION

2.1 MOBILIZATION

The basis and payment will be per section of 9.10 of SDDOT specs. The contractor will be able to utilize the area on the south side of the creek between 8th and 7th street for the duration of the project. The gravel parking area between 7th street and the Post Office and Williams Street and the Creek will be allowed to be utilized until July 1, 2020. Areas utilized should be cleaned reasonably to the approval of the engineer.

Each group will have an item for mobilization. This is for accounting purposes for FEMA.

2.2 CONSTRUCTION STAKING

The contractor will be responsible for their own staking, if they need it. This item will be paid as single lump sum item.

2.3 TRAFFIC CONTROL MISCELLANEOUS

The basis for all traffic control will meet 635.5 section C of the SDDOT Specs and meet all MUTCD standards. The contractor shall submit a traffic plan if requested by the Engineer. The contractor shall ensure that protection will be in place to ensure public safety. The existing concrete barriers may be used until June 1, 2020. The temporary concrete barriers provided for the project may be placed at the current locations until the contractor is ready to place them in the final position. Moving the barriers will be incidental to the price of the barriers.

Indiscriminate driving and parking of vehicles within the ROW will not be permitted. Any damage to the vegetation, surfacing, embankment, from such indiscriminate use shall be repaired and/or restored by the Contractor, at no expense to the City, and to the satisfaction of the Engineer.

2.4 REMOVE 8" CONCRETE PAVEMENT

The existing concrete section of road must be removed. Broken concrete free of rebar may be used as riprap. Some rebar is in the pavement.

2.5 REMOVE ASPHALT

This item is to saw cut a straight line across the existing asphalt and to produce a clean line. The match line shall be cut full depth in the existing surface to obtain a vertical, straight edge. The contractor must mark the asphalt in advance of cutting and receive the engineer's approval before beginning cutting. Then the existing asphalt will be removed and disposed of in a legal manner. Saw cutting shall be incidental.

2.6 TYPE B INLET 3' X 4'

Inlets must be designed to meet SDDOT standards. The boxes may either be fabricated in place or fabricated by a SDDOT approved precast fabricator. The contractor must submit shop drawings to the City Engineer for approval before fabrication may begin, or materials ordered. Frames will be included in the bid price for this item.

Floors of the inlet shall be 3 inches below the flow lines of the pipe.

2.7 CURB AND GUTTER

Both inlets will have a six linear foot section either side which will taper from the back of the inlet to the gutter.

2.8 SDDOT 450 PIPE CULVERT

Standard Bedding material (type C) shall be considered incidental to the installation of the storm sewer pipe. No separate payment shall be made for standard bedding material.

The contractor shall notify the Engineer upon completion of the culvert work. Inspection of the culvert will be made by the Engineer with the Contractor and all discrepancies will be noted. If deficiencies are identified prior to paving, they shall be corrected prior to placing base material. Final payment will not be made until all discrepancies have been corrected and the culvert work has been given final acceptance.

The plans include placing of the RCP pipe and installing one flared end.

2.9 MOVE AND RESET SIGN

The existing sign will be taken down and replaced after the work is complete in the area.

2.10 BASE COURSE

Base course will meet SDDOT requirements and be paid for by tickets.

2.11 ASPHALT SHALL BE 6 INCHES THICK

The type of Asphalt will be Class E, Type 1, PG-22 with up to 15% RAP. The asphalt item is for all work and material (including binder) for placing and rolling the asphalt. The price will be measured by the ton and verified with tickets.

2.12 SIGN

The signs will meet MUTCD standards and be paid for completely installed.

2.13 TRAFFIC CONTROL MOVABLE CONCRETE BARRIERS

The price will be for providing movable concrete traffic barriers and placing them and moving them once, if needed. The City has some barriers in place now, and the City will need city barriers beginning June 1, 2020. Thus, the contractor must provide MUTCD appropriate barriers for local streets for less than 40 mph.

2.14 TRAFFIC CONTROL MOVABLE CONCRETE BARRIER END PROTECTION

The contractor will be responsible for supplying and installing two end protection units for the barriers.

2.15 SEED, FERTILIZER AND COVER

Seeding shall be Foothills Seed "Sports turf mix".

The contractor must either seed the project by June 3 or seed the project later in the fall with a dormant seed mix.

Initial preparation of newly graded areas for seeding shall be worked to a minimum depth of 6 inches. Every effort shall be made to obtain this depth on the first pass with tillage equipment. The implement used shall be a tool carrier with rigid shanks and sweeps or chisels or a heavy duty disk as appropriate to the conditions. The implement shall have positive means of controlling depth of penetration.

Lumps or clods exposed by the initial pass of tillage equipment over three (3) inches in diameter shall be broken up. The number of additional passes required breaking up lumps or clods shall be kept to a minimum. Working the soil to a fine, pulverized condition shall be avoided.

After seedbed preparation has been completed, the Contractor shall pick up and dispose of all loose stones or boulders having a vertical projection of two 2) inches (or more above the soil surface. Logs, stumps, brush, weeds, cables, or other foreign material, which might interfere with the proper operation of drills, mowers, or other implements, shall be disposed of by the Contractor.

The Contractor is responsible for smoothing dirt ridges, which result from his operations or from traffic. Such ridges shall be smoothed so they will not interfere with future mowing.

Following completion of seeding operations, foot, vehicular, or equipment traffic over the seeded area shall be kept to a minimum.

Areas damaged from such traffic shall be reworked and reseeded as determined by the Engineer.

The Contractor shall, prior to acceptance of the project, reseed any area on which the original seed has been lost or displaced.

After seed, fertilizer and mulch have been placed, it shall be watered to provide a moist condition through the mulch as well as into the underlying soil bed.

For a period of three weeks after seeding and initial watering, the Contractor shall apply adequate water to insure proper germination of the seed and growth of the grass. The Engineer may waive watering requirements if adequate natural moisture has been present. At the end of the three (3) week watering period, the Engineer will make an inspection to determine if the grass is alive and growing. If seed has not satisfactorily rooted into the soil and is not alive and growing, the Engineer will determine if new seed and/or additional watering, at the Contractors expense, are required. Replaced seed shall be watered as required for the original.

Seeding will be measured to the nearest square yard. Measurement for fertilizer and mulch will be the same as for the seeding. Tickets indicating the appropriate application rate has been met shall be furnished to the Engineer to verify this area.

Seeding will be paid for at the contract unit price per square yard. This price will be full compensation for the preparation of the seed and for labor, tools, equipment, and incidentals necessary.

Payment for seeding, fertilizing, and mulch will all be included under the same bid item. Water for seeding shall be considered incidental and shall be included in the unit price bid for seeding.

SECTION 3 - 7th STREET BOX REMOVAL

3.1 REMOVE BOXES

The current boxes shall be removed and disposed of a legal manner. If there are abutments within the channel bottom those must be removed as well.

Only concrete free of rebar may be crushed and used as riprap.

The surrounding soil may be used as embankment.

3.2 REMOVE GUARD RAIL

The contractor shall contact the Engineer before removal. The existing guard rail and posts shall be removed and disposed of a legal manner.

3.3 REMOVE SHEET PILE WINGWALLS

The current sheet pile wingwalls need to be removed and disposed of in a legal manner.

3.3 MOVE TRAFFIC BARRIERS OUT OF THE CREEK

The contractor shall remove the existing concrete barriers out of the creek and place them on an approved area by the Engineer.

3.3 REMOVE CONCRETE PIPE

The pipes in the southeast corner of 7th Street crossing shall be removed and disposed of.

SECTION 4 - BIKE PATH RECONSTRUCTION

4.1 REMOVE CONCRETE BIKE PATH

The existing concrete trail must be removed from the west end of the project to a logical joint. Broken concrete free of rebar may be used as riprap.

4.2 CONCRETE SIDEWALK 6" THICK

Sidewalks shall be a minimum of 4000 psi concrete. Cross-slopes shall not exceed 2%. Expansion joints shall be spaced at a maximum of 100 feet. Tooled joints shall be a maximum of 8 feet apart.

4.3 BASE COURSE

Base course will meet SDDOT requirements and be paid for by tickets.

SECTION 5 - BEAR BUTTE CREEK EMBANKMENT REPAIR

5.1 ROCK CHECK DAM

This item (SDDOT 734) is to construct a rock check dam to prevent excess silt from travelling down Bear Butte Creek. After construction is completed, the silt shall be removed upstream of the dam and removed. The contractor will be responsible for removing silt build up during construction if it appears that the silt will overtop the dam.

This item assumes that the dam will only need to be placed once and removed once. If a flood event destroys or damages the dam, then the contractor is responsible for discussing the problem with the Engineer before any work is completed. Any further work is eligible for a change order.

5.2 EMBANKMENT

DUE TO FEMA REGULATIONS ALL MATERIAL MUST BE BROUGHT IN FROM A CERTIFIED PIT. TICKETS WILL BE REQUIRED FOR PAYMENT.

Excavation will meet the requirements of section 120 of SDDOT standard specifications and will be paid for by the cubic yard.

Excavate the existing subgrade to provide for the required depth of aggregate base course and asphalt surfacing or aggregate base course and concrete surfacing.

Dirt which is free of rocks bigger than 1 inch in diameter may be deposited on the adjacent lot as shown in the plans. Rocks bigger than 1 inch and all other material must be disposed of off-site in a legal manner at the contractor's expense.

Water for compaction of subgrade and embankments shall be provided by the contractor and used to maintain soil at or near optimum moisture content to obtain required density. Water shall be incidental to the price of base material.

Compaction of subgrade will be governed by the specified density method. Compaction of embankment shall be no less than 95% of Standard proctor density.

5.3 ITEM REPLACE RCP PIPE AND FLARED END

Some of the ends of existing outlets have disconnected due to the lack of adjacent material. The contractor will be responsible for repositioning any disconnected pipe and flared ends and compacting the embankment around them. The flow lines shall be placed at the existing stable pipe slope. A minimum of 1 foot above flow line of the channel is required.

It is assumed that the RCP pipe and flared ends will be reusable. The contractor is responsible to contact the engineer if changes may be required.

5.4 ARTICULATING CONCRETE BLOCK

The City has approved the use of ArmorFlex 85-L articulating Concrete Block for use on this project. The contractor or a supplier may submit another type of block before March 26,2020 for the Engineer's review. If approved, the engineer will issue an addendum on March 30, 2020 so that all contractors may use different options. The design was based on a channel slope of 2%, Q100 =12,000 cfs at a velocity of 16.41 fps.

ARTICULATING CONCRETE BLOCK (ACB) SYSTEM SPECIFICATIONS – ARMORFLEX®

GENERAL

Scope of Work

The contractor shall furnish all labor, materials, equipment, and incidentals required for, and perform all operations in connection with, the installation of the ArmorFlex® Articulating Concrete Block (ACB) system in accordance with the lines, grades, design and dimensions shown on the Contract Drawings and as specified herein.

Submittal

The Contractor shall submit to the Engineer of Record (EOR) evidence of full-scale hydraulic testing in accordance with ASTM D-7277, and if necessary, Factor of Safety (FoS) calculations in support of the proposed ACB system stamped and signed by a Professional Engineer licensed to practice in the state where the project is located. The Contractor shall also submit to the EOR an appropriate geotextile, selected for the site being protected on the basis of the gradation and permeability of the surface soils, which information shall have been provided by the EOR or the designated geotechnical engineer.

The Contractor shall furnish manufacturer's certificates of compliance for ACB/mats, revetment cable, geotextile, and any revetment cable fittings and connectors. The Contractor shall also furnish the manufacturer's specifications, literature, preliminary shop drawings for the layout of the mats, installation and safety instructions, and any recommendations, if applicable, that are specifically related to the project. If a color has been specified for the block, the Contractor shall submit a color chart indicating the specified standard color.

Alternative materials from qualified suppliers may be considered; to qualify, proposed alternative suppliers must own and operate their own manufacturing facility, and shall directly employ a minimum of five (5) registered Professional Engineers. Full documentation consistent with the foregoing must be submitted in writing to the EOR a minimum of twenty (20) business days prior to bid date, and must be pre-approved in writing as an addendum to the bid documents and drawings by the EOR at least ten (10) business days prior to bid date. Submittal packages must also include, as a minimum, the following:

1. Evidence of satisfactory full-scale laboratory testing in accordance with *ASTM D 7277, Standard Test Method for Performance Testing of Articulating Concrete Block (ACB) Revetment Systems for Hydraulic Stability in Open Channel Flow*, performed on behalf the submitting manufacturer on a qualifying test flume of sufficient length for the test flows to achieve normal depth in all cases, and associated engineered calculations quantifying the FoS of the proposed ACB system under the design conditions of the specific project, stamped and signed by a registered Professional Engineer residing in and licensed to practice in the state where the project is located;

2. A list of 5 comparable projects, in terms of size and applications, in the United States, where the satisfactory performance of the specific alternate ACB system can be verified after a minimum of five (5) years of service life;

3. Information about, or certifications of, all materials associated with the ACB system as detailed above, including (but not limited to) cable, fittings, geotextile, and any other materials required for satisfactory installation in accordance with *ASTM D 6884, Standard Practice for Installation of Articulating Concrete Block (ACB) Revetment Systems*;

4. The names and contact information (phone numbers and e-mail addresses, at a minimum) for the suppliers' representatives, for technical, production or logistics questions, at least one of whom must reside in the state where the project is located.

PRODUCT

General

All ACB mats shall be prefabricated as an assembly of concrete blocks having specific hydraulic capacities, and laced with revetment cables. The ACB system may also be

assembled on-site by hand-placing the individual units either with or without subsequent insertion of cables.

Individual units in the system shall be staggered and interlocked for enhanced stability. The mats shall be constructed of open and/or closed cell units as shown on the contract drawings. The open cell units have two (2) vertical openings of rectangular cross section with sufficient wall thickness to resist cracking during shipping and installation. The open cell units have an open area of 18-23% as measured from the base of the mat. Parallel strands of cable shall extend through a minimum of two (2) cable ducts in each block allowing for longitudinal binding of the units within a mat. Each row of units shall be laterally offset by one-half of a block width from the adjacent row so that any given block is cabled to four other blocks (two in the row above and two in the row below).

Each block shall incorporate interlocking surfaces that minimize lateral displacement of the blocks within the mats when they are lifted by the longitudinal revetment cables. The interlocking surfaces must not protrude beyond the perimeter of the blocks to such an extent that they reduce the flexibility or articulation capability of the ACB mats or become damaged or broken when the mats are lifted during shipment or placement. Once the mats are in place, the interlocking surfaces shall minimize the lateral displacement of the blocks even if the cables should become damaged or removed. The mats must be able to flex a minimum of 18° between any given row or column of blocks in the uplift direction and 45° in the downward direction.

The cables inserted into the mats shall form lifting loops at one end of the mat with the corresponding cable ends spliced together to form a lifting loop at the other end of the mat. The EOR shall approve appropriate sleeves for use in order to splice the lifting loop. The cables shall be inserted after sufficient time has been allowed for the concrete to complete the curing process.

The ACB mats shall be placed on a filter fabric as specified herein. Under no circumstances shall the filter fabric be permanently affixed or otherwise adhered to the blocks or mats; i.e., the filter fabric shall be independent of the block system.

Certification (Open-Channel Flow): ACB mats will only be accepted when accompanied by documented hydraulic performance characteristics that are derived from tests under controlled flow conditions. Testing shall conform to *ASTM D 7277, Standard Test Method for Performance Testing of Articulating Concrete Block (ACB) Revetment Systems for Hydraulic Stability in Open Channel Flow*, as amended and updated. Note that all hydraulic performance testing shall be performed in a 2H:1V flume, and that the tested length be long enough that the test flows achieve normal depth in all cases. Analysis and interpretation of the test data shall conform to the guidance contained in *ASTM D 7276, Standard Guide for Analysis and Interpretation of Test Data for Articulating Concrete Block (ACB) Revetment Systems in Open Channel Flow*, as amended and updated.

Performance (Open-Channel Flow): The design of the ACB mats shall be in accordance with the Factor-of-Safety design methodology as described in "Erosion and Sedimentation"

by Pierre Julien, Cambridge University Press, Second Ed. 2010. The minimum designed safety factor shall be 1.5 by utilizing the following equation.

$$SF = ((\vartheta_2 / \vartheta_1)\,\alpha_\theta) / ((1 - \alpha_\theta^2)^{0.5} \cos\beta + \eta\,(\vartheta_2 / \vartheta_1) + (\vartheta_3\,F_d' \cos\delta + \vartheta_4\,F_l')) / \vartheta_1 W_s) \geq 1.5$$

where ϑ_1, ϑ_2, ϑ_3, & ϑ_4 are geometric properties of the block, α_θ, β, & δ are angles characteristic of the site and application, η is the stability number for a sloped surface, F_d & F_l are the drag and lift forces, respectively, and W_s is the submerged weight of the block. ArmorFlex block geometric parameters are available upon request.

The analysis shall be performed based upon the stability of the ACBs due to gravity forces alone, neglecting conservative forces added by cabling, mechanical anchorage, contact with adjacent blocks, or other restraints not attributable to gravity based forces. The analysis must account for a 0.5-inch block projection, in accordance with *ASTM D 6884, Standard Practice for Installation of Articulating Concrete Block (ACB) Revetment Systems,* Section 6.3.3. **Site grading requirements may not be used to omit this requirement for standard (non-tapered) block.**

All design calculations submitted must be based upon the smallest block utilized in the mats. Partial "half blocks" must be analyzed separately.

In order to analyze the performance of the unit, the hydraulic information listed below is required:

ACB HYDRAULIC INFORMATION

Design Volumetric Flow Rate (ft^3/sec)		***Specified by EOR***
Minimum Shear Stress (lb/ft^2)		
Channel Friction or Bed Slope (ft/ft)		
Channel Side Slopes (_ H:1V)		
Channel Bottom Width (ft)		
Allowable Unit Protrusion (in)	0.5	

Articulating Concrete Blocks

Scope: This specification covers ACB mats used for general erosion control, slope stabilization, channel armoring and channel protection. Installations may be exposed to infrequent and/or light-duty vehicular loading, such as for low-water crossings or boat ramps, by specifying a minimum thickness of 6". Concrete units covered by this specification are made from lightweight or normal weight aggregates, or both. The values stated in U.S. customary units are to be regarded as the standard.

Materials: Cementitious Materials - Materials shall conform to the following applicable ASTM specifications:

1. Portland Cements - Specification C 150, for Portland Cement.
2. Blended Cements - Specification C 595, for Blended Hydraulic Cements.
3. Hydrated Lime Types - Specification C 207, for Hydrated Lime Types.
4. Pozzolans - Specification C 618, for Fly Ash and Raw or Calcined Natural Pozzolans for use in Portland Cement Concrete.
5. Aggregates – Specification C 33, for Concrete Aggregates, except that grading requirements shall not necessarily apply.

Casting: The ACB units shall be produced using a dry cast method. Dry cast units obtain strength more quickly than wet cast blocks, and will also achieve a greater uniformity of quality and greater durability.

Physical Requirements: At the time of delivery to the work site, the ACB units shall conform to the physical requirements prescribed in Table 2 listed below.

PHYSICAL REQUIREMENTS

Compressive Strength Net Area Min. p.s.i (mPa)		**Water Absorption Max. lb/ft^3 (kg/m^3)**	
Avg. of 3 units	Individual Unit	Avg. of 3 units	Individual Unit
4,000 (27.6)	3,500 (24.1)	9.1 (160)	11.7 (192)

Units will be sampled and tested in accordance with *ASTM D 6684, Standard Specification for Materials and Manufacture of Articulating Concrete Block (ACB) Revetment Systems.*

Visual Inspection: All units shall be sound and free of defects which would interfere with the proper placement of the unit, or which would impair the performance of the system. Surface cracks incidental to the usual methods of manufacture, or surface chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.

Cracks exceeding 0.25 inches (.635 cm) in width and/or 1.0 inch (2.54 cm) in depth shall be deemed grounds for rejection. Chipping resulting in a weight loss exceeding 10% of the average weight of a concrete unit shall be deemed grounds for rejection.

Blocks rejected prior to delivery from the point of manufacture shall be replaced at the manufacturer's expense. Blocks rejected at the job site shall be repaired with structural grout or replaced upon request at the expense of the contractor.

Sampling and Testing: The purchaser (or their authorized representative) shall be accorded access to the relevant manufacturing facility or facilities, if desired, in order to inspect and/or sample the ACB units from lots ready for delivery prior to release for delivery to the job site. Such inspections are at the sole expense of the requesting entity.

Field installation shall be consistent with the way the system was installed in preparation

for hydraulic testing pursuant to *ASTM D 7277, Standard Test Method for Performance Testing of Articulating Concrete Block (ACB) Revetment Systems for Hydraulic Stability in Open Channel Flow*. Any external restraints, anchors, or other ancillary components (such as synthetic drainage mediums) shall be employed as they were during testing; e.g., if the hydraulic testing installation utilized a drainage layer, then the field installation must also utilize a drainage layer. This does not preclude the use of other section components for other purposes, e.g., a geogrid for strengthening the subgrade for vehicular loading, or an intermediate filter layer of sand to protect very fine-grained native soils.

Hydraulic testing shall be conducted on the thinnest block in a "family" of similar blocks (i.e., same footprint but different thicknesses), with the tested critical shear value then converted to a critical shear at 0° before extrapolation to thicker blocks within the same family. Such extrapolation may not be made from a thicker block to a thinner block. The extrapolation method is detailed in the National Concrete Masonry Association (NCMA) "Design Manual for Articulated Concrete Block (ACB) Revetment Systems", section 4.2.

Purchaser may request additional testing other than that provided by the manufacturer as needed. Such requested testing will extend any stated lead times for manufacturing and delivery, if the results of such testing are a prerequisite to approval (i.e., approval for release to manufacturing). Costs associated with such testing shall be borne by the purchaser.

Manufacturer

Articulating concrete blocks (ACB's) shall be **ArmorFlex® Block and a Half** as manufactured and sold by:

ARMORTEC, A Contech Company
9025 Centre Pointe Dr., Suite 400
West Chester, OH 45269
Phone: 1-800-645-7000
Fax: 1-513-645-7993
URL: http://www.conteches.com/Products/Erosion-Control/Hard-Armor/ArmorFlex

The selected ARMORFLEX® blocks shall have the following nominal characteristics:

STANDARD SIZES OF ARMORFLEX® BLOCKS

CLASS	TYPE	MIN. WEIGHT (lbs)	BLOCK SIZE			OPEN AREA %
			Length (in)	Width (in)	Height* (in)	
40BAAH	Open	59	17.4	15.5	4.75	20
50BAAH	Open	76	17.4	15.5	6.0	20
70BAAH	Open	113	17.4	15.5	8.5	20
45BAAH	Closed	71	17.4	15.5	4.75	10
55BAAH	Closed	91	17.4	15.5	6.0	10
85BAAH	Closed	135	17.4	15.5	8.5	10
**Block height may vary based on local manufacture's capabilities.*						

Revetment Cable and Fittings

Option 1. Polyester Revetment Cable and Fittings: Revetment cable shall be constructed of high tenacity, low elongating, and continuous filament polyester fibers. Cable shall consist of a core construction comprised of parallel fibers contained within an outer jacket or cover. The size of the revetment cable shall be selected such that the minimum acceptable strength is at least five (5) times that required for lifting of the mats, in accordance with ASTM D-6684 paragraph 5.5.2.

Elongation requirements specified below are based upon stabilized new, dry cable. Stabilization refers to a process in which the cable is cycled fifty (50) times between a load corresponding to $200D^2$ and a load equal to 10%, 20% or 30% of the cable's approximate average breaking strength. Relevant elongation values are as shown in the table below. The tolerance on these values is $\pm$ 5%.

ELASTIC ELONGATION		
at Percentage of Break Strength		
10%	20%	30%
0.6	1.4	2.2

The revetment cable shall exhibit resistance to most concentrated acids, alkalis and solvents. Cable shall be impervious to rot, mildew and degradation associated with marine organisms. The materials used in the construction of the cable shall not be affected by continuous immersion in fresh or salt water.

Selection of cable and fittings shall be made in a manner that insures a safe design factor for mats being lifted from both ends, thereby forming a catenary. Consideration shall be taken for the bending of the cables around hooks or pins during lifting. Fittings such as sleeves and stops shall be aluminum and washers shall be plastic unless otherwise shown on the Contract Drawings.

Option 2. Galvanized Steel Revetment Cable and Fittings: Revetment cable shall be constructed of preformed galvanized aircraft cable (GAC). The cables shall be made from individual wires and strands that have been formed during the manufacture into the shape they have in finished cable.

Cable shall consist of a core construction comprised of seven (7) wires wrapped within seven (7) or nineteen (19) wire strands. The size of the revetment cable shall be selected such that the minimum acceptable strength is at least five (5) times that required for lifting of the mats.

The revetment cable shall exhibit resistance to mild concentrations of acids, alkalis, and solvents. Fittings such as sleeves and stops shall be aluminum, and the washers shall be galvanized steel or plastic. Furthermore, depending on material availability, the cable type (7x7 or 7x19) can be interchanged while always ensuring the required factor of safety for the cable.

Selection of cable and fittings shall be made in a manner that insures a safe design factor for mats being lifted from both ends, thereby forming a catenary. Consideration shall be taken for the bending of the cables around hooks or pins during lifting. Revetment cable splicing fittings shall be selected so that the resultant splice shall provide a minimum of 75% of the minimum rated cable strength.

Anchors

The specifying EOR *may* require, at his/her discretion, permanent anchoring of the mats, e.g., by the use of ancillary earth anchors or attachment to other structures using the lifting cable loops, or through the open cells of an open-cell block. The design of the ArmorFlex system is intended to provide hydraulic stability without the use of such anchors; consequently, any such anchor design shall be by others as approved by the EOR.

Filter Fabric

The geotextile filter shall meet the minimum physical requirements listed in Table No. 3 of these Specifications. Consultation with the manufacturer is recommended; the standard for sizing geotextile for these applications is AASHTO M-288, Permanent Erosion Control. Either woven or non-woven geotextile are acceptable, as long as they meet the other project requirements.

The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, ester, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic, if necessary, to make the filaments resistant to deterioration due to ultraviolet and heat exposure. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

The Contractor shall furnish manufacturer's certified test results to the EOR, showing actual test values obtained when the physical properties are tested for compliance with the specifications.

During all periods of shipment and storage, the filter fabric shall be protected from direct sunlight, UV radiation, and temperatures greater than 140°F. To the extent possible, the fabric shall be maintained wrapped in its protective covering. The geotextile shall not be exposed to sunlight or UV radiation until the installation process begins.

PHYSICAL REQUIREMENTS

Physical Property	Test Procedure	Minimum Value	
Grab Tensile Strength (Unaged Geotextile)	ASTM D4632	*IAW AASHTO M288 Class 2*	
Breaking Elongation (Unaged Geotextile)	ASTM D4632	50% max. (in any principal direction)	
Burst Strength	ASTM D3786	*IAW AASHTO M288 Class 2*	
Puncture Strength	ASTM D4833	*IAW AASHTO M288 Class 2*	
A.O.S., U.S. Std. Sieve	ASTM D4751		***Specified by EOR***
Permittivity	ASTM D4491		

Final acceptance of the filtration geotextile must be made by the EOR based on project specific soil information. Soil characteristics such as grain size distribution, permeability, and plasticity shall be determined for every 200,000 square feet of geotextile installed or for each source of borrow material used during construction. Significant differences in soil characteristics may require the performance of further sieve and possible hydrometer testing at the discretion of the EOR. The locations for which the material to be tested is extracted shall be approved by the EOR. The Contractor shall provide the site-specific soil and modified proctor curves for the site soil, at his own expense, to the manufacturer. Also, the contractor shall be responsible for the performance of the test by a certified independent laboratory experienced in performing such test. The test shall be performed under the actual field soil conditions or as otherwise required by the EOR.

At the time of installation, the filter fabric shall be rejected if it has been removed from its protective cover for over 72 hours or has defects, tears, punctures, flow deterioration, or damage incurred during manufacture, transportation or storage. With the acceptance of the EOR, placing a filter fabric patch over the damaged area prior to placing the mats shall repair a torn or punctured section of fabric. The patch shall be large enough to overlap a minimum of three (3) feet in all directions.

Size of ACB Mats

General: The concrete blocks, cables and fittings shall be fabricated at the manufacturer or another approved location into mats with a width of up to eight (8) feet and a length up to forty (40) feet, which is approved by the EOR. The maximum mat length may be shorter for heavier blocks.

Mat Length: The ACB mats shall have the ability for fabrication in various lengths, widths, and in combinations of length and/or widths. Special mats are a combination of two opposing dimensions either in the longitudinal or transverse direction of the mats. The special mats are available in various dimensions that allow for a custom fit to a site-specific project. Obstructions, such as manholes, pipe outfalls, or other fixed structures, will be accommodated to the extent that accurate information is provided about them prior to the preparation of mat layout drawings.

FOUNDATION PREPARATION, GEOTEXTILE AND MAT PLACEMENT

Subgrade Preparation

General: All subgrade preparation shall be performed in accordance with *ASTM D 6884, Standard Practice for Installation of Articulating Concrete Block (ACB) Revetment Systems*, as updated and amended.

Grading: The slope shall be graded to a smooth plane surface to ensure that intimate contact is achieved between the slope face and the geotextile (filter fabric), and between the geotextile and the entire bottom surface of the individual ACBs. All slope deformities, roots, grade stakes, and stones which project normal to the local slope face must be re-graded or removed. No holes, "pockmarks", slope board teeth marks, footprints, or other voids greater than 0.5 inch in depth normal to the local slope face shall be permitted. No grooves or depressions greater than 0.5 inches in depth normal to the local slope face with a dimension exceeding 1.0 foot in any direction shall be permitted. Where such areas are evident, they shall be brought to grade by placing compacted homogeneous material. The slope and slope face shall be uniformly compacted, and the depth of layers, homogeneity of soil, and amount of compaction shall be as required by the EOR.

Excavation and preparation for all termination trenches or aprons shall be done in accordance to the lines, grades and dimensions shown in the Contract Drawings. The termination trench hinge-point at the top of the slope shall be uniformly graded so that no dips or bumps greater than 0.5 inches over or under the local grade occur. The width of the termination trench hinge-point shall also be graded uniformly to assure intimate contact between all ACBs and the underlying grade at the hinge-point.

Inspection: Immediately prior to placing the filter fabric and ACB mats, the prepared subgrade shall be inspected by the EOR as well as the owner's representative. No fabric or blocks shall be placed thereon until that area has been approved by each of these parties.

Placement of Geotextile Filter Fabric

General. All placement and preparation should be performed in accordance with *ASTM D 6884, Standard Practice for Installation of Articulating Concrete Block (ACB) Revetment Systems,* as updated and amended. Filter Fabric, or filtration geotextile, as specified elsewhere, will be placed within the limits of ACBs shown on the Contract Drawings.

Placement. The filtration geotextile will be placed directly on the prepared area, in intimate contact with the subgrade, and free of folds or wrinkles. The geotextile will not be walked on or disturbed when the result is a loss of intimate contact between the ACB and the geotextile or between the geotextile and the subgrade. The geotextile filter fabric will be placed so that the upstream strip of fabric overlaps the downstream strip. The longitudinal and transverse joints will be overlapped at least one and a half (1.5) feet for dry installations and at least three (3) feet for below-water installations. The geotextile will extend at least

one (1) foot beyond the top and bottom revetment termination points, or as required by the EOR. If ACBs are assembled and placed as large mattresses, the top lap edge of the geotextile should not occur in the same location as a space between ACB mats unless the space is concrete filled.

Placement of ACBs/Mats

General. ACB placement and preparation should be performed in accordance with *ASTM D 6884, Standard Practice for Installation of Articulating Concrete Block (ACB) Revetment Systems*, as amended and updated.

ACB block/mats, as specified in Part 2:A of these Specifications, will be constructed within the specified lines and grades shown on the Contract Drawings.

Placement. The subgrade shall be prepared in such a manner as to produce a smooth plane surface prior to placement of the ACBs or mats. No individual block within the plane of placed ACBs will protrude more than one-half inch or as otherwise specified by the EOR. ACBs should be flush and develop intimate contact with the subgrade section, as approved by the EOR. Proposed hand placing is only to be used in limited areas, specifically identified by the EOR or manufacturers' mat layout drawings, as approved by the EOR.

If assembled and placed as large mattresses, the ACB mats will be attached to a spreader bar or other approved device to aid in the lifting and placing of the mats in their proper position by the use of a crane or other approved equipment. The equipment used should have adequate capacity to place the mats without bumping, dragging, tearing or otherwise damaging the underlying fabric. The mats will be placed side-by-side, so that the mats abut each other, and/or end-to-end. Mat seams or openings between mats greater than two (2) inches will be backfilled with 4000 p.s.i. non-shrink grout, concrete or other material approved by the EOR. Whether placed by hand or in large mattresses, distinct changes in grade that results in a discontinuous revetment surface in the direction of flow will require backfill at the grade change location so as to produce a continuous surface.

Termination trenches will be backfilled and compacted flush with the top of the blocks. The integrity of the trench backfill must be maintained so as to ensure a surface that is flush with the top surface of the ACBs for its entire service life. Termination trenches will be backfilled as shown on the Contract Drawings. Backfilling and compaction of trenches will be completed in a timely fashion. No more than 500 linear feet of placed ACBs with non-completed termination trenches will be permitted at any time.

Finishing. The cells or openings in the ACBs will be backfilled and compacted with suitable material, as specified by the EOR. Backfilling and compaction will be completed in a timely manner so that no more than 500 feet of exposed mats exist at any time. Finishing requirements are explicitly at the discretion of the EOR.

Consultation. The manufacturer of the ACBs/mats shall provide design and construction advice during the design and initial installation phases of the project when required or as

necessary, at the discretion of the EOR. The ACB supplier shall provide, at a minimum, one full day or two half-days of on-site project support upon request.

SECTION 6 - POST OFFICE EMBANKMENT REPAIR

6.1 REMOVE AND REPLACE FENCE

The Post Office should remove and reset fence. This item is in place in case the Post Office does not do that quickly enough. Any work on Post Office property will need to be separated out accounting wise.

SECTION 7 - BEAR BUTTE CREEK EMBANKMENT REPAIR

This section involves work on the BLM property. BLM has stringent restrictions due to the historic nature of the Fort Meade property. Thus, the contractor may only work on the property with a BLM representative present.

7.1 REMOVE CONCRETE PIPE

There are eleven 60 inch diameter reinforced concrete pipe that were placed as gabions or a wall to protect the City's sanitary sewer system. The contractor shall remove them and dispose of them.

7.2 BACKHOE CREW WORK

This is an hourly pay item to cover work to rebuild the embankment by instruction of the BLM representative or the engineer. It is assumed that the only equipment required for this activity is a backhoe and that 16 hours should be enough time to accomplish the work. No material will be allowed to be imported or excavated off site without prior approval from the engineer.

CHANGE ORDER

Order #_____

Date _____

Agreement date _____

Project Description _____

Owner: **City of Sturgis**_____

Contractor_____

The following changes are made to the CONTRACT DOCUMENTS

1. Change to CONTRACT TIME:

Working day extension_____

Justification

The CONTRACT TIME will be (increased) (decreased) by working days.

2. Change to CONTRACT PRICE:

ORIGINAL CONTRACT PRICE_____

CURRENT CONTRACT PRICE adjusted by previous change order_____

Change to CONTRACT PRICE due to CHANGE ORDER will be (increased) by $_____

Or (decreased) by $_____

CONTRACT PRICE including this CHANGE ORDER will be $_____

Approvals required: Requested by:_____

Contractor- print name_____

Recommended by: _____

Engineer – print name_ Liz Wunderlich, P.E.

Accepted by:_____

Owner – Daniel Ainslie, City Manager_____