

# RUMBAUGH CREEK BRIDGE REHABILITATION



## PROJECT SPECIFICATIONS

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### Abbreviations

MSE   Mechanically Stabilized Earth

# ***DIVISION 01 – GENERAL REQUIREMENTS***

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## **Section 01 00 00 – General Requirements**

### PART 1 - GENERAL

#### 1.1 SUMMARY OF WORK

- A. Project Location: Town of Pagosa Springs, Colorado. The Rumbaugh Creek Bridge is located approximately 120 yards north of the intersection of US Highway 160 (Pagosa St.) and North 1<sup>st</sup> St. in Pagosa Spring. The bridge spans Rumbaugh Creek which runs roughly perpendicular to N. 1<sup>st</sup> St. easterly into the San Juan River.
- B. Definition of Contract Line Items: Contractor proposal shall list each line item.
  - 1. Item No. 1 – Rehabilitation of Rumbaugh Creek Bridge: This item consists of all work, including that depicted on the construction drawings and required by the specifications, to partially deconstruct, shore, stabilize, rebuild and repair the masonry arch bridge.
    - a. Measurement for payment will be made based the schedule of values submitted by the contractor and approved by the Contracting officer.
  - 2. Item No. 2 – Rehabilitation of the South Stone Masonry Retaining Wall: This item consists of all work, including that depicted on the construction drawings and required by the specifications, to document, deconstruct, excavate, create structural earth backfill and rebuild the stone masonry retaining wall that is located South of the Rumbaugh Creek Bridge roughly parallel with the East spandrel wall of the Bridge.
    - a. Measurement for payment will be made based the schedule of values submitted by the contractor and approved by the Contracting officer.
- C. Contractor’s Use of Premises
  - 1. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period.
    - a. No public access to the site will be allowed during construction.
  - 2. Storage of Materials: Confine storage of materials to immediate vicinity of project site, unless directed otherwise by The Town of Pagosa Springs’ representative.
  - 3. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the work is indicated.
    - a. Preservation of Natural Features:
      - 1) Prevent damage to natural surroundings.

- 2) Do not remove, injure, or destroy trees or other plants without prior approval. Consult with The Town of Pagosa Springs' representative and remove agreed upon roots and branches that interfere with construction.
  - 3) Do not fasten ropes, cables, or guys to existing trees.
4. Hauling Restrictions: Comply with all legal load restrictions in the hauling of materials. A special permit will not relieve Contractor of liability for damage which may result from moving of equipment.

D. Work Restrictions

1. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7 a.m. to 6 p.m., Monday through Friday, except as otherwise arranged with The Town of Pagosa Springs' representative.
2. Special Construction Requirements
  - a. Any material excavated from site that meets the criteria for re-use may be stored on site during construction, provided erosion control measures are taken and the location is approved by The Town of Pagosa Springs' representative.
3. Existing Utilities
  - a. It is the Contractor's responsibility to locate all utilities prior to any work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PROJECT MANAGEMENT AND COORDINATION

A. Project Meetings

1. Pre-construction Conference: Before start of construction, The Town of Pagosa Springs will arrange an on-site meeting with Contractor. The meeting agenda may include the following:
  - a. Roles and Responsibilities/Lines of Authority.
  - b. Natural and cultural resource protection.
  - c. Coordination of Subcontractors.
  - d. Labor law application.
  - e. Modifications.
  - f. Payments to Contractor.
  - g. Payroll reports.
  - h. Contract time.
  - i. Notice to proceed.
  - j. Construction Schedule.
  - k. Photographic documentation.

- l. Correspondence procedures.
  - m. Acceptance/rejection of work.
  - n. Progress meetings.
  - o. Submittal procedures.
  - p. As-constructed drawings.
  - q. Saturday, Sunday, holiday and night work.
  - r. Reference materials.
  - s. Submittals required prior to or at Preconstruction Conference:
    - 1) Letter designating the Project Superintendent.
    - 2) Proposed construction schedule.
    - 3) Schedule of values.
    - 4) Accident prevention plan.
    - 5) A list of Subcontractors for this project.
    - 6) Written statements from subcontractors certifying compliance with applicable labor standard clauses.
    - 7) Satisfactory evidence of liability insurance coverage and workman's compensation for the Contactor and all subcontractors.
    - 8) Quality control plan.
  - t. Project closeout requirements.
2. Progress Meetings: The Town of Pagosa Springs may (at their option) schedule weekly or bi-weekly progress meetings with the Contractor and subcontractors, to be conducted by teleconference or on site. The meeting agendas may include the following:
- a. Submittal status.
  - b. Review of off-site fabrication and delivery schedules.
  - c. Requests for information (RFI) and other issues.
  - d. Modifications.
  - e. Work in progress and projected.
  - f. Construction Schedule update.
  - g. Status of Project Record Drawings.
  - h. Other business relating to work.
3. Photographic Documentation: Take still or moving digital pictures to document all stages of construction. Before performing any work, document all existing features of the structures, including detailed documentation of the masonry areas requiring repair. Document each area of masonry repair before and after treatment. Images shall be made available weekly to the Town of Pagosa Springs.

### 3.2 SCHEDULES

#### A. After contract award and before the Pre-Construction Conference submit:

- 1. Schedule of Values
  - a. Breakdown each lump-sum item into component parts of work for which progress payments may be requested. The total costs for the component parts of work shall equal the contract price for that lump-sum item. The Contracting Officer may request

data to verify accuracy of dollar values. Include mobilization, general condition costs, overhead and profit in the total dollar value of unit price items and in the component parts of work for each lump-sum item. Do not include mobilization, general condition costs, overhead or profit as a separate item.

- b. Do not break down unit price items. Use only the contract price for unit price items.
- c. The total cost of all items shall equal the contract price. The Schedule of Values will form the basis for progress payments.
- d. An acceptable Schedule of Values shall be agreed upon by the Contractor and The Town of Pagosa Springs before the first progress payment is processed.

## 2. Construction Schedule

- a. Prepare a list of all activities required to complete the Work. Prepare a skeleton network to identify probable critical paths.
- b. Identify milestones in schedule including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- c. Upon acceptance of the Construction Schedule by the The Town of Pagosa Springs, the Construction Schedule will be used to evaluate the Contractor's monthly applications for payment.

## 3.3 SUBMITTALS

### A. Submittal Procedures

- 1. Prepare and submit any required Submittals.
- 2. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on receipt of submittal by The Town of Pagosa Springs' representative. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.
  - a. Initial Review: Allow 7 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
  - b. Re-submittal Review: Allow 7 days for review of each re-submittal.
- 3. Approved Equals
  - a. For each item proposed as an approved equal, submit supporting data, including:
    - 1) Drawings and samples as appropriate.
    - 2) Comparison of the characteristics of the proposed item with that specified.
    - 3) Changes required in other elements of the work because of the substitution.
    - 4) Name, address, and telephone number of vendor.
    - 5) Manufacturer's literature regarding installation, operation, and maintenance.
  - b. A request for approval constitutes a representation that Contractor:
    - 1) Has investigated the proposed item and determined that it is equal or superior in all respects to that specified.

- 2) Will provide the same warranties for the proposed item as for the item specified.
  - 3) Has determined that the proposed item is compatible with interfacing items.
  - 4) Will coordinate the installation of an approved item and make all changes required in other elements of the work because of the substitution.
  - 5) Waives all claims for additional expenses that may be incurred as a result of the substitution.
- B. Contractors Review: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions.
- C. The Town of Pagosa Springs' representative will review each submittal, make marks to indicate corrections or modifications required, and return one copy.
- D. Shop Drawings, Product Data, and Samples
1. As specified in the individual sections, forward submittals to The Town of Pagosa Springs' representative at least seven (7) days before need for approval. Unless a different number is specified, submit two copies of each shop drawing and two copies of all other submittals requested.
  2. After approving submittals, The Town of Pagosa Springs' representative will return one copy to the Contractor.
  3. If submittals are not approved, The Town of Pagosa Springs' representative will return one copy to Contractor with reasons for rejection. Resubmit and identify changes.
- E. Manufacturer's Installation Instructions - When contract documents require compliance with manufacturer's printed instructions, provide one complete set of instructions for The Town of Pagosa Springs' representative and keep another complete set of instructions at the project site until substantial completion.

### 3.4 SAFETY REQUIREMENTS

- A. Description: The work consists of establishing and implementing an effective site-specific accident prevention program and providing a safe environment for all personnel and visitors.
- B. Submittals
1. Accident Prevention Plan - The Plan shall be written to comply with OSHA and project requirements including but not limited to the following:
    - a. Name of responsible supervisor to carry out the program.
    - b. Weekly safety meetings.
    - c. First aid procedures.
    - d. Outline the work and associated hazards, and the methods proposed to ensure property protection and safety of the public and Contractor's employees.
    - e. Planning for possible emergency situations.
    - f. Fire Protection.
    - g. Overhead protection plan for initial shoring of masonry arch vault.

C. Qualification of Employees

1. Ensure that employees are physically qualified to perform assigned duties in a safe manner.
2. Do not allow employees to work whose ability or alertness is impaired because of drugs, fatigue, illness, intoxication, or other conditions that may expose themselves or others to injury.
3. Operators of vehicles, mobile equipment, hoisting equipment, and hazardous plant equipment shall be able to understand signs, signals, and operating instructions, and be capable of operating such equipment. Provide operating instructions for all equipment.

D. Accident Reporting

1. Reportable Accidents: A reportable accident is defined as death, occupational disease, traumatic injury to employees or the public, fires, and property damage by accident in excess of \$100. Notify The Town of Pagosa Springs' representative immediately in the event of a reportable accident.
2. All Other Accidents: The Contractor shall report all other accidents to the The Town of Pagosa Springs' representative as soon as possible and assist the Town and other officials as required in the investigation of the accident.

E. Personnel Protective Equipment: Meet requirements of National Institute for Occupational Safety and Health (NIOSH) and OSHA.

F. Emergency Instructions: Post telephone numbers and reporting instructions for ambulance, physician, hospital, fire department, and police in conspicuous locations at the work site.

G. Protective Equipment

1. Inspect personal protective equipment daily and maintain in a serviceable condition. Clean, sanitize, and repair, as appropriate, personal items before issuing them to another individual.
2. Inspect and maintain other protective equipment and devices before use and on a periodic basis to ensure safe operation.
3. It is the Contractor's responsibility to require all those working on or visiting the site to wear hard hats and other necessary protective equipment at all times.
4. Because the project sites are exposed, protective equipment shall include adequate protection from the sun in the form of personal equipment, a temporary shade structure, or other type of protection.

### 3.5 NATURAL AND CULTURAL RESOURCE PROTECTION

- A. The site may contain subsurface archeological resources. An archeological monitor will be present periodically at the work site. If archeological resources are discovered at the project site while the archeological monitor is not at the site, contact the The Town of Pagosa Springs' representative and stop work until the monitor arrives at the site and determines whether work can continue. Archeological resources may include bottles or other items resembling trash left in the fill material behind the stone masonry vault or walls when they were originally constructed.

### 3.6 QUALITY REQUIREMENTS

- A. Any required testing and inspecting services are the responsibility of the Contractor and are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements. The quality of all work shall be the responsibility of the contractor.
- B. Submittals
  - 1. Quality Control Plan
    - a. A list of personnel responsible for quality control and assigned duties.
    - b. Names, qualifications, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms.
    - c. Methods of performing, documenting, and enforcing quality control of all work.
  - 2. Test Reports
- C. Quality Assurance
  - 1. The Contractor's Quality Control Supervisor may also perform the duties of Project Superintendent.
  - 2. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
  - 3. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by Contract.

### 3.7 REFERENCES

- A. Industry Standards
  - 1. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
  - 2. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

### 3.8 TEMPORARY FACILITIES AND CONTROLS

- A. Temporary Facilities
  - 1. Provide temporary toilet[s] and wash facilities for use by construction personnel.
    - a. Sufficiently lighted and ventilated toilet facilities in weatherproof, sight proof, sturdy enclosures with privacy locks. Maintain and clean at least weekly.

2. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations.

B. Temporary Utilities

1. General: Power generation equipment must be brought to the site at the Contractor's expense if power is required on site.
2. No potable water is available on site. Water must be transported to the site as needed.

C. Security and Protection Facilities

1. Site Enclosure Fence: Furnish and install an orange plastic barrier fence in a manner that will prevent people from easily entering construction area...
2. Temporary Enclosures: Provide temporary enclosures for protection of masonry construction, in progress and completed, from exposure, foul weather, and other construction operations.
3. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
  - a. Responsible Person: A capable and qualified person shall be placed in charge of fire protection. The responsibilities shall include locating and maintaining fire protective equipment and establishing and maintaining safe torch cutting and welding procedures.
  - b. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
  - c. Hazard Control: Take all necessary precautions to prevent fire during construction. Provide adequate ventilation during use of volatile or noxious substances.
  - d. Spark Arresters: Equip all gasoline or diesel powered equipment used during periods of potential fire hazards or in potential forest and grass fire locations with spark arresters approved by the USDA Forest Service.
4. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
  - a. Vehicles and Equipment: Provide one extinguisher on each vehicle or piece of equipment.

3.9 TEMPORARY STORM WATER POLLUTION PREVENTION

- A. Description: The work consists of implementing measures to prevent Storm Water Pollution during construction activities, in accordance with the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program, and all Federal, State, and local regulations, and in accordance with the Storm Water Pollution Prevention Plan (SWPPP) to be prepared for this project.

B. Submittals

1. Storm Water Pollution Prevention Plan
  - a. Site description.

- b. Expected sequencing of operations and construction schedule.
  - c. Weather monitoring procedure.
  - d. Descriptions and details of erosion controls, including dust control.
  - e. Erosion control plans.
  - f. Controls for other potential onsite storm water pollutants.
  - g. Applicable specifications.
  - h. Maintenance and inspection procedures and forms.
  - i. Description of potential non-storm water discharges at site.
  - j. Notice of Intent (NOI) form.
  - k. Notice of Termination (NOT) form.
  - l. Contractor and Sub-contractor Certification forms.
  - m. Other record keeping forms and procedures.
  - n. Housekeeping Best Management Practices, including vehicle wash-down areas, protection of equipment storage and maintenance areas, and sweeping of roadways related to hauling activities.
2. Erosion Control Products: Submit manufacturer's product information and installation recommendations for silt fence, filter fabric, erosion control blanket, straw bales, and any other materials proposed for use on this project.

C. Regulatory Requirements

- 1. Permits: Apply and obtain all required permits in a timely fashion, as there may be significant lead time required to obtain permits from the local NPDES Permitting Agency.
- 2. Notice of Intent (NOI): The Contractor shall file a Notice of Intent (NOI), and implement the accepted SWPPP during construction.
- 3. Notice of Termination (NOT): After Substantial Completion of the construction project, file a Notice of Termination (NOT).

3.10 PRODUCT REQUIREMENTS

- A. Product Delivery, Storage, and Handling: Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Protection After Installation: Provide adequate coverings as necessary to protect installed materials from damage resulting from natural elements, traffic, and subsequent construction. Remove when no longer needed.

3.11 EXECUTION

- A. Examination: Investigate and verify existence and location of utilities and other construction.
- B. Coordination with Utility Service Providers: Contact utility service providers to coordinate the work, testing requirements, and inspections.
- C. Preparation: Take field measurements as required to fit the work properly. Where portions of the work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.

- D. Construction Layout: Verify layout information shown on drawings, in relation existing features of the site. If discrepancies are discovered, notify The Town of Pagosa Springs' representative promptly.

### 3.12 CLOSEOUT PROCEDURES

#### A. Closeout Requirements:

1. Submit specific warranties, guarantees, workmanship bonds, final certifications, and similar documents.
2. Submit Project Record Drawings.
  - a. Maintain one complete full-size set of contract drawings. Clearly mark changes, deletions, and additions to show actual construction conditions. Show additions in red, deletions in green, and special instructions in blue.
3. Terminate and remove temporary facilities from Project site.
4. Complete final cleaning requirements.

#### B. Substantial Completion and Final Inspection

1. When project is substantially complete, request, in writing, a final inspection. Upon receipt of written request that project is substantially complete, the The Town of Pagosa Springs' representative will proceed with inspection within 7 days of receipt of request or will advise the Contractor of items that prevent the project from being designated as substantially complete.
2. If, following final inspection, the work is determined to be substantially complete, The Town of Pagosa Springs' representative will prepare a Punch List to be corrected before final acceptance and issue a Letter of Substantial Completion. Contractor shall complete the work described on the Punch List within 30 calendar days, as weather permits. If the Contractor fails to complete the work within this time frame, the The Town of Pagosa Springs may either replace or correct the work with an appropriate reduction in the contract price.
3. If, following final inspection, the work is not determined to be substantially complete; The Town of Pagosa Springs' representative will notify Contractor in writing. After completing work, Contractor shall request a new final inspection.
4. After all deficiencies have been corrected, a Letter of Final Acceptance will be issued.

#### C. Final Cleaning

1. Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
2. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Town property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 010000

## ***DIVISION 04 – MASONRY***

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### **Section 04 01 20 – Masonry Restoration**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. This section provides the requirements for restoration of the historic stone arch bridge and related retaining walls including repointing mortar joints and rebuilding displaced and missing stone masonry.

#### **PART 2 - PRODUCTS**

##### **2.1 MASONRY MATERIALS AND ACCESORIES**

- B. Mortar: A repair mortar shall be developed in general conformance with a Type O mortar as described in ASTM C-270, *Standard Specification for Mortar for Unit Masonry*. The starting volumetric proportions of 1 part portland cement, 2 parts lime, and 8 to 9 parts sand. Several trial mixtures may be required to arrive at a mix that matches the original with respect to color and texture. A representative of the Town of Pagosa Springs shall approve cured (min. 14 days) mortar samples, prior to proceeding with any work. Colored additives used in mortar shall contain pure, concentrated mineral pigments specially processed for mixing into mortar and complying with ASTM C979, *Standard Specification for Pigments for Integrally Colored Concrete*
- C. Anchors for Tie Backs: Anchors for attaching the stone masonry wall to the Mechanically Stabilized Earth (MSE) wall shall be stainless steel eye bolts per drawings installed during rebuilding of the stone masonry retaining wall.

#### **PART 3 - EXECUTION**

- A. Mortar Repointing: All mortar joints eroded more than ¼ inch from the original plane of the face of the stone wall shall be ground out and repointed. Mortar joints with cracks greater than 1/16 inch in width shall be ground out and repointed. Mortar repointing shall be conducted in such a manner as to produce a dense joint with a surface free of any cracks or bond-line delaminations. In addition to this specification, the contractor is referred to the following publication for methods and materials for proper joint repointing in historic structures:

<http://www.nps.gov/history/HPS/TPS/briefs/brief02.htm>

- B. Mortar joints shall be cut out to a minimum depth of two times the joint width. All cutting shall be done by hand or with small hand power tools to avoid damage to the stone. Joints from which mortar is thus removed must be cleaned of dust and debris using water or compressed air. Mist prepared joints with water immediately prior to pointing. Joints are to be damp with no standing water during pointing operations.

- C. All dry ingredients shall be mixed thoroughly in a paddle batch mixer for at least three and not more than seven minutes using less water than needed for normal workable mortar to produce a stiff mortar mix. Small batches may be mixed by hand.
- D. Mixed mortar shall stand for not less than one-half hour and not more than two and one-half hours for pre-hydration to reduce post curing shrinkage after which time water shall be added to small batches and mixed by hand to bring the mortar to a stiff yet workable consistency.
- E. NOTE: The amount of water added may vary day to day and section to section of the walls depending upon the temperature, humidity, wind and the absorption of the masonry. On hot dry days, repointing operations may require shading of freshly placed mortar to reduce evaporative shrinkage.
- F. All mortar shall be used within two and one-half hours of its initial mixing, and within one hour of adding water to bring it to a working consistency unless Hot Weather Construction Requirements are in place. Re-tempering of the mortar to replace evaporated water is permitted within these time frames. Any mortar not used within two and one-half hours of initial mixing shall be discarded.
- G. Mortar shall be tucked into the joints in approximately ¼-inch layers and tightly compressed. When each layer is firm another layer may be installed. The final layer shall be tooled to compress the outer surface of the mortar and seal the joint. Joint tooling shall match the shape and texture of original joints. Observe cold and warm weather provisions adapted from requirements of the International Building Code and the MSJC Specification for Masonry Structures (ACI 530.1-02/ASCE 6/02/TMS 602/02) shown below.

### Cold Weather Construction Requirements

Wall Temperature (F)	Special Requirements
32 to 40	<ul style="list-style-type: none"> <li>Heat sand or mix water to provide mortar between 40 and 120°F at the time of mixing.</li> </ul>
25 to 32	Above requirements, plus: <ul style="list-style-type: none"> <li>Maintain mortar above freezing until used.</li> </ul>
20 to 25	Above requirements, plus: <ul style="list-style-type: none"> <li>Heat masonry surfaces under construction to 40°F during construction and prior to grouting.</li> <li>Provide wind break when wind speed is above 15 mph.</li> </ul>
less than 20	Above requirements, plus: <ul style="list-style-type: none"> <li>Provide enclosure heated to above 32°F.</li> </ul>

### Hot Weather Construction Requirements

Air Temperature (F)	Special Requirements
Above 100°F or 90°F with an 8 mph wind	<ul style="list-style-type: none"> <li>Maintain sand piles in damp, loose condition</li> <li>Maintain mortar and grout temperature below 120°F.</li> <li>Flush mixer, mortar transport container, and mortar boards with cool water before use.</li> <li>Retemper mortar with cool water.</li> <li>Use mortar within 2 hours of initial mixing.</li> </ul>
Above 115°F or 105°F with an 8 mph wind	<ul style="list-style-type: none"> <li>Follow above requirements, plus:</li> <li>Use cool mixing water for mortar and grout. Ice is permitted if all ice is melted when other mortar or grout materials are added.</li> <li>Shade materials and mixing equipment from direct sunlight</li> </ul>

H. Anchors Installation for Tie Backs: Install anchors in accordance with the manufacturer's recommended installation instructions. It is critical to properly clean the holes with compressed air or an industrial vacuum cleaner to achieve the design values. To be installed with stainless steel coupling nuts and stainless steel eyebolts for tie back attachment in MSE wall.

END OF SECTION 40 01 20

## ***DIVISION 31 – EARTHWORK***

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### **Section 31 05 13 – Select Fill for Earthwork**

#### **PART 1 - GENERAL**

- A. This section covers fill for use in construction of the mechanically stabilized earth wall system.
- B. At the beginning of excavation, a sample of the removed fill material shall be obtained for testing by an independent test agency and approval by The Town of Pagosa Springs. The sample shall be tested for gradation and engineering properties. If the removed fill proves unsuitable as Select Fill, additional fill shall be brought to the site for use as select fill in the construction of the MSE walls.

#### **PART 2 - PRODUCTS**

- A. The select fill, defined as the material placed in the reinforced volume behind the wall, shall consist of coarse aggregates. Permissible aggregate gradations shall have the maximum aggregate size of 1 ½ in. (38 mm), the maximum material passing the #40 (425 µm) sieve of 60 percent, and the maximum material passing the #200 (75 µm) sieve of 15 percent. The effective internal friction angle for the coarse aggregate shall be a minimum 34 degrees according to AASHTO T 236, *Standard Method of Test for Direct Shear Test of Soils under Consolidated Drained Conditions* on samples compacted to 95 percent density according AASHTO T 99 *Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop*.

#### **PART 3 - EXECUTION**

- A. At each soil reinforcement level, the select fill material should be roughly leveled and compacted before placing the soil reinforcing system. The soil reinforcement and the maximum lift thickness shall be placed according to the plans or as approved by the Engineer. At the end of each day's operations, the Contractor shall shape the last level of select fill to permit runoff of rainwater away from the wall face. Select fill shall be compacted to 95 percent of maximum density as determined by AASHTO T 99. Select fill compaction shall be accomplished without disturbance or distortion of soil reinforcing system and the stone masonry wall. Compaction in a strip 3 ft. (1 m) wide adjacent to the backside of the stone masonry wall shall be achieved using a minimum of 3 passes of a light weight mechanical tamper. The Contractor's test agency shall perform density tests at the beginning of the project to ensure the Contractor's methods are achieving the required compaction.

END OF SECTION 31 05 13

## Section 31 05 19 – Geosynthetics for Earthwork

### PART 1 - GENERAL

- A. The specified geosynthetic fabric shall be used in construction of the MSE walls. Substitute geosynthetic fabrics may be used if approved in advance by the CO.

### PART 2 - PRODUCTS

- A. Geosynthetic fabric shall be Thrace-LINQ GTF 400 or approved equal. Minimum grab tensile strength of 400 pounds per ASTM D-4632, minimum wide width tensile strength of 333 pounds per inch per ASTM D-4595, minimum puncture per ASTM D-4833 of 180 pounds, permittivity of  $0.210 \text{ s}^{-1}$  per ASTM D-4491. The fabric is manufactured by Thrace-LINQ, Inc., 2550 West Fifth North St., Summerville, SC 29483. Phone number 1-800-445-4675.

### PART 3 - EXECUTION

- A. MSE walls are to be constructed in accordance with industry standard practices and the following:
  1. Foundation Preparation. The foundation for the MSE wall shall be graded level for a width equal to the length of reinforcement elements plus 12 inches or as shown on the plans. Prior to wall construction, except where constructed on rock, the foundation shall be compacted with a vibratory compactor. Any foundation soils found to be unsuitable shall be removed and replaced with select fill as per Section 31 05 13 of these specifications.
  2. Geosynthetic Placement - The geosynthetic reinforcement shall be installed in accordance with the manufacturer's recommendations, unless otherwise modified by these specifications.
  3. The geosynthetic reinforcement shall be placed within the layers of the compacted soil as shown on the plans.
  4. The geosynthetic reinforcement shall be placed in continuous longitudinal strips in the direction of main reinforcement. Joints in the design strength direction (perpendicular to the slope) shall not be permitted in the geotextile fabric except as indicated on the drawings.
  5. Where MSE walls will have a temporary open end condition, due to the phased construction, an end dam shall be fabricated using the geosynthetic reinforcing to prevent fill from spilling out of the end of the MSE wall. During subsequent phases, MSE walls will be constructed abutting the end dam.
  6. Place only that amount of geosynthetic reinforcement required for immediately pending work to prevent undue damage. After a layer of geosynthetic reinforcement has been placed, the next succeeding layer of soil shall be placed and compacted as appropriate. After the specified soil layer has been placed, the next geosynthetic reinforcement layer shall be installed. The process shall be repeated for each subsequent layer of geosynthetic reinforcement and soil.
  7. Geosynthetic reinforcement shall be placed to lay flat and pulled tight prior to backfilling. After a layer of geosynthetic reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geosynthetic reinforcement in position until the subsequent soil layer can be placed. Under no circumstances shall compaction equipment be allowed on the geosynthetic reinforcement before at least 150 mm of soil has been placed.
  8. During construction, the surface of the fill should be kept approximately level.

9. Geosynthetic reinforcement shall be placed directly on the compacted horizontal fill surface.
10. Geosynthetic reinforcements are to be placed within 2 inches of the design elevations and extend the length as shown on the elevation view unless otherwise directed by the Owner's Engineer. Correct orientation of the geosynthetic reinforcement shall be verified by the Contractor.
11. Fill Placement - Fill shall be compacted as specified by project specifications or to at least 95 percent of the maximum density determined in accordance with AASHTO T-99, whichever is greater.
12. Backfill shall be placed, spread, and compacted in such a manner to minimize the development of wrinkles and/or displacement of the geosynthetic reinforcement.
13. Fill shall be placed in 6 inch maximum lift thickness and hand operated equipment is used.
14. Backfill shall be graded away from the slope crest and rolled at the end of each work day to prevent ponding of water on surface of the reinforced soil mass.
15. Tracked construction equipment shall not be operated directly upon the geosynthetic reinforcement or fill.

END OF SECTION 31 05 19 GEOSYNTHETICS FOR EARTHWORK