## Request for Proposals San Juan County Pack Creek Emergency Watershed Protection Projects Construction Management/General Contractor Services

San Juan County 117 South Main Street PO Box #9 Monticello, Utah 84535

> Date of Issue: March 13, 2024

#### I. INTRODUCTION

San Juan County ("County") is soliciting proposals from Construction Management/General Contractors (CM/GC) to provide construction services for the Pack Creek Emergency Watershed Protection Projects (the "Projects") to be located at predetermined locations within the Pack Creek Area of San Juan County (the "Project Site").

The preliminary scope of the Projects includes the following and are specified as "Exhibit B, Specifications and Design":

- Phase 1- Consists of 5 locations along the Pack Creek community identified as critical. Starting from the top they are the utilities and bridge crossing at the Mattson property, the irrigation diversion, the water and power crossing, the low water crossing and the Pack Creek bridge area.
- 2) Phase 2- Consists of 8 locations along the Pack Creek community where continued downcutting or lateral movement risks loss of property. There are 2 locations where toe rock will be used to prevent lateral movement and 6 locations where "Rock and Roll" structures will be used to stabilize the grade of the downcutting stream.

The Project will complement the design and development provided by the United States Department of Agriculture's Natural Resources Conservation Service (NRCS).

The Fixed Limit Construction Cost ("FLCC") must not exceed \$1,067,500.

Critical CM/GC responsibilities for the Project include Coordinating with the County and NRCS, Community and Property Owners Communication on Projects and Timeline, Construction Project Management for all projects, and constructing projects including sustaining infrastructure quality, security, durability, longevity, functionality of operations and maintenance, and in using materials to withstand and mitigate frequent or periodic flooding.

Notwithstanding anything to the contrary herein, the County and NRCS maintains the right to recommend on matters relating to the Project, and the County maintains final decision-making authority on all matters relating to the Project.

#### II. SCOPE OF WORK

**Design and Construction Method:** The selected CM/GC shall assist the County and NRCS in the construction phases of the Project using the following method:

- A) The CM/GC shall consult with the Project committee, members of this committee may include designated San Juan County Employees, NRCS employees, representatives of Pack Creek Water Association, and others as may meet the needs of the County (the "Project Committee").
- B) The CM/GC shall, after fully accounting for the FLCC, advise the Project Committee regarding Project construction costs and risks, including methods to reduce risk, reduce costs, and improve schedules during all phases of the Project.

**Preconstruction Phase:** This phase of the Project includes attending Project Committee meetings, estimating and cost control, schedule development, construction drawings and constructability reviews. The CM/GC shall assist the County and NRCS in maintaining the cost of construction within the FLCC for the duration of the Project through construction and warranty periods within the Project's schedule. The CM/GC shall provide in-depth, accurate, and timely cost data for a rigorous life-cycle cost assessment throughout the Project.

Schematic specifications and Design, attached as Exhibit B, are already completed in which the CM/GC will be expected to review and verify the Project for accuracy and complete understanding. This review will take place in coordination and with NRCS and the Project Committee to ensure and provide an accurate accounting of the upfront and construction costs for the various systems, materials and constructability.

Costs must be provided based on designs provided and current market pricing and will be quoted as the Final/Guaranteed Maximum Price ("GMP")) for both increased accuracy and the facilitation of informed decisions on the most life-cycle cost effectiveness of the Project.

The CM/GC shall advise the Project Committee regarding project phasing and schedule, including early procurement of materials, if necessary, coordination of staging areas for construction access, stockpiling of materials, storage and other construction related activities.

During the preconstruction phase, the CM/GC shall provide ongoing review of the design documents for constructability, clash detection, design error and omissions, design understandability and bid clarity, and overall availability of products for the Project's. The CM/GC shall track any discovered error or omission and work with NRCS until it is fully resolved. The CM/GC shall not seek payment through a change order markup or otherwise resulting from any discovered error or omission, including design errors or omissions for constructability.

If the CM/GC subcontracts any of the Project, the CM/GC shall develop and obtain subcontracts and trade contracts in accordance with local, county, state, and federal requirements, obtain competitive bids for all the work, materials and equipment, conduct pre-bid meetings and site tours, and work with the Project Committee to address questions, issue addendums and open bids in the presence of the County. After meeting with the Project Committee and once the Project implementation is sufficient and approved by the County, the CM/GC shall develop and submit a GMP for the work that meets the goals for the Project. The GMP will be based on price information included in the CM/GC's approach to price. The GMP will be compared to the NRCS's costs to ensure GMP is in line with market conditions and costs.

The CM/GC, in cooperation with the County, shall obtain any and all State approvals for permitting, including obtaining the building permit and other permits, as necessary.

**Construction Phase:** Final construction will not begin until the County and NRCS, and all required permitting agencies have reviewed and accepted the Project for the construction approach. The CM/GC shall, among other things, manage the construction process, including

general coordination with the County, NRCS, the Project Committee, subcontractors and trade contractors, manage submittals and requests for information, provide input regarding constructability, manage contingency funds, resolve issues and claims, update construction schedules, as needed, and conduct coordination meetings.

The CM/GC shall obtain project bonding including a payment and performance bond, award and manage subcontracts and trade contracts, and obtain all required building, noise, storm water, general construction or other permits to complete the Project. The CM/GC shall conduct, coordinate, and manage water quality inspections, environmental monitoring, compliance with permits, permit reporting and documentation, and final closeouts of permits.

The GM/GC shall conduct, coordinate and manage quality control inspections and weekly construction meetings, coordinate safety programs, and maintain records, as-built drawings, and manuals.

The GM/GC shall develop and monitor punch lists, and coordinate and assist with the subcontractor and manufacturer warranty corrections and the timely Project closeout.

The GM/GC shall support overall public outreach efforts.

#### III. FIXED LIMIT OF CONSTRUCTION COST (FLCC) and GUARANTEED MAXIMUM PRICE (GMP)

- A. <u>FLCC:</u> The FLCC is the Project's construction budget as listed in this RFP's Introduction Section. The County, the Project Committee, and the CM/GC shall work together to keep the costs of construction, as represented, below the FLCC.
- B. <u>GMP:</u> The GMP is the final price that the CM/GC agrees to accept in full performance of the Project. The GMP must be based on the final drawings and specifications for the Project. The GMP must include all fees and percentages required by this RFP and all other costs, if any, to complete the Project.

The final GMP is normally determined at the completion of the contract documents and receipt of subcontractors' proposals. However, the County may require the GMP to be negotiated at an earlier time.

C. <u>Contingency:</u> The CM/GC shall include contingencies during bidding and price escalation, and shall consult with the Project Committee to determine what materials, equipment, component systems and types of construction are to be included in the contract documents. The CM/GC shall recommend reasonable adjustments in the scope of the Project, and recommend alternate bids in the construction documents, as needed to remain below the FLCC.

At the point the GMP is established, the CM/GC will be allowed to carry a maximum contingency of 3% of the FLCC as a construction contingency amount. Any use of the

funds within the GMP shall be recommended by the CM/GC and approved by the County.

The contingency fund can only be used for the following types of work and only for direct costs of construction:

- 1) Construction errors by the CM/GC;
- 2) Replacement of defective work self-performed by the CM/GC; and
- 3) Items included in the contract documents, but missed by the CM/GC in establishing the GMP.

The contingency funds cannot cover items such as:

- 1) Errors by Contractor or subcontractors at any tier;
- 2) Coordination issues between subcontractors at any tier; or
- 3) Replacement of defective work not self-performed but installed by the CM/GC or subcontractors at any tier.

If the entire 3% contingency fund is used during construction, any additional funds needed to complete the project must be provided at the CM/GC expense.

#### IV. COST PROPOSAL, FEES, and MARKUPS

Prior to submitting a cost proposal, the CM/GC shall carefully examine the RFP, visit the Project Site, fully inform itself of all existing conditions and limitations, and include in the proposal the cost of all items required by the RFP. If the CM/GC observes that portions of the contract documents are at variance with applicable law, building codes, rules, regulations, or contain obvious erroneous or uncoordinated information, the CM/GC shall promptly notify the County and/or NRCS, and the necessary changes shall be made to the contract documents.

The CM/GC shall complete Exhibit A and have Exhibit A signed by an authorized representative of CM/GC, and timely submit Exhibit A and the CM/GC's other proposal documents in a sealed envelope at the location specified below. The CM/GC shall submit a completed Exhibit A and all other proposal documents prior to the deadline for submission indicated within the Project Schedule section below.

The CM/GCs shall furnish the following fees and markups as part of its proposal:

A. <u>Preconstruction Fee:</u> This lump sum fee consists of all costs for the CM/GC to provide the required services of the preconstruction phase, except pre-authorized, out-of-state travel. No other reimbursable costs will be allowed or considered in addition to this fee. NOTE: The preconstruction services will begin prior to the Commencement of the Construction phase.

- B. <u>Construction Management Fee</u>: This lump sum fee shall consist of and include overhead (e.g., office, profit, and office personnel who will be managing the project during bidding, construction, and closeout, including the warranty period). This fee does not include general conditions.
- C. <u>Cost of Insurance Premiums</u>: These costs shall be included in the general contractor costs, including builder's risk insurance.
- D. <u>Construction Supervision Cost</u>: This is a monthly cost to the Project, which will commence at the issuance of the notice to proceed and continue through the final completion of the CM/GC's on-site management/supervision services (e.g., project manager and superintendent services). All services and personnel costs not specifically identified as a construction supervision cost will be considered part of the lump sum construction management fee, including costs for receptionists, accountants, safety officers, and expediters. These costs do not include general conditions or people performing the actual construction activities.
- E. <u>CM/GC Change Order and Fees</u>: The CM/GC shall not increase its construction management fee, monthly construction supervision cost, or general conditions fee for proposed change orders that are determined by the County to be an omission or unforeseen condition.

Scope changes prior to the final GMP that exceed the FLCC will include an increase in the construction management fee, monthly construction supervision cost, and general conditions fee as defined in the RFP.

Scope changes after the final GMP will include a 5% markup. Additionally, the monthly construction supervision cost and general conditions fee may be increased only if the County approves an increase in contract days. If the County approves such an increase, it will be applied as a percentage of the fee identified in the RFP divided by the number of construction days in the CM/GCs GMP schedule as defined in the CM/GC contract documents.

F. <u>Self-Performed Work Markup</u>: The CM/GC may only perform self-performed work on the terms set forth herein. The CM/GC shall bill this self-performed work at actual cost incurred, plus the self-performed work markup. Actual costs for self-performed work will be subject to audit by the County. No billing rates will be allowed.

The cost of any self-performed work must be part of the established GMP.

This is a fixed percentage markup that will be applied to the cost for the CM/GC's actual labor plus burden cost, material costs, and equipment costs for self-performed work. A markup equal to or less than 5% will be considered. Proposals with markups above 5% will result in the rejection of the proposal.

G. <u>Self-Performed Unit Costs</u>: Identify the following unit costs for self-performed work (for example):

Cost of labor to install spread footings (less rebar) per cubic yard; Cost of labor to install continuous footings (less rebar) per cubic yard; Cost of labor to install slab on grade (less rebar) per square foot; and Cost of labor to install suspended slabs (less rebar) per square foot.

- H. <u>General Conditions</u>: This cost shall include all costs normally associated with mobilization such as surveying, trailer, signage, office supplies, temporary power, phone and sanitation, clean-up, and fencing. The CM/GC shall itemize and provide with its proposal a list of all costs that it is proposing for general conditions.
- I. <u>Other Costs</u>: No costs, exceptions or exclusions will be allowed outside of those listed above.

CM/GCs shall also submit rate schedules (similar to the Form Rate Schedule directly below) for all key employees that the CM/GC anticipates will provide services in connection with this RFP. If the CM/GCs intend to use different employees during different phases of the process and at different fee rates, please include and list those appropriately. Fees should be based only on the Projects as designed.

Form Rate Schedule for CM/GC and Its Key Employees				
Name and Title of	Hourly Rate	<u>Hours</u>	Total Cost Per Employee	
<u>Employee</u>				
Continue naming all key				
employees of the CM/GC				
that the CM/GC				
anticipates will provide				
services regarding this				
RFP				
	Grand Totals:			

#### V. PROPOSAL SUBMISSION REQUIREMENTS; POTENTIAL PROPOSAL PROTECTIONS

- A. All proposals must be submitted as one document (20 single-sided pages or less with a font size of 12 points or greater) and be organized to sequentially address each of the following subsections:
  - 1. CM/GC Proposal Form. The CM/GC must complete Exhibit A and have Exhibit A signed by an authorized representative of CM/GC.

2. Introduction. The CM/GC must provide an introduction section to its submitted proposal Version: March 2024 Page | 7

regarding the CM/GC.

- 3. Surety Company Letter. The CM/GC must submit a letter from a surety company indicating that the CM/GC is capable of obtaining payment and performance bonds for up to at least \$1,500,000 for the Project. The surety submitting the letter must have a current surety license for the State of Utah, be listed as a certified surety company in the current United States Department of the Treasury Circular 570 and have an underwriting limitation greater than or equal to \$1,500,000, as set forth in the current United States Department of the Treasury company letters indicating "unlimited" bonding/security capability are not acceptable. Payment and performance bonds will be required at the time the construction contract is awarded. The final value of the bonds must equal the negotiated amount of the construction contract and related contract documents.
- 4. Statement of CM/GC's Qualifications and Experience: The CM/GC must submit a statement of qualifications and experience (four pages in length or less) that describes the following:
  - a) the CM/GC's overall qualifications and experience;
  - b) the CM/GC's specific qualifications, past project experience of on-site management teams, preconstruction team, and key personnel;
  - c) the CM/GC's team experience with the County or NRCS;

CM/GCs should refer to Section VII regarding the specific details of evaluation criteria to make sure they provide information based on those topics which will be evaluated.

The CM/GC should keep in mind that the list of personnel in the Proposed CM/GC team section of the statement of qualifications are considered key personnel. The CM/GC is agreeing to make the personnel available to complete work on the Project at whatever level the Project requires. Personnel changes will be reviewed by County to assure the replacement is equally qualified and has adequate experience. County will only allow changes in key personnel when caused by circumstances outside the control of the CM/GC. Changes in key personnel for the convenience or benefit of the CM/GC will not be allowed and are strongly discouraged.

5. Management Plan: CM/GCs shall develop and submit a management plan (five pages in length or less) demonstrating how it will manage its responsibilities and scope of work outlined within this RFP. The management plan should include the CM/GC's philosophy and approach to the following: preconstruction services, project communication plan, schedule control plan, cost control plan, safety plan, quality control plan, change control plan, self-performing plan, and project closeout plan. The management plan should include a narrative that specifically addresses the firm's or individual's experience and capability to successfully perform the required services requested in the RFP.

Included in the management plan is your proposed project schedule described herein at subsection V.6., Project Schedule.

Indicate all services that will be provided during the preconstruction phase of the Project and the individuals who will be performing these services. Provide an organizational chart to clarify the CM/GC's supervision and support structure during this phase. Clearly identify all personnel that will be considered as a construction supervision cost under the GMP. Any personnel not identified in this management plan to be a construction supervision cost, will be considered a part of the lump sum construction management fee and will not be allowed as either a future general conditions or construction supervision cost except for those that are actually performing the construction activities.

Indicate the number of projects (outside of this scope) that the project manager will be responsible for during the Project.

6. Project Schedule: Include in your management plan a proposed project schedule. Indicate critical dates and other information in sufficient detail for the selection committee to determine if the time frames are reasonable. Address project specific criteria, risks that have been identified by the RFP, and additional risks that the CM/GC has identified. State how those risks will be mitigated. Provide and include an 11"x 17" page to utilize and demonstrate a proposed project schedule. A completion date prior to that shown in the RFP schedule is requested, but not mandatory. The actual notice to proceed will be based and determined on how quickly the CM/GC returns the contract and the required bonds, general conditions, as well as the resolution of any issues that may arise in the procurement process. The actual completion date will be based on the CM/GC's proposed schedule and the date the CM/GC received the contract for signature.

All plans, schedules and proposals are required to reflect the project construction time. Non-compliance with the schedule will not result in automatic disqualification; however, it will be evaluated by the selection committee in determining the final selection.

- 7. Termination or Debarment Certification: Federal and state regulations require certification by prospective contractors (including CM/GCs, subcontractors, and principals) as to current history regarding debarment, eligibility, indictments, convictions, or civil judgements. The CM/GC must submit a certification that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from soliciting work by any governmental department or agency. The CM/GC must also certify that neither it nor its principals have been terminated during the performance of a contract or withdrew from a contract to avoid termination. If the CM/GC cannot certify these two (2) statements the firm shall submit a written explanation of the circumstances for review. CM/GCs are to submit these certifications with the statement of qualifications.
- 8. Project Risks, Tools, and Ideas: Describe the CM/GC's philosophy and approach in addressing a risk identification and mitigation plan, tools and techniques, value added ideas, include a risk identification and mitigation plan. State how risks will be mitigated throughout the process by your firm being specific as to the scope and knowing that change order acceptance will be minimal.

9. References: Provide the names and contact information for a minimum of four references—two

from owners and two from subcontractors where you have completed projects and worked with subcontractors using the CM/GC method. The Selection Committee will use this information to, among other things, verify the CM/GC's project history, qualifications, and experience, and previous success in establishing working relationships between the CM/GC team members, subcontractors, owners, and other key project stakeholders.

As noted above, CM/GCs should refer to section VII regarding the specific details of evaluation criteria for all related items listed above to make sure they provide information based on those topics which will be evaluated.

Proposals in non-standard formats cannot be evaluated without considerable analysis. Failure to satisfy any of the foregoing proposal submission requirements may result in rejection of the CM/GC's submitted proposal.

- 10. CM/GC shall submit one original, six copies, and one electronic copy of its proposal to the County. The electronic copy of CM/GC's proposal must be in "PDF" format, and submitted on a flash drive, or other electronic storage medium (See subsection B directly below for potential proposal protection).
- 11. CM/GC shall address its proposal as set forth below. CM/GC shall submit its proposal by mail or hand delivery. All proposals are due on October XX at 5:00 pm. Proposals that do not meet these requirements are subject to rejection by the County.

If Provided by Mail: San Juan County Attn: Mack McDonald 117 South Main Street PO Box #9 Monticello, Utah 84535 <u>If Provided by Hand Delivery</u>: San Juan County Attn: Mack McDonald 117 South Main Street Monticello, Utah 84535

- B. Potential Proposal Protection
  - 1. The electronic pdf copy of CM/GC's proposal must be a full and complete copy of CM/GC's proposal unless:
    - CM/GC's proposal contains information that may be protected under Section 63G-2-305(1), Utah Code Annotated, Section 63G-2-305(2), Utah Code Annotated, or both; and
    - b. CM/GC complies with Section 63G-2-309, Utah Code Annotated.
  - 2. If CM/GC satisfies subsections a. and b. directly above, the electronic pdf copy of

CM/GC's proposal must be a redacted copy of CM/GC's proposal.

3. If CM/GC complies with subsections 1a, 1b, and 2 directly above, the County, upon receiving a GRAMA request for CM/GC's proposal, will release a copy of CM/GC's redacted proposal. However, if CM/GC fails to comply with subsections 1a, 1b, and 2 directly above, the County, upon receiving a GRAMA request for CM/GC's proposal, will release a full and complete copy of CM/GC's proposal.

#### VI. COUNTY'S REQUEST FOR PROPOSALS POLICY

Each CM/GC who submits a proposal in response to this RFP agrees to comply with and be bound by the County's Request for Proposals policy ("the RFP Policy"). Each CM/GC may request and receive a copy of the RFP Policy by sending an email to <u>mmcdonald@sanjuancounty.org</u> and requesting a copy of the RFP Policy.

#### VII. EVALUATION CRITERIA

Submitted Proposals will be evaluated and scored by the selection committee based on the following criteria:

Evaluation Criteria			
<u>Primary Criteria</u>	<u>Primary Criteria</u> <u>% of Overall</u> <u>Evaluation</u> Score		
Statement of Qualifications, Experience & References		Sub-Criteria	Sub-Criteria % of Primary Criteria Evaluation Score
	35%	• <u>Overall Qualifications</u> : show the overall qualifications and experience of the CM/GC, including those projects completed by the CM/GC that are of similar scope, size and complexity to the Project scope of work in this RFP.	15%
		<ul> <li><u>Qualifications of Proposed Teams and Key</u> <u>Personnel</u>: show the qualifications and experience of the specific teams proposed by the CM/GC for the Project in relation to projects of similar scope, size and complexity to the Project. Include team members' experience on past relevant projects, clearly identify what role they filled in the listed relevant projects, describe staff member availability during the project, years of experience and years of experience with current company. In particular, the CM/GC should address the following roles and teams (or their equivalent</li> </ul>	10%

		•	<ul> <li>in CM/GC proposed structure): <ul> <li>Preconstruction Team;</li> <li>Construction Team;</li> <li>Project Manager;</li> <li>Superintendent;</li> <li>Project Estimator.</li> </ul> </li> <li>Previous Experience: show any previous experience of CM/GC with San Juan County or NRCS as listed in this RFP. Include the following information about each applicable project: <ul> <li>Name &amp; location</li> <li>Construction costs</li> <li>Construction Type (e.g. stream diversion systems, stream bed repair or concrete work)</li> <li>Year project finished</li> <li>Length of time CM/GC spent on project</li> <li>Rolls filled on project, and names of employees that filled roles.</li> </ul> </li> </ul>	10%
Primary Criteria	Primary Criteria <u>% of Overall</u>			
	<b>Evaluation</b>			
	<u>Score</u>			
Management Plan, Project Schedule, & Risk Mitigation	40%		Sub-Criteria	Sub-Criteria % of Primary Criteria Evaluation Score
		•	<ul> <li><u>Management Plan</u>:         <ul> <li>Overall Understanding of Project: show the overall understanding of the Project, the user, the risks, the Project specific needs or site conditions, a project organization chart during construction.</li> <li>Preconstruction Services: show how the team will approach the preconstruction services.</li> <li>Project Communication Plan: show how teams will communicate with San Juan County, NRCS and Project Team throughout the various phases of the Project.</li> <li>Schedule Control Plan: provide a detailed schedule; identify the necessary bid packages; include identifying, managing and controlling critical path activities.</li> <li>Cost Control Plan: show how the team will approach managing and controlling Project costs throughout construction,</li> </ul> </li> </ul>	20%

		<ul> <li>including bid packages and change requests.</li> <li>Safety Plan: show how the team will approach safety on the work site, include any applicable certifications and training documentation.</li> <li>Quality Control and Value Added Ideas: show how the team will approach quality control and how to provide added value ideas related to site constraints, available labor force, material selection and costs, and scheduling.</li> <li>Change Control Plan: show how the team will manage and control RFIs, ASIs, PRs, PCOs, and change order pricing.</li> <li>Self-Performing Plan: the construction firm shall also discuss what portions of the Project they plan to self-perform.</li> <li>Project Closeout Plan: provide a plan for Project Schedule: provide a detailed schedule; identify the necessary bid packages; include identifying, managing and controlling critical path activities as they relate to Project construction time.</li> <li>Risk Mitigation: provide a detailed risk mitigation plan, show CM/GC will identify Project risks and work to mitigate them.</li> </ul>	10%
Cost Proposal, Fees, and Markups	25%		25%

#### VIII. PROJECTED SCHEDULE FOR THE RFP PROCESS

The County reserves the right to modify this schedule at its sole discretion.

<u>Activity</u> Request for Proposal Issued On-Site Q&A Meeting Last day to submit questions via e-mail Proposal Due Date Notice of Award Date March 12, 2024. March 22, 2024 (11:00 am) April 5, 2024 (5:00 pm) April 8, 2024 (5:00 pm) April 16, 2024

#### IX. QUESTION AND ANSWER MEETING

Interested CM/GCs wishing to submit a proposal are required to attend an onsite question, answer, and introduction meeting located on site at the Pack Creek Bridge pullout. We will meet directly in front of the bridge and drive/walk to each project location throughout the area. If the weather is incremental, we will hold the meeting in the County Administration Building Commission Chambers Room 200, at 117 South Main Street in Monticello, Utah on Friday, March 22, 2024, at 11:00 am. It is critical that interested parties are on time for the meeting and that appropriate attire be worn. Attendance at this meeting is not mandatory.

#### X. PROPOSAL CLARIFICATIONS

County may convene the selection committee to develop a short list of not less than three CM/GCs to be invited to face-to-face proposal clarifications. This proposal clarification process will be made using information provided by the CM/GC in response to the RFP and the evaluation criteria as noted above in Section VII, Evaluation Criteria.

If necessary, the purpose of a face-to-face proposal clarification is to provide an opportunity for the selection committee to seek clarification of the CM/GC's proposal.

The CM/GC's proposed primary project personnel, including the project manager and superintendent, must be in attendance at a face-to-face proposal clarification. The project manager must be in daily control of the construction site during actual construction. The superintendent must have overall job authority for CM/GC, must be in attendance at all Project Committee meetings, job meetings, and must be authorized by the CM/GC to negotiate and sign any and all change orders in the field, if necessary. Unless otherwise noted, the attendance of the project manager and subcontractors is at the discretion of the CM/GC.

#### County reserves the right to select a CM/GC without an interview process.

#### XI. INQUIRIES

All inquiries relating to this RFP must be directed to Mack McDonald, San Juan County's Purchasing Agent, via email at <u>mmcdonald@sanjuancounty.org</u>. County may reject any proposal submitted in response to this RFP if one or more employees, agents, representatives, or otherwise contacts any other County employee, agent, or representative regarding this RFP.

#### XII. PROTESTS

CM/GCs may protest the RFP process in accordance with the San Juan County RFP Policy.

#### XIII. ADDITIONAL PROVISIONS

CM/GCs, by submitting a proposal in response to this RFP, agree to be bound by the San Juan County RFP Policy and this RFP, including the following: who submit a proposal in response to this RFP acknowledge that they have each read and understand this RFP and agree to be bound by the terms and provisions of this RFP, including, but not limited to, the following:

A. Proposals Must Remain Constant

Proposals, including costs, must remain constant from the proposal submission date through the execution of a contract between the County and a CM/GC for one or more services sought through this RFP. Any proposal which will not remain constant for this required time period may be rejected by the County.

B. Governing Law; Jurisdiction; Venue; Restriction on Assignment

All contracts between the County and a CM/GC for one or more services sought through this RFP will be interpreted, construed, and given effect according to the laws of the state of Utah and the ordinances and policies of the County. The courts within San Juan County, Utah will have exclusive jurisdiction and be the exclusive venue regarding any matter regarding such contract(s) or any matter regarding this RFP. No such contract may be assigned, in whole or in part, without the written consent of the County.

C. Licensing

A selected CM/GC shall obtain all applicable federal, state, and local licenses before a contract between the County and the CM/GC for one or more services sought through this RFP is executed. These licenses must be maintained by CM/GC for the duration of the contract between the County and CM/GC for one or more services sought through this RFP.

D. Registration

CM/GC shall be registered with the Utah Department of Commerce, Division of Corporations and Commercial Code. CM/GC may obtain forms and information regarding this registration requirement by calling (801) 530-4849 or 1-877-526-3994, or by accessing the following website: www.commerce.utah.gov.

E. Modifying Proposal

CM/GC may modify its proposal at any time prior to the deadline for interested CM/GCs to submit proposals, which is set forth in the "Projected Schedule for the RFP Process" section above. After this deadline, CM/GC is precluded from modifying its proposal unless otherwise permitted by the RFP Policy or this RFP.

F. Independent Contractor

CM/GC agrees that, if it enters into a contract with the County, CM/GC will be an independent contractor, and, thus, CM/GC will not have the authority, express or implied, to bind the County to any agreements, settlements, liability, or understanding whatsoever with any third party, and CM/GC will not have an interest in any benefits provided by the County to its employees.

G. Free and Competitive Bidding

Any agreement or collusion among CM/GCs to fix a price, limit competition, or other similar conduct shall render the proposals of such CM/GCs void.

H. Insurance

CM/GC agrees that prior to entering into a contract with the County for one or more services sought through this RFP and for the duration of such contact, CM/GC shall secure and maintain, at its own expense, insurance coverage that satisfies the following:

- 1. General Liability Insurance: An occurrence form commercial general liability insurance policy with the following minimum limits:
  - a. Each occurrence \$2,000,000.00;
  - b. Damage to Rented Premises \$100,000.00;
  - c. Medical Expense (any one person) \$10,000.00;
  - d. Personal and Adv. Injury \$2,000.000.00;
  - e. General Aggregate \$4,000,000.00; and
  - f. Products Comp/Op Agg. \$2,000,000.00;
- 2. Builders Risk Insurance: To assist in satisfying the following obligation to the County regarding the Project, CM/GC shall obtain a builders risk insurance policy with a completed value of \$1,500,000.00 or more and any additional coverage protections the CM/GC desires to satisfy the following obligation: "From the commencement of the

Project through the completion of the Project, CM/GC shall carry all of the risk arising from, in connection with, and/or relating in any way to the Project, including all materials, fixtures, and equipment, and regardless of whether the property is at the Project Site, in transit, or off the Project Site."

- 3. Automobile Liability Insurance: With minimums to satisfy the state of Utah's requirements; and
- 4. Workers Compensation and Employer's Liability Insurance: With minimums to satisfy the state of Utah's requirements.
- I. Indemnification

CM/GC agrees that, if it enters into a contract with the County, CM/GC, for itself, and on behalf of its representatives, shall indemnify the County and its representatives from any and all claims that arise from, are in connection with, or relate to the contract, the acts or omissions of CM/GC, its representatives, or both, or both the contract and the acts or omissions of Services, its representatives, or both.

#### J. Conflicts

Any conflicts between one or more of the following shall be resolved in the following order:

- 1. the contract between the County and a CM/GC for one or more services sought through this RFP;
- 2. the RFP Policy;
- 3. the County's other policies and procedures;
- 4. this RFP; and
- 5. the proposal submitted by a CM/GC in response to this RFP.

#### EXHIBIT A CM/GC PROPOSAL FORM

CM/GC	Name:
(Provide the complete legal name for th Address:	e CM/GC)
City: St	ate: Zip:
List one person who San Juan County may contact cond	cerning CM/GC's proposal.
Name and	Title:
Telephone	Number:
E-Mail:	
Mailing	Address:
Final Proposal Cost/Pricing Structure:	
Preconstruction Fee: The CM/GC agrees to perform all s for the lump sum of (\$).	services during the pre-construction phase
<u>Construction Management Fee:</u> The CM/GC agree construction phase for the lump sum of (\$	es to perform all services during the
<u>Construction Supervision Cost</u> : The CM/GC agrees to p services, not covered in the construction m (\$).	perform all supervision and support team nanagement fee, for the sum of
CM/GC Change Order Markup: The CM/GC agr	rees not to add more than 5% to

CM/GC Change Order Markup: The CM/GC agrees not to add more than 5% to subcontractor/supplier costs for all work added to the contract by change order due to scope changes or otherwise.

Self-Performed Work Markup: The CM/GC agrees not to add more than 5% to its labor and material costs to self-performed work by the CM/GC.

Self-Performed Unit Costs (example):

a.	Labor to install spread footings (less rebar)	\$ per cubic yard
b.	Labor to install continuous footings (less rebar)	\$ per cubic yard
c.	Labor to install slab on grade (less rebar)	\$ per square
	foot	
d.	Labor to install suspended slabs (less rebar)	\$ per square
	foot	

General Conditions: (Attach itemized list with line item and total amounts where applicable)

The CM/GC guarantees that the Project will be complete, including punch list items, within the negotiated time frame after receipt of the notice to proceed, should the CM/GC be selected to enter into a contract with the County. The CM/GC agrees to pay liquidated damages in the amount of \$1,000.00 per day for each day that the Project is not completed after the expiration of the negotiated time frame as stated in a contract between the County and the selected CM/GC.

I certify that to the best of my knowledge the information contained in this proposal is accurate and complete. I further certify that I am legally authorized by CM/GC to submit this proposal and bind CM/GC.

CM/GC:

	Ву:
	Print
Name:	 Title:
	Date:

#### EXHIBIT B SPECIFICATIONS AND DESIGN

#### UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE

ADDRESS: 2390 West Highway 56, Suite 14 Cedar City, Utah 84720

**PHONE:** 435-868-3947

## CONSTRUCTION DRAWINGS, SPECIFICATIONS, OPERATION and MAINTENANCE



United States Department of Agriculture Natural Resources Conservation Service

PROJECT: San Juan County Pack Creek EWP

I have reviewed these specifications with an NRCS representative and agree to follow the details herein. I will notify NRCS 72 hours prior to construction or excavation related to this project and will keep them informed on a regular basis on the progress of the project.

Signed by Sponsor			Date	
Signed by NRCS R	epresentative		Date	
Prepared By:	Jason Dodds	Date:	<u>June 2023</u>	

USDA is an equal opportunity provider, employer, and lender.

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Practice Code	Job Class
578 Stream Crossing	V
Bankfull Capacity V = all	
580 Streambank and shoreline protection	V
Bankfull capacity = 1500 CFS < 5000 CFS	
Channel Depth V = all	
410 Grade Stabilization Structure	V
Effective height 15 Ft < 20 Ft	
Drainage Area 21,120 < 25,600	
587 Structure for Water Control	V
Drainage Area 21,120 < 25,600	
Effective height 5 ft < 10 ft	
Discharge < 10 CFS	
Wall height < 8 ft	

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## DESIGN REPORT

Sponsor: San Juan County

#### Contract #: NR228D43XXXXC004

County: San Juan

Purpose: EWP

#### I. SUMMARY

June 9, 2021 the Pack Creek Fire was started by an abandoned campfire. The fire burned approximately 8,952 acres in the Pack Creek Drainage. The NRCS was originally called out in August 2021 to complete a DSR on the incident. At the time of the first visit no significant flows had happened in Pack Creek but the next couple months the monsoonal moisture would cause significant downcutting and damage to a low water crossing, power and water crossing, and irrigation diversion structure.

Due to the significant erosion and downcutting in the channel, this engineering design has been divided into two types of . Phase 1 only deals with the critical infrastructure and knickpoints in effort to reduce significant head cuts and continue to provide water, power and access. Phase 2 will protect these structures by establishing a sustainable grade for the creek. These phases have been contracted at the same time but has 2 separate sets of drawings.

Phase 1 consists of 5 locations along the Pack Creek community identified as critical. Starting from the top they are the utilities and bridge crossing at the Mattson property, the irrigation diversion, the water and power crossing, the low water crossing and the Pack Creek bridge.

Mattson utilities are encased in concrete but are being eroded due to an exposed surface and little reinforcement. A large headcut has made it way under the Mattson Bridge. A large grade control structure is planned to prevent further downcutting to protect the bridge abutments and concrete encased low water crossing.

The irrigation diversion supplies all irrigation water to the pack creek community. The existing diversion is just above a massive 15 ft headcut that is only being stopped by a large concrete pad. The pad is jeopardized be large flows which are working on all sides of the structure. A new grade control structure, rock berm, j hook, and diversion box are all required at this site. The irrigation diversion structure is required because there is no way to install the grade control structure without affecting the existing diversion box. The diversion box is considered an environmental structure and therefore will meet ACI 350.

The water and power crossing consists of a culinary water line that was exposed and broke due to high flows. The water line is used to provide redundancy in the culinary system in Pack Creek. The water line will be replaced by the Pack Creek water company and protected by EWP to prevent further damage from erosion and flooding. In the same location there is an exposed power line that is jeopardized. This design consists of a concrete grade control structure with a k rail cross vain to ensure this area remains a critical knickpoint.

The low water crossing on Desert Solitaire is the sole access for many resident on the north side of Pack Creek. This critical knickpoint has a head cut that has worked its way up to the crossing and actually jeopardized the existing low water crossing to the point people cannot drive across. A new road crossing including a culvert will be installed be the county. EWP funds will be used to protect the new crossing by installing a concrete high flow crossing and grade control structure.

The Pack Creek bridge is the only access road to the pack creek community. High flows have eroded the downstream side of the bridge causing a six-foot drop. A grade control structure has been designed to prevent continued downcutting and protect this critical infrastructure.

Phase 2 consists of 8 locations along the Pack Creek community where continued downcutting or lateral movement risks loss of property. There are 2 locations where toe rock will be used to prevent lateral movement and 6 locations where "Rock and Roll" structures will be used to stabilize the grade of the downcutting stream.

Toe rock, as shown in the design, consists of sloping the bank to a 1.5 to 1 slope ratio, installing toe rock with filter fabric, and re-seeding/planting the grubbed area with riparian vegetation.

Rock and Roll structures consist of alternating, interlocking logs into the banks at a constant grade. Log

#### II. DESIGN CONSIDERATIONS

Pack Creek is a perennial stream that has very low flows in the late summer months but has seen post fire monsoonal flows of over 1500 CFS. It is in an area with very poor-quality rip rap as most formations are sandstone. The NRCS geologist came out and identified some of the Pack Creek flood boulders as suitable rock for stream restoration projects. All other rock will have to be hauled out of Green River which is 52 mile haul. Many of the cottonwoods that were growing along pack creek have been killed by the fire. These trees will hopefully be used during phase 2 of this project.

Rock was sized using the NRCS technical supplement 14C for part 654 of the National Engineering handbook. This technical supplement has many different methods which produce drastically different rock sizes from a D50 of 28 inches all the way up to a D75 of 121 inches. EWP project must be environmentally and economically justifiable and therefore a D50 of 28 inches has been selected for this project. This is the largest stone size economically obtained in the area.

Critical data inputs were pulled from the measured velocities and depths measured at the Mattson Bridge during most events in the past two years. Design inputs are as follows.

 $G_s = 2.65 \text{ or } \gamma_s = 165.36 \text{ lb/ft}^3$ Width = 25 ft Manning's n = 0.05Slope = .04 ft/ft Depth = 6 ft C = 0.86 for high turbulence zones. V = 13.5 ft/sec Channel Friction Slope = 0.04 ft/ft



Isbash Equation

Isbash Solution  $D_{50} = 28$  inches. (See riprap spreadsheet in the calculations)

$$D_{50} = 0.0122 V^{2.06} \qquad (eq. TS14C-9)$$

US Bureau of Reclamation

US Bureau of Reclamation Solution  $D_{50} = 31$  inches

$$D_{50} = 0.01 V^{2.44}$$
 (eq. TS14C-10)

USGS Method

USGS Method Solution  $D_{50} = 69$  inches.

$$D_{75} = \frac{3.5}{C \times K} \times \gamma_{w} \times D \times S_{f} \qquad (eq. TS14C-19)$$

Lane's Method

Lane's Method Solution  $D_{75} = 121$  inches.

Most of the project area is located on private property. All design aspects must have land rights to install and maintain each project. Land rights are the responsibility of the Sponsor.

For the new irrigation diversion structure, the water company wanted to be able to split the stream 30/70 percent. Water rights was contacted, and they agreed that this could be possible if all water users agreed to that management. The Diversion structure is designed to split 30/70 or take the entire stream depending on channel flow rate.

#### III. REFERENCES

- 1. USDA NRCS Utah, Conservation Practice Standard 578 Stream Crossing
- 2. USDA NRCS Utah, Conservation Practice Standard 580 Streambank and Shoreline Protection
- 3. USDA NRCS Utah, Conservation Practice Standard 578 Structure for Water Control
- 4. USDA NRCS Utah, Conservation Practice Standard 410 Grade stabilization Structure

#### IV. CONSTRUCTION

Sponsor will install part of the work on the low water crossing with his own forces and hire a competent contractor to do the installation on the rest of the sites. The contractor and sponsor are fully responsible for quality control. The NRCS will provide quality assurance as specified in this document.

#### V. OPERATION & MAINTENANCE

Sponsor will be responsible for the operation and maintenance of this project specific system in accordance with manufacturer's operations recommendations, provided NRCS specifications and state and local regulatory requirements and agreements. Because a lot of the work will be done on landowners property an MOU may need to be established to ensure O&M is completed as designed.

- VI. ENGINEERING JOB CLASSIFICATION JC = 5
- VII. CONSTRUCTION REQUIREMENTS

- 1. Drawings Numbered: 1-12
- 2. Construction Specification(s): 1-94

#### VIII. DESIGN APPROVAL

Design Reviewed by: Jason Roper Date: July 2023

Design Approved by: Jason Dodds Date: July 2023

#### IX. SPONSOR 'S ACKNOWLEDGEMENT

The Sponsor acknowledges that:

- a. He/She has received a copy of the construction drawings and specifications and has an understanding of the contents and the requirements.
- b. He/She has obtained all the necessary permits and land rights to construct and maintain this project.
- c. No changes will be made in the installation of the job without prior concurrence of the NRCS engineer.
- d. Maintenance of the installed work is necessary for proper performance during the project life.

Accepted by:	Dat	e:

### ROLES AND RESPONSIBILITIES DURING CONSTRUCTION

#### SPONSOR

- 1. Host a pre-construction conference (site showing).
- 2. May serve as general contractor.
- 3. Obtain all required permits.
- 4. Notify NRCS before construction. Keep agency informed of progress and any and all issues that may arise during construction.
- 5. Notify BLUE STAKES prior to beginning construction.
- 6. Follow all federal, state, and local laws, and zoning regulations.
- 7. Be available for consultation and decision making for all changes that may arise during construction.
- 8. Hire competent contractor.
- 9. Authorize contractor to start work after obtaining NRCS approved drawings (design) and specifications.
- 10. Protect all cultural and historic resources.
- 11. Assure compliance with drawing (design) and specification requirements.
- 12. Stop work of contractor when justified for safety issues or when contractor is not meeting contract requirements.
- 13. Seed any disturbed areas as required.
- 14. Pay bills and submit copies of receipts to NRCS as required.

#### CONTRACTOR

- 1. Participate in the pre-construction conference.
- 2. Inform Sponsor of planned construction schedule and details during construction.
- 3. Provide adequate notice to Sponsor before starting the job so that NRCS may be notified (72 hours advance notice)

- 4. Protect all NRCS survey benchmarks from damage. Keep Sponsor informed of progress.
- 5. Immediately inform Sponsor and NRCS when unexpected site conditions are encountered.
- 6. Avoid unnecessary destruction of NRCS layout survey staking and flagging.
- 7. Provide/perform necessary layout staking, flagging, and measurements beyond basics provided by NRCS.
- 8. It is the contractor's responsibility to maintain quality control. (QC)
- 9. Protect any and all cultural and historic resources.
- 10. Protect surface water and groundwater from contamination during construction.
- 11. Read, know, and follow the construction plans and specifications.
- 12. Observe and verify utility locations.
- 13. Know and work safely within OSHA requirements at all times.
- 14. Use materials specified in construction drawings (design) and specifications. Obtain materials, equipment, and appropriately skilled personal on-site as scheduled.
- 15. Contractor must have a foreman (responsible decision maker) and a set of plans and specifications on-site at all times during construction.
- 16. Build to dimensions, elevation, and quality of workmanship specified in construction drawings (design) and specifications. Perform quality control (QC) activities such as staking, material verifications, and concrete tests where required.
- 17. Understand construction inspection plan. Do not proceed with work until required inspections are made.
- 18. Repair construction not meeting plans or specification requirements.

NRCS

- 1. Assist Sponsor with pre-construction conference.
- 2. Inform Sponsor and contractor of safety responsibilities. Inform Sponsor and contractor of observed safety concerns.
- 3. Follow quality assurance plan.

- 4. Provide basic layout and staking, as needed.
- 5. Be available for quality assurance (QA). Inform contractor and Sponsor of the results of inspections including, but not limited to, compliance with drawings (design), specifications, and safety requirements.
- 6. Protect any and all cultural and historic resources.
- 7. Observe construction and perform needed quality assurance (QA) testing and measurements in order to determine that work meets requirements of the plans and specifications.
- 8. Inform Sponsor of presence of unexpected site conditions, cultural or historic resources. Investigate and determine need for design changes and provide alternatives as appropriate.
- 9. Ensure appropriate engineering approvals are obtained before making changes, and notify contractors and Sponsor of these approved changes.
- 10. Certify completion of construction for individual components, and entire system indicating that construction meets the requirements of the drawings (design) and specifications. Inform Sponsor of the components that need inspecting and the details of the inspection to help insure proper completion of the system.

## QUALITY ASSURANCE PLAN QA-UT-09, ROCK STRUCTURES

#### QUALITY ASSURANCE ITEMS:

The following items should be inspected at the time of installation to insure that the system will be functional for the life of the project. The technical representative should be notified 48 hours prior to the installation so that a staff member may be there to document the installation.

With prior approval, some of the items may be installed without inspection if documented at the time of installation with photographs.

- Bank Excavation
  - Installed in the proper location, starting and ending stations and tied into banks according to plans.
  - Dimensions are according to the drawings. Front, back slopes, and height.
  - Sand and gravel filters and/or filter fabrics installed according to plans and specifications.
- Rock
  - Rock gradation, minimum size, maximum size of rock.
  - Rock material is type specified.
  - Rock shape, i.e. angular not round.
  - Rock is placed according to design.
  - Dimension of walls, height, width, slopes

#### SPECIAL QUALITY ASSURANCE ITEMS:

All rock must be approved by the NRCS geologist prior to installation.

## QUALITY ASSURANCE PLAN QA-UT-10, STREAM WORK

#### Quality Assurance Items

- The following items should be inspected at the time of installation to insure that the system will be functional for the life of the project. The technical representative should be notified 48 hours prior to the installation so that a staff member may be there to document the installation.
- With prior approval, some of the items may be installed without inspection if documented at the time of installation with photographs.
- Bank Excavation
  - Installed in the proper location, starting and ending stations and tied into banks according to plans.
  - Dimensions are according to the drawings. Front, back slopes, and height.
  - Sand and gravel filters and/or filter fabrics installed according to plans and specifications.
- Rock
  - Rock gradation, minimum size, maximum size of rock.
  - Rock material is type specified.
  - Rock shape, i.e. angular not round.
  - Rock is placed according to design.
  - Dimension of walls, height, width, slopes
- Planting/live staking
  - Type, diameter and species are according to plan.
  - Planting depth is according to the drawings.
- Revetments (Root wads, trees, etc)
  - $\circ$  The proper size and length and diameter is installed according to the plans.
  - The proper anchor system is installed.

- Fencing
  - Location, size, type is installed according to the plans.

Special Quality Assurance Items: The contractor must be able to demonstrate proper depth of rock. Pictures and survey will be essential to ensuring proper depth and thickness.

## GENERAL REQUIREMENTS

#### <u>GENERAL:</u>

This construction plan sets forth the requirements for this installation as shown on the drawings and described in the construction specifications. The project shall be constructed at the location and to the lines and grades as shown on the drawings in accordance with the construction specifications. These construction plan documents are only applicable to Farm Bill practices.

#### RESPONSIBILITIES:

#### a. <u>Sponsor / Operator</u>:

The Sponsor /operator is the official spokesperson for this project. The Sponsor /operator is the person who reviewed and approved the construction plan, made all contractual agreements with the contractor, ensures construction is in accordance with the requirements as set forth in the plans, obtains all permits and is financially responsible. The Sponsor /operator is the sole person who can authorize any changes during construction that incur financial obligations. The Sponsor /operator is responsible to repair any disturbed areas by seeding, planting or other methods of mitigating damages.

#### b. <u>Technical Representative</u>:

Technical Representative may be a Technical Service Provider or NRCS personnel. The technical representative has the authority to review the practice during construction and conduct necessary tests and quality control reviews to ensure that all work is in compliance with the construction plan. The technical representative reviews all construction changes and insures that the Sponsor /operator approves prior to installation. The technical representative maintains a job diary and/or construction notes and prepares as-built drawings of the project when applicable.

#### c. <u>Contractor</u>:

The contractor/installer has a contractual agreement with the Sponsor /operator for the project installation as set forth in the construction plan. The contractor/installer shall not make changes to the construction plan without technical representative and Sponsor /operator approval. The contractor/installer shall comply with all applicable permits and conduct the work in a safe and timely manner.

#### CONSTRUCTION PLAN:

#### a. <u>Specifications</u>:

The construction specifications and material specifications describe minimum acceptable quality of work and materials for the project. Specifications may also reference a commercial standard such as the American Society of Testing Materials, ASTM, which identifies materials. Commercial standards set forth the minimum acceptable quality of identified materials within the industry. If a conflict arises between the drawings and specifications, the specification governs the work and/or material.

#### b. <u>Drawings</u>:

The drawings are a visual representation to supplement construction and material specifications. The drawings include location, profiles, sections, details and notes necessary to describe the work.

#### PERMITS:

All permits, rights of ways, and/or easements that are applicable for the construction and/or operation are the responsibility of the Sponsor /operator and shall be available for review by the technical representative prior to the start of construction.

#### SAFETY:

The contractor is responsible for compliance with all state and local laws, ordinances, codes, and/or regulations applicable, including OSHA 1910 and 1926, to the project. The technical representative will document any safety violations witnessed.

## SPECIAL ENVIRONMENTAL CONSIDERATIONS: Environmental Laws, Executive Orders, Policies, etc.

The Sponsor is responsible for compliance with all wetlands, cultural resources, federal, state and local laws, ordinances, codes, and/or regulations applicable. *As applicable, these specific measures have been identified and documented on the NRCS conservation measures specification sheet. Any changes to the layout of the project will need to be cleared with the technical representative 48 hours prior to construction.* The technical representative will document any special environmental violations witnessed.

#### WORKMANSHIP:

The contractor is responsible for damage of any property that occurs during construction. The construction site shall be maintained in a safe and clean manner. The
contractor will be responsible to restore temporary construction areas to pre-existing condition.

# Pollution Control:

When applicable the Contractor is responsible for developing a Storm Water Pollution Prevention Plan (SWPPP) and obtaining the necessary permits from the State of Utah, Department of Water Resources (UDWR). Applicability is defined by rules and regulations required by UDWR. The Contractor is responsible for following the approved plan and is liable for any fees or fines resulting from the development/violation of the plan.

A SWPPP shall be submitted to the technical representative before construction activities begin. SWPPP may consist of a written description or plan view drawing of the proposed measures/actions to be taken. As a minimum the SWPPP shall consist of:

## Chemical pollution:

The contractor shall provide watertight tanks or barrels or construct a sump sealed with plastic sheets to dispose of chemical pollutants, such as drained lubricating or transmission fluids, grease, soaps, concrete mixer washwater, or asphalt, produced as a by-product of the construction activities. At the completion of the construction work, sumps shall be removed and the area restored to its original condition. Sump removal shall be conducted without causing pollution.

# Air pollution:

The burning of brush or slash and the disposal of other materials shall adhere to state and local regulations. Fire prevention measures shall be taken to prevent the start or spreading of wildfires that may result from project activities. Firebreaks or guards shall be constructed and maintained at locations shown on the drawings.

All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust. All dust control methods shall ensure safe construction operations at all times. If chemical dust suppressants are applied, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations.

The contractor shall maintain equipment in such a manner to avoid pollution of the soil, water, or air. Washing down, fueling, or servicing of equipment shall not take place in any body of water. Sponsor /operator and the technical

representative shall be contacted after any spill. The Contractor is responsible for all costs and shall clean-up any spill immediately upon discovery. Clean-up methods shall comply with guidance and methods approved by the Utah Department of Environmental Quality.

#### QUALITY CONTROL/QUALITY ASSURANCE:

Quality Control consists of developing, implementing, and maintaining a system to ensure that the specified quality is achieved for all materials and work performed. The contractor shall maintain a system of quality control to provide the specified material testing and verification of material quality before use. The system activities shall include procedures to verify adequacy of completed work, initiate corrective action to be taken, and document the final results.

Quality Assurance is performed by the technical representative to ensure that the project is being installed per the construction drawings and specifications. The technical representative is limited to assuring that the quality control system is being followed and is not responsible or authorized to direct construction activities.

#### **CERTIFICATION:**

Inspection of the project will be performed by the technical representative during construction and after the work has been completed. If deficiencies are found the Sponsor /Contractor will be notified by the technical representative verbally and/or in writing regarding corrective actions necessary before certification and payment of the project are made.

# CONSTRUCTION SPECIFICATION CS-UT-31, CONCRETE FOR MINOR STRUCTURES

## 1. <u>SCOPE</u>

The work consists of furnishing, forming, placing, finishing, and curing Portland cement concrete for structures. The structures must be constructed at the location and to the line and grades as shown in the plan.

## 2. <u>SITE PREPARATION</u>

The site must be excavated and cleared to a depth and area adequate to place gravel, concrete, and standpipe structure to the standards shown on the drawings and in this specification.

A 1 ½-inch minus gravel material must be placed beneath the structure to provide foundational support and allowing fine leveling as required. The gravel thickness must be a minimum of 6 inches unless otherwise indicated by the technical representative and must be spread to an area no less than 6 inches past the structure in all directions. The finished grade of the gravel must be as shown on the drawings.

# 3. MATERIALS

*Portland Cement:* Portland cement must conform to the requirements of ASTM C150 for the specified types of cement. Type I, II or III Portland cement must be used, unless another type is specified on the drawings.

*Concrete Aggregates:* The coarse and fine aggregate must conform to the durability and gradation requirements of ASTM C33. The maximum size of the aggregate must be 1 inch unless otherwise stated on the drawings.

*Admixtures:* Air-entraining admixtures must conform to the requirements of ASTM C260. Water-reducing and/or set-retarding admixtures must conform to ASTM C494 Types A, B, D, F or G. Plasticizing, or plasticizing and retarding admixtures must conform to ASTM C494, Types F or G, or C1017 as applicable. Accelerating or water-reducing and accelerating admixtures must be noncorrosive and conform to the requirements of ASTM C494, Types C and E.

*Fly Ash:* Class F fly ash meeting ASTM C618 may be used in the concrete mix as a partial substitution of Portland cement.

Reinforcing Steel: Steel bars for concrete reinforcement must be Grade 60 new, unfinished, deformed billet-steel bars conforming to ASTM A615/A615M. Welded steel wire fabric reinforcement must conform to the requirements of ASTM A1064/A1064M. Welded deformed steel wire fabric for concrete reinforcement must conform to the requirements of ASTM A1064/A1064M.

*Waterstop:* Waterstops must be of the non-metallic type and Class II fabricated of polyvinyl chloride (PVC) with the following requirements: Specific gravity must be a maximum of 1.4, tensile strength must be a minimum of 1,400 psi, ultimate elongation of the web must be a minimum of 280 percent (flanges must be a minimum of 200 percent). Waterstop must be tested and meet the following ASTM Standards: D792, D638, or D395.

Hydrophilic type waterstops must have a minimum tensile strength of 350 psi, Elongation of 600%, Tear resistance of 50 lbs/in and specific gravity of 1.3. Hydrophilic waterstops must meet ASTM D412, D624 and D792.

*Concrete Curing Compound:* Curing compound refers to a liquid membraneforming compound suitable for spraying on concrete surfaces to retard the loss of water during the concrete curing process. Curing compound must meet the requirements of either ASTM C309 or C1315. If type 1 is specified, a fugitive dye must be used.

Joint Sealant: Joint Sealant must conform to ASTM C920, Type S, Grade NS, Class 25, Use I. Sealant must have as a minimum movement capability of  $\pm$ 35% and tensile strength of 300 psi. The sealing compound if used with other joint material, such as fillers or gaskets, must be compatible.

## 4. <u>CONCRETE MIX DESIGN</u>

Concrete mixes must be composed of Portland cement, fine and coarse aggregates and clean water. Portland cement Type III and IIIA may be used upon request and acceptance by the technical representative, based on a need for early concrete strength to facilitate construction. Maximum size of the course aggregate must not exceed 1 inch. Fly ash may be used as a partial substitution for Portland cement in an amount of no more than 25 percent (by weight) of the cement in the concrete mix. The compressive strength of the concrete mix must be a minimum of 4,500 psi at 28 days. The water cement ratio must be no greater than 0.5 by weight, unless noted otherwise on construction drawings.

An air-entraining admixture must be used when concrete is placed in an environmentally exposed area; concrete must have air entrainment of 5 to 7 % (by volume) of the concrete at the time of placement.

Use of calcium chloride or antifreeze compounds is not permitted in any concrete mix.

Fiber mesh may be used as a secondary reinforcement to increase resistance to cracking and must not replace reinforcing steel as shown on the drawings. Fibers must be added to the concrete mix at a minimum rate of 1.5 pounds per cubic yard of concrete and a maximum of 15 pounds per cubic yard. Fiber mesh material must be 100 percent virgin polypropylene fibrillated fibers containing no olefin materials and conform to ASTM C1116 and C1399. The individual fibers must have a graded length of ½ inch to ¾ inch and incorporated into the concrete mix per manufacturers recommendations.

The slump must be 2 to 5 inches except when superplasticizer is used in the concrete mix. When superplasticizer is used, the slump must not exceed 8 inches following addition and mixing. Additional superplasticizer must not be added to the concrete mix after discharge of the concrete at the job site has commenced

Ten days prior to the concrete placement, the contractor must provide to the technical representative, a statement of the materials and mix proportions (including any admixtures needed) intended for use. The statement must include evidence satisfactory to the technical representative that the materials and proportions will produce concrete conforming to strength and mix requirements. The identified materials and proportions constitute the "job mix." After a job mix has been approved, neither the source, character, or grading of the aggregates nor the type or brand of cement or admixture must be changed without prior notice to the technical representative. If such changes are necessary, no concrete containing new or altered material must be placed until the technical representative has approved a revised job mix.

# 5. <u>STEEL REINFORCEMENT</u>

The reinforcement must be the size, grade and overlap length as shown on the drawings and must be based on ACI 350-06, Sections 12.2.2 and 12.15, using the appropriate factors for a Class B splice. Reinforcing steel must be free from rust, oil, grease, paint or other deleterious matter. Welded wire fabric must overlap

the larger of 6 inches or two mesh spacings. Installation of reinforcing into fresh concrete is not permitted. Welding of reinforcing steel is not permitted.

All reinforcing must be supported and securely fastened in-place to prevent movement during placement of the concrete. Stabbing of reinforcing steel into wet concrete must not be permitted. Vertical reinforcement must be supported by either plastic chairs or epoxy coated steel wire. Horizontal reinforcement must be supported by concrete blocks having strength equal to or greater that the 28-day compressive strength of the concrete being placed, or plastic chairs.

Maintain the following concrete coverage for concrete reinforcing:

Unformed surface in contact with earth	3″
Formed surfaces in contact with earth	2″
Formed surfaces exposed to outside weather	2″
Clear distances between bars	2″

When specified on the construction drawings, the contractor must provide to the technical representative a construction plan detailing size, location, dimensions, bend angles, minimum overlap, embedment length and quantity of reinforcing steel to be placed (rebar schedule). The contractor must provide the rebar schedule to the technical representative 10 days prior to placement for approval.

# 6. <u>FORMS</u>

Concrete forms must have sufficient strength and rigidity to hold the concrete and to withstand the necessary pressure, tamping and vibration without deflecting from the prescribed lines. They must be mortar-tight and constructed so that they can be removed without hammering or prying against the concrete. Form surfaces must be smooth and free from holes, dents, sags, or other irregularities. Forms must be coated with a non-staining form release agent prior to being set into place. All form work must remain in place a minimum of 24 hours after placement of concrete. The contractor must be responsible for the construction, design, placement and removal of all formwork. All shoring during placement of concrete is the sole responsibility of the contractor.

All form ties must permit their removal to a depth of 1 inch below the surface of the concrete without injury to the concrete and must not be used without use of cones. Form ties that break off at the surface of the concrete must not be

permitted. Cone holes must be filled with a non-shrink concrete grout that is tamped into the hole immediately after form removal

Items to be embedded in concrete must be positioned accurately and anchored firmly.

## 7. <u>WATERSTOPS</u>

Waterstops must be of the size, dimension and location shown on the drawings and must be held firmly in the correct position as the concrete is placed. Joints must be cemented, welded, or vulcanized as recommended by the manufacturer. Joints must be watertight. Intersecting waterstop joints must be prefabricated and supplied by the same manufacturer providing the waterstop.

## 8. <u>CONSTRUCTION JOINTS</u>

Construction joints must be made at locations shown on the drawings and of the type specified by the technical representative.

Surfaces of construction joints must be cleansed of all unsatisfactory concrete, laitance, coatings, stains, or debris by washing and scrubbing with a wire brush or wire broom and kept moist for at least one hour prior to placement of new concrete.

In addition, the top surfaces of walls and columns must be immediately and carefully protected from any condition that might adversely affect curing of concrete.

Expansion and contraction joints must be made only at locations shown on the drawings. Exposed edges on these joints must be carefully tooled, chamfered and free of mortar and concrete spillage.

Preformed expansion joint filler must be held firmly in the correct position as the concrete is placed and must be left exposed for its full length with clean and true edges.

# 9. <u>SAFETY</u>

The contractor is responsible for compliance with all state and local laws, ordinances, codes, and/or regulations applicable, including OSHA Part 1910 and 1926, to the project. The technical representative will document any safety violations witnessed.

The contractor must develop and implement safety protocols that comply with OSHA Part 1910 and 1926. As a minimum the procedures will include: catwalks

and railings for work performed in excess of 4 feet above the ground (ladders may be used as work platforms only when use of small hand tools or handling of light material is involved), protective cones for all vertically exposed rebar, and construction equipment (including concrete delivery trucks) must be equipped with reverse alarms. If a concrete bucket is used, no person must either ride or at any time be directly underneath a bucket in transport.

## 10. <u>PLACEMENT</u>

Contractor must notify the technical representative 48 hours prior to the placement of concrete to allow inspection of the reinforcing steel, forms, subgrade, preparation for curing, and vibrating equipment. Concrete must not be placed until the subgrade, forms, and steel reinforcement have been inspected and approved.

Prior to placement of concrete, the forms, reinforcing steel, and subgrade must be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, rust or other harmful substances and/or coatings. Rock surfaces must be cleaned by wire brushing, wet sand-blasting, air water jets or other means satisfactory to the technical representative. Earth surfaces must be firm and damp before placing concrete. Placement of concrete on mud, dried earth, uncompacted fill or frozen subgrade will not be permitted.

No additional water must be added to the concrete at time of placement to increase slump and workability of concrete, unless water has been withheld prior to mixing of the concrete (trim water). In that event, water may be added to the volume levels which had been withheld, such that the total water of concrete mix placed is equal to the approved mix proportions.

The maximum length of time between introduction of the cement to the aggregates and placement of the concrete in the forms must not exceed 1-1/2 hours for concrete temperatures below 85° F or 45 minutes for concrete temperatures above 85°F.

Mobile concrete mixers or volumetric batching and continuous mixing at the construction site is permitted. The batching and mixing equipment must conform to the requirements of ASTM C685 and must be demonstrated before placement of concrete by tests with the job mix to produce concrete meeting the specified proportioning and uniformity requirements.

Concrete must be consolidated by either hand spading and tamping or mechanical vibration to ensure smooth and dense concrete along form surfaces, in corners, and around embedded items. The use of vibrators to transport

concrete in the forms is not permitted. Vibration must not be applied directly to the reinforcement steel, forms, or to concrete that has begun to set.

Successive layers must be placed at a fast enough rate to prevent the formation of "cold joints". If a successive layer cannot be placed in a timely manner, a standard type construction joint must be used between layers.

Concrete must be placed in horizontal lifts not greater than 20 inches. Concrete must not be dropped more than 5 feet vertically, or 12 feet vertically for a superplasticized concrete mix. An elephant trunk, chute, or similar means must be used when applicable to minimize the vertical drop.

The depositing of concrete must be regulated so that concrete may be consolidated with a minimum of lateral movement, segregation, laitance, or honey-combing. Hoppers and chutes must be used as necessary to prevent segregation and the splashing of mortar on the forms and reinforcing steel above the placing level. Temporary stays and braces can be removed when no longer needed.

Vibration is required at all joints that contain waterstops.

#### 11. DELIVERY TICKETS

The contractor must obtain from the supplier a delivery ticket for each load of concrete before unloading at the site. A copy of the delivery ticket for each truckload of ready mix concrete must be available for review by the technical representative. The following minimum information must be included on each load ticket:

- A. Name of concrete supplier and batch plant
- B. Name of purchaser and job location
- C. Date of delivery
- D. Truck Number
- E. Amount of concrete delivered
- F. Time loaded or time of first mixing of cement and aggregates
- G. Mixing water in the load as free water, including any water trimmed
- H. Type and amount of cement
- I. Type and amount of admixtures

- J. Weights of fine and coarse aggregate
- K. Percent moisture content or weight of free water contained in the aggregate.

The contractor or inspector must also include the following additional information on the load ticket:

- L. Water added by the receiver of the concrete
- M. Time the concrete arrived at the site
- N. Time the concrete was completely unloaded.

## 12. <u>FINISHING OF UNFORMED SURFACES AND CURING</u>

All flat work surfaces must be true and even, and must be free from open or rough spaces, depressions, or projections. All flatwork must be screeded to grade and then bull-floated. Vibratory screeding may be used in lieu of bullfloating.

Sloped slabs must be worked to a uniform grade, maintaining the specified thickness, and finished in a manner to insure dense concrete. All sloped surfaces must be true and even, and must be free from open or rough spaces, depressions, or projections.

Excessive floating or troweling while the concrete is soft must not be permitted. The addition of dry cement or water to the surface of the screeded concrete must not be permitted.

Concrete edges must be chamfered 3/4 inch or finished with molding tools.

Concrete must be cured for a period of at least 7 days after it is placed. Exposed concrete surfaces must be kept continually wet during the entire curing period or until curing compound is applied.

Curing compound must be thoroughly mixed immediately before applying, and must be applied at a uniform rate recommended by the manufacturer, as a minimum. It must form a uniform, continuous, adherent film over the entire surface.

Curing compound must not be applied to surfaces requiring bond with concrete remaining to be placed, construction joints, reinforcing steel, and embedded items. These areas must be wet cured.

Concrete surfaces subjected to heavy rainfall, running water and/or other moisture damage within 3 hours after curing compound has been applied must receive a second application.

## 13. FINISHING FORMED SURFACES AND CURING

Concrete edges must be chamfered 3/4 inch or finished with molding tools.

Concrete must be cured for a period of at least 7 days after it is placed.

Forms must not be removed without approval of the technical representative. Removal of forms must be done in such a way as to prevent damage to the concrete and in a way that will allow the concrete to take the stresses due to its own weight uniformly and gradually.

Wall forms and forms for joints with waterstops must not be removed for 24 hours after the concrete is placed. Other forms may be removed when the concrete is sufficiently cured so that the concrete will not be damaged. When forms are removed prior to the 7 day curing period the concrete surfaces must be kept continually wet during the entire curing period or until curing compound is applied

Age of stripped concrete must be at least 7 days before any load is applied other than the weight of forms, scaffolds and succeeding lifts.

The following must be done immediately after removal of forms.

- A. Removal of all fins and other surface irregularities which affect appearance or function.
- B. Removal of all form bolts and ties to the depth of their cone.
- C. All cavities, holes and honey-combing must be thoroughly cleaned, wetted and filled with dry pack mortar. The area to be patched must be kept damp prior to patching.
- D. The patching mortar must be compacted to form a dense, wellbonded unit that is free from shrinkage cracks.
- E. All patched areas must be cured as specified in Section 11.

# 14. <u>REMOVAL OR REPAIR</u>

Concrete that is honeycombed, damaged, frozen or otherwise defective must be removed or repaired immediately upon discovery, at the contractor's expense. The technical representative must be notified of any damaged concrete. The contractor must submit to the technical representative a removal/repair plan prior to performing any repair work for concurrence.

All patching repairs must be made using a non-shrink grout material and installed per the approved plan. When proprietary patching material is proposed in the plan, the manufacturer's data sheets and written recommendations must be included in the plan.

Repair material or replacement concrete must have properties, color, and texture similar to and compatible with the concrete being repaired or replaced. Repair or replacement concrete work must be performed only when the technical representative is present.

Curing of repaired or replaced concrete must be started immediately after finish work is completed or as specified by the manufacturer of proprietary compounds.

## 15. SPECIAL PROVISIONS FOR CONCRETING IN HOT/COLD WEATHER

Hot Weather:

For this specification, hot weather is defined as any combination of high ambient temperature, (generally above 80°F), low relative humidity, and wind velocity tending to impair the quality of fresh or hardened concrete or otherwise resulting in abnormal properties.

The temperature of the concrete must be less than 90°F during mixing, conveying and placement.

Special provisions must be made to immediately protect and cure the concrete due to rapid drying conditions. Concrete surfaces exposed to the air must be kept continuously wet for the first 24 hours of the curing period or until curing compound is applied.

In extreme conditions, it may be necessary to (1) restrict placement to late afternoon, or night, (2) restrict the depth of layers to assure coverage of the previous layer while it will still respond readily to vibration, (3) suspend placement until conditions improve.

## Cold Weather:

For this specification, cold weather is defined as when the daily minimum ambient air temperature at the site is less than 40°F.

The temperature of the concrete at the time of placement must not to be less than  $50^{\circ}$ F, nor more than  $90^{\circ}$ F. Heated water of  $140^{\circ}$ F or less may be used when cement is added to the mix.

Prior to placement of concrete, all ice, snow and frost must be completely removed from all surfaces to be in contact with the concrete.

The use of antifreeze or accelerator compounds is not allowed.

The concrete must be protected for a minimum of three days following placement with insulated blankets or heated enclosures. Combustion heaters must have exhaust flue vented out of the concrete protection enclosure and must not be permitted to dry the concrete.

Concrete must maintain a uniform temperature throughout its entire dimension to minimize thermal expansion/contraction cracks.

In both hot and cold weather concreting, the contractor must furnish to the technical representative, a record of daily maximum and minimum ambient air and concrete surface temperatures during the curing period.

#### 16. <u>PIPE DETAILS</u>

Pipe entering into or leaving the structure must cast into the wall of the structure and be located as shown on the plans. The joint must be watertight.

## 17. <u>SAFETY GRATES ON THE STRUCTURE</u>

If the structure has an open top a protective cover is required on top of the structure to prevent accidental entry. Covers must be permanently attached to the structure, support the weight of an adult and allow adequate access for maintenance. The grates must be sturdy and made of steel unless otherwise approved by the engineer.

## 18. <u>HEADGATES</u>

Structures requiring headgates must have new screw-type headgates matching the appropriate size of pipe used or size of gated opening. Headgates must be mounted securely to the pipe or the structure using manufacturer's specifications. Support for the frame of the gate may be required for tall gates. The headgate frame may be supported by the structure. The headgate riser stem must be tall enough that removal of the safety grate is not required to operate the gate.

## 19. MEASUREMENT AND PAYMENT

Concrete is measured to the neat lines or pay limits as shown on the drawings, and the volume of concrete is computed to the nearest 0.1 cubic yard. No deduction in volume is made for chamfers or edges.

Payment for each item of concrete is made at the contract unit price for that item. The payment for concrete will constitute full compensation for completion of the concrete work, including furnishing and placing reinforcing steel, furnishing and handling concrete, joint fillers, waterstops, metal plates, dowels or dowel assembles, and metal plates, but not including other items listed for payment elsewhere in the contract.

## 20. ITEMS OF WORK AND CONSTRUCTION DETAILS

All concrete structures must meet or exceed ACI-350.

# CONSTRUCTION SPECIFICATION CS-UT-23, EARTHFILL

## 1. <u>SCOPE</u>

The work consists of the construction of earth embankments, other earthfills, and earth backfills required by the drawings and specifications.

*Earthfill* is composed of natural earth materials that can be placed and compacted by construction equipment operated in a conventional manner.

*Structural Earth backfill* is composed of natural earth material placed and compacted in confined spaces or adjacent to structures (including pipes) by hand tamping, manually directed power tampers or vibrating plates, or their equivalent.

*Unsuitable material* is composed of sod, brush, roots, woody and vegetative materials, concrete rubble, frozen soil, perishable material or any other material not suitable as earthfill.

## 2. <u>MATERIALS</u>

All fill material must be obtained from required excavations and designated borrow areas. The selection, blending, routing, and disposition of material in the various fills must be subject to approval by the technical representative.

Rock particles larger than the maximum size specified for each type of fill must be removed prior to compaction of the fill.

The types of material used in the various fills must be as listed and described in the specifications and drawings.

## 3. FOUNDATION PREPARATION

The foundation area must be cleared of trees, stumps, roots, brush, rubbish, and stones having a maximum dimension greater than six (6) inches. Foundations must be stripped to remove vegetation and other unsuitable materials or to the depth shown on the drawings, whichever is greater. Topsoil must be stripped from the foundation area and stockpiled for use as a top dressing for vegetation establishment unless otherwise shown on the drawings.

Earth foundations must be graded to stable slopes and surface irregularities removed.

Foundation soils must be free of loose, uncompacted earth in excess of 2 inches in depth and must be at a moisture content such that the earthfill can be compacted and bonded with the first layer as specified for subsequent layers of earthfill. Foundation soils must be free of frozen materials or standing water prior to earthfill being placed upon them.

## 4. <u>PLACEMENT</u>

Fill must not be placed until the required excavation and preparation of the underlying foundation soils is completed and inspected by the technical representative. No fill must be placed upon or incorporated with unsuitable material.

Fill must be placed in approximately horizontal layers beginning at the lowest elevation of the foundation. The thickness of each layer of fill prior to compaction must be as specified in Table 1. Materials placed by dumping in piles or windrows must be spread uniformly to not more than the specified layer thickness prior to compaction.

Structural earth backfill must be placed in a manner that prevents damage to the structures and allows the structures to assume the loads from the earth backfill gradually and uniformly. The height of the earth backfill adjacent to a structure must be increased at approximately the same rate on all sides of the structure.

# For Concrete structures, placement of structural earth backfill may begin after the concrete has cured for the minimum time specified in CS-UT-31, Concrete for Minor Structures.

Earthfill in dams, levees, and other structures designed to impound water must be placed to meet the following additional requirements:

a. The distribution of materials throughout each zone must be essentially uniform, and the fill must be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material.

b. The embankment top must be maintained approximately level during construction except for sectional construction as approved by the technical representative or as shown on construction drawings.

c. Dam embankments must be constructed in continuous layers from abutment to abutment, except where openings to facilitate construction or to allow passage of stream flow during construction are specified.

d. If the surface of any layer becomes too hard and smooth to achieve a suitable bond with the succeeding layer, it must be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed.

Table 1 – Equipment Compaction Requirements			
Equipment Type	Applicable Soils <sup>1</sup>	Layer Thickness <sup>2</sup> (inches)	Minimum Passes <sup>3</sup>
Sheepsfoot roller (10,000 lb. min. operating weight)	ML, MH, CL, CH or SM, SC, GM, GC with >20% fines	9	Walked out <sup>4</sup>
Vibratory tamping roller (9,000 lb. min operating weight)	SM, SC, GM, GC	9	3
Rubber-tired scraper (fully loaded)	GM, GC, SM, SC, ML, MH, CL, CH	9	1
Rubber-tired front end loader (fully loaded)	GM, GC, SM, SC, ML, MH, CL, CH	6	1
Track-type crawler (standard tracks)	GM, GC,	6	2
30,000 lb. min.	SP, SW, GP, GW	12	4
	CL, ML, SC, SM	6	4
Less than 30,000 lb.	GW, GC, GP, GW, SM, SC, SP, SW, ML, CL	6	4
Steel drum Vibratory roller (10,000 lb. min.)	SP, SW, GP, GW	12	4

<sup>1</sup> Unified Soil Classification System

<sup>2</sup> Prior to Compaction

- <sup>3</sup> The technical representative must determine if adequate compaction is being achieved. Additional passes may be required.
- <sup>4</sup> Walked Out refers to compaction effort achieved when the sheeps foot tooth no longer penetrates the fill layer.

# 5. <u>MOISTURE CONTROL</u>

## In all cases:

The application of water to the earthfill material must be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the material after placement on the earthfill, if necessary. Uniform moisture distribution must be obtained by disking.

Material that is too wet when deposited on the earthfill must either be removed or be dried to the specified moisture content prior to compaction.

If the top surface of the preceding layer of compacted earthfill or a foundation or abutment surface in the zone of contact with the earthfill becomes too dry to permit suitable bond, it must either be removed or scarified and moistened by sprinkling to acceptable moisture content before placement of the next layer of earthfill.

Earthfill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content, must be reworked to meet the requirements or removed and replaced by acceptable earthfill. The replacement earthfill and the foundation, abutment, and earthfill surfaces upon which it is placed must conform to all requirements of this specification for foundation preparation, approval, placement, moisture control, and compaction. Contractor is responsible for all additional costs, time and materials associated with reworking placed earthfill.

During the course of the work, the technical representative may perform quality assurance tests to identify material; determine compaction characteristics; determine moisture content; and determine density of earthfill in place. Tests performed by the technical representative will be used to verify that the earthfill conforms to compaction and moisture requirements and is not as a replacement for the contractor's quality control system.

# 6. <u>COMPACTION</u>

Earthfill must be compacted and with appropriate moisture according to the following requirements for the class of earthfill specified on drawings:

**Class A**—Each layer of earthfill must be compacted, as necessary, to provide the density of the earthfill not less than the minimum density specified on the construction drawings or as specified below.

 The compacted fill must have a minimum density as specified in Section 8 of this specification or as shown on the drawings. The density must be shown as a percent of the standard proctor maximum dry density as determined by ASTM D698, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort." The in-place density of the compacted fill must be determined using any of the following test procedures: ASTM D1556 "Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method", D2167 "Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method", D2937 "Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method", and D6938 "Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)."

- Moisture content for the compacted earthfill must be determined by one of the following methods: ASTM D-2216 "Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass", D-6938 "Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)", D-4643 "Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating", D-4944 "Standard Test Method for Field Determination of Water (Moisture) Content of Soil by Pressure Tester", or D-4959 "Standard Test Method for Determination of Vater (Moisture) Content of Soil by Direct Tester", or D-4959 "Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating." Acceptable moisture content must be within the range of +/-2% of the optimum moisture as determined using ASTM D-698.
- The contractor must provide a quality control system to verify that placed earthfill has achieved adequate compaction and moisture content, per laboratory test data. As a minimum, the quality control system must included one (1) field test for every lift of earthfill or 300 cubic yards placed. The contractor is responsible for obtaining and testing soil samples for determination of standard proctor maximum dry density and optimum moisture content of soil to be used as fill.

*Class C*— Each layer of earthfill must be compacted by the specified number of passes of the type and weight of roller or other equipment specified in Table 1 or by an approved equivalent method. Each pass must consist of, at least one complete coverage by the wheel, track, or roller over the entire surface of the fill layer in a direction parallel to the main axis of the fill.

• Fill materials must have a moisture content sufficient to insure the required compaction. When kneaded in the hand, the soil will form a ball which does not readily separate and will not extrude out of the hand when squeezed tightly. The adequacy of the moisture content will be determined by the technical representative.

*Class S*— Earth backfill adjacent to structures must be compacted to a density equivalent to that of the surrounding in place earth material or adjacent required earthfill or earth backfill. Compaction must be accomplished by hand tamping or manually directed power tampers, plate vibrators, walk-behind, miniature, or self-propelled rollers. Unless otherwise specified, heavy equipment including backhoe mounted power tampers or vibrating compactors and manually directed vibrating rollers must not be operated within 3 feet of any structure. Towed or self-

propelled vibrating rollers must not be operated within 5 feet of any structure. Compaction by means of drop weights operating from a crane or hoist is not permitted.

- Testing must follow Class A compaction, moisture and quality control requirements as stated above.
- Compacting of earth backfill adjacent to structures must not begin until the concrete has attained the specified strength, as determined by testing of casted concrete cylinders, by direction of the technical representative or the following:

Structure	Time interval (days)
Vertical or near-vertical walls with earth loading on one side onl	y 14
Walls backfilled on both sides simultaneously	7
Conduits and spillway risers, cast-in-place (with inside forms in place)	7
Conduits and spillway risers, cast-in-place (inside forms removed	d) 14
Conduits, pre-cast, cradled	2
Conduits, pre-cast, bedded	1
Cantilever outlet bents (backfilled both sides simultaneously)	3

*Class U*— Earthfill that is made of excess or unsuitable material from the project site must be spread in adjacent fields or removed burned and buried. Buried material will be at least 3 feet below the natural ground surface and the finished surface of the burial area will blend in with surrounding topography. Disposal areas must be those shown on construction drawings or as directed by the technical representative.

# 7. <u>MEASUREMENT AND PAYMENT</u>

For items of work for which specific unit prices are established in the contract, the volume of each type and compaction class of earthfill and earth backfill within the specified zone boundaries and pay limits is measured and computed to the nearest cubic yard. No deduction in volume is made for embedded items, such as, but not limited to, conduits, inlet structures, outlet structures, embankment drains, sand diaphragm and outlet, and their appurtenances.

Payment for each type and compaction class of earthfill and earth backfill is made at the contract unit price for that type and compaction class of earthfill. Such payment will constitute full compensation for all labor, material, furnishing, transporting, equipment, water application, and all other items necessary and incidental to the performance of the work.

## 8. <u>ITEMS OF WORK AND CONSTRUCTION DETAILS</u>

Class C fill will be sufficient for this project. See Table 1 for compaction details.

# CONSTRUCTION SPECIFICATION CS-UT-21, EXCAVATION

## 1. <u>SCOPE</u>

The work consists of all excavations to the lines and grades as shown on the drawings.

# 2. <u>SAFETY LAWS</u>

The owner and/or contractor is responsible for compliance to all Federal, State of Utah, and local safety laws, ordinances and regulations applicable for excavation and removal of materials.

## 3. <u>REMOVAL OF WATER</u>

The contractor must construct and maintain all necessary cofferdams, channels, flumes, pumping equipment, and/or other temporary diversion and protective work for dewatering the various parts of the work. Foundations, cutoff trenches, and other parts of the work must be maintained free from water as required for construction. After having served their purpose, all temporary protective works must be removed, or leveled in such a way as to not interfere in any way with the operation, usefulness or stability of the project.

## 4. <u>USE OF EXCAVATED MATERIALS</u>

Excavated materials that conform to the material requirements, as stated in the drawings and approved by the technical representative, may be used as earthfill to the extent as needed.

## 5. <u>DISPOSAL OF WASTE MATERIAL</u>

All surplus or waste material must be disposed of in areas shown on the drawings or as agreed upon by the Sponsor /operator and the technical representative, and left in a neat condition, free of depressions and sloped to drain.

## 6. <u>BRACING AND SHORING</u>

Unstable excavated surfaces and/or other excavations as defined by all federal and state law must be supported to prevent soil movement.

## 7. <u>EXCAVATION OF BORROW MATERIAL</u>

All borrow sites must be left in a final condition with stable side slopes, removal of hazards, sloped to drain, free of depressions and other unsightly conditions. Areas disturbed by work must be seeded as specified in the plan.

8. <u>BLASTING</u>

If use of explosives becomes necessary, the transportation, handling, storage, and use of explosives must be by a person of proven experience and ability in blasting operations in accordance with state laws. Blasting must be done in such a way as to prevent damage or unnecessary fracturing of the foundation.

## 9. OVER-EXCAVATED AREAS

All over-excavated areas must be brought up to design elevation with compacted fill using the appropriate NRCS Utah Construction Specification for Earthfill (CS-UT-23).

# CONSTRUCTION SPECIFICATION CS-UT-221, DIVERSION

1. <u>SCOPE</u>

The work consists of constructing a channel across the slope, with a supporting ridge on the lower side as shown on the drawings, or as staked by the technical representative.

# 2. <u>MATERIAL</u>

The earth material used in constructing the diversion must be obtained from the diversion channel, designated borrow areas, or other required excavation. The fill matrix must contain no frozen earth material, rock fragments greater than 4 inches in diameter, sod, brush, or other foreign material.

# 3. <u>CONSTRUCTION</u>

- A. The foundation of all fill sections must be prepared so that a good bond is obtained between the base and fill material. Heavy sod must be stripped to a minimum of 6-inches in depth and the area scarified. Existing banks must be cleared of all debris and sloped to a 1:1 slope or flatter before fill placement. All dead furrows and gullies to be crossed must be filled and compacted. All old terraces, fence rows, and obstructions that will interfere with the diversion must be removed. All trees, brush, stumps, and vegetation **or frozen material** must be removed and disposed at sites shown on the drawings or as approved by the technician.
- Fill material must be placed in layers of 6 inches or less prior to compaction and fully compacted prior to the placement of the next layer.
  Each layer must be compacted by the construction equipment in such a

manner that the entire surface of each fill layer will be traversed by one wheel tread or track of the equipment.

- C. When stated on the drawing, the topsoil must be removed, stockpiled, and replaced after initial grading.
- D. The top of the constructed ridge must not be lower at any point than the design elevation plus 20 percent, but not less than 6 inches above the design elevation for settlement.

# 4. <u>ITEMS OF WORK AND CONSTRUCTION DETAILS</u>

Construction survey will be required in ensure proper depth of excavation and placement of riprap.

# CONSTRUCTION SPECIFICATION CS-UT-02, CLEARING AND GRUBBING

## 1. <u>SCOPE</u>

The work consists of the clearing and grubbing of designated areas by removal and disposal of trees, snags, logs, stumps, shrubs, vegetation and rubbish.

## 2. <u>REMOVAL</u>

All trees, snags, logs, brush, stumps, and shrubs not marked (section 3) for preservation and rubbish must be removed from within the limits of the construction areas. Unless otherwise specified, all stumps, roots and root clusters having a diameter of 1 inch or larger must be grubbed out to a depth of at least 2 feet below subgrade elevation for concrete structures and 1 foot below the ground surface for earthfills.

## 3. <u>MARKING</u>

The limits of the area(s) to be cleared and grubbed will be marked by stakes, flags, tree markings, or other suitable methods.

Trees to be left standing and uninjured will be designated by special markings placed on the trunk about 6 feet above the ground surface.

## 4. <u>SALVAGE</u>

Trees to be salvaged for saw logs must be trimmed and cut to planned lengths and hauled to the loading area.

Brush piles for wildlife must be established as shown on the drawings.

## 5. <u>DISPOSAL</u>

Where brush piles for wildlife are not specified on the drawings, cleared and grubbed materials must be disposed of by burning or burying at selected locations approved by the technician. Where cleared and grubbed materials are hauled offsite they must be disposed of in accordance with local and state laws. Materials to be buried must be placed at least 2 feet below the surrounding ground line and have a minimum of 2 feet of cover with the finished surface graded to drain. Any burning operations must be subject to all public laws governing such operations.

# CONSTRUCTION SPECIFICATION CS-UT-11, REMOVAL OF WATER

# 1. <u>SCOPE</u>

The work consists of the removal of surface water and ground water as needed to perform the required construction. This also includes the dewatering of borrow sites. It must include furnishing, constructing and operating all temporary facilities and equipment. This construction specification also includes removal of temporary facilities.

## 2. <u>DIVERTING SURFACE WATER</u>

Protective measures needed to divert stream flow and other surface water must be built, maintained, and operated during construction.

#### 3. <u>DEWATERING CONSTRUCTION AND BORROW SITES</u>

The construction site must be dewatered and kept free of standing water or excessively muddy conditions as needed for proper execution of the construction work. Dewatering must include furnishing, installing, operating and maintaining all equipment including pumps as needed.

## 4. <u>REMOVAL OF TEMPORARY WORKS</u>

After the temporary works have served their purposes, they must be removed or graded to present a neat appearance without interfering with permanent drainage systems or stream flows.

## 5. <u>EROSION AND POLLUTION CONTROL</u>

All temporary works must be accomplished in such a manner that erosion and the transmission of sediment and other pollutants are minimized.

# CONSTRUCTION SPECIFICATION CS-UT-252, CONDUITS AND PIPELINES

# 1. <u>SCOPE</u>

The work consists of furnishing and placing circular, arched or elliptical pipe and necessary appurtenances.

# 2. <u>MATERIALS</u>

Pipe and fittings must conform to the requirements of the applicable NRCS Material Specifications listed below, for the type and grade of material being used. Where connecting bands are used, they must withstand the internal pressure of the installation without leakage.

All pipe sizes and classes must be as shown on the drawings. Any change must be approved by the technical representative prior to the purchase of the pipe.

# 3. <u>MATERIAL HANDLING</u>

The material must be delivered and handled in a manner that will not damage, or reduce its strength, or damage the coating. All special handling requirements of the manufacturer must be adhered to. When handling and placing coated or plastic pipe, care must be taken to prevent damage resulting from metal surfaces or rocks. Care must be exercised while handling the pipe during cold weather. Pipe that is mishandled must be fully inspected for damage and cracks. Damaged pipe must not be used. All fittings and couplers must equal or exceed the pressure rating of the pipe with which they will be used. They must be made of material that is recommended by the manufacturer for use with the pipe.

## 4. <u>LAYING AND BEDDING</u>

Unless otherwise specified, the pipe must be installed in accordance with the manufacturer's recommendations. The pipe must be laid such that the spigot must be inserted into the bell.

Soil material, fine gravel or coarse gravel specified as bedding material must be durable, non-compressible and be within the grading limits of the Unified Soil Classification System, USCS. The ASTM specifications for classifying soils are: ASTM D-2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), and ASTM D-2488, Standard Practice for Description and Identification of Soils (Visual Manual Procedure).

The following table lists some general properties of materials suitable for bedding. Gradation is unique for each soil in the USCS. The bedding

requirements are site specific and must be shown on the drawings using an identification symbol of the USCS.

		S.G.	Size
Material	USCS	(Min.)	(Max.)
Soil	SW,SP,SM,SC,ML,CL	1.75	#10 Sieve
Fine Gravel	SW,SP,SM,SC	2.00	3/4-inch
Coarse Gravel	GW,GP,GM,GC	2.40	3-inch
	SW,SP,SM,SC		

Installation of the pipe must be in accordance with Utah NRCS Construction Specification CS-UT-201, and bedding material must be hand compacted around the pipe to the depth of cover as stated on the drawings. The trench width must be 2 times the pipe diameter or 24 inches whichever is greater.

Installation of HDPE Pipe, which is ripped in, must be in accordance with Utah NRCS Construction Specification CS-UT-272.

Perforated pipe must be laid with the perforations down and oriented symmetrically about a vertical center line. Perforations must be clear of any obstructions at the time the pipe is laid.

Elliptical pipe and pipe with elliptical or quadrant reinforcement must be laid so that the vertical axis, as indicated by markings on the pipe, is in the vertical position.

During backfilling, the pipe must be anchored to prevent separation from the bedding. The pipe must be laid so the pipeline barrel is uniformly supported, which may require special excavation for bells and/or couplings.

All gasketed pipe, not glued or fused, must have thrust blocks placed at tees, reducers, elbows, valves, and end of lines. The deflection of the pipe between joints must not exceed 1 degree or 4 inches.

Exposed PVC pipe or pipe installed without UV protections must be painted or otherwise protected. PVC pipe must be painted only with a latex based paint.

#### 5. <u>STRUTTING</u>

When required, struts or horizontal support ties must be installed as specified on the drawings. Struts and ties must remain in place until the backfill has been placed to a height of 5 feet above the top of the pipe, or has been completed if the finished height is less.

## 6. <u>JOINTS</u>

Pipe joints must conform to the details prescribed by the manufacturer and shown on the drawings. All joints and connections must be sound, watertight, and withstand a working pressure equal to or greater than the pipe.

The joints must be made in a manner so that the inside of the pipe is free from obstructions.

When bell type joints with gaskets are used, the spigot must be inserted into the bell to the proper markings shown on the pipe.

## 7. <u>COATINGS</u>

All coatings must be inspected after final placement and just prior to backfill. Any pinholes and/or damage must be repaired with a material that is recommended by the manufacturer.

#### 8. <u>NRCS MATERIAL SPECIFICATIONS</u> A. <u>CONCRETE PIPE</u>

## NON-REINFORCED PIPE

The American Society of Testing Materials, ASTM, specifications applicable for concrete pipe are:

- a. <u>Irrigation pipe</u>. The pipe with rubber gasket joints must conform to the requirements of ASTM C-505, Standard Specification for Non-reinforced Concrete Irrigation Pipe with Rubber Gasket Joints.
- b. <u>Irrigation or drainage pipe</u>. The pipe with mortar joints must conform to the requirements of ASTM C-118, Standard Specification for Concrete Pipe for Irrigation or Drainage, (nonreinforced concrete pipe)
- c. <u>Drain tile</u>. The pipe must conform to the requirements of ASTM C-412, Standard Specification for Concrete Drain Tile.

- d. <u>Perforated pipe</u>. The pipe must conform to the requirements of ASTM C-444, Standard Specification for Perforated Concrete Pipe.
- e. <u>Culvert pipe</u>. The pipe must conform to the requirements of ASTM C-14, Standard Specification for Non-reinforced Concrete Sewer, Storm Drain, and Culvert Pipe, for the class of pipe specified on the drawing.

Refer to NRCS Material Specification, MS-543, Nonreinforced Concrete Pipe.

# REINFORCED PIPE

- a. <u>Round pipe.</u> Round reinforced concrete culvert pipe must conform to the requirements of ASTM C-76, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, C-361, Standard Specification for Reinforced Concrete Low-Head Pressure Pipe, or C-655, Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe, for the class of pipe specified on the drawing.
- <u>Arch pipe</u>. Reinforced concrete arch culvert pipe must conform to the requirements of ASTM C-506, Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe, for the class of pipe specified on the drawing.
- c. <u>Elliptical Pipe</u>. Reinforced concrete elliptical culvert pipe must conform to the requirements of ASTM C-507, Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe, for the class of pipe specified on the drawing.

Refer to NRCS Material Specification, MS-541, Reinforced Concrete Pressure Pipe

## RUBBER GASKET JOINTS

When rubber gasket joints are specified, the joints and gaskets must conform to the requirements of ASTM C-443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

B. <u>CORRUGATED METAL PIPE</u>

Corrugated metal pipe and fittings must conform to the requirements of the applicable Specification for the specified classes and shapes of pipe, as listed:

Corrugated steel pipe:ASTM A-760, Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains. Refer to NRCS MS 551 Coated Corrugated Steel Pipe.

Corrugated aluminum pipe: ASTM B745, Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains. Refer to NRCS Material Specification, MS-552, Aluminum Corrugated Pipe.

The additional requirements apply for riveted seams:

- a. Unless otherwise specified, circumferential shop riveted seams must have a maximum rivet spacing of 6 inches, except that 6 rivets will be sufficient for 12-inch diameter pipe.
- b. When close riveted pipe is specified: (1) the pipe must be fabricated so that the rivet spacing in the circumferential seams must not exceed 3 inches, except that 12 rivets will be longitudinal seams that will be covered by the coupling bands the rivets must have finished flat heads or the rivets and holes must be omitted and the seams must be connected by welding to provide a minimum of obstruction to the seating of the coupling bands.
- c. Double riveting or double spot welding for corrugated steel pipe less than 42 inches in diameter, or corrugated aluminum pipe less than 30 inches in diameter may be required. When double riveting or double spot welding is specified, the riveting or welding must be done in the manner specified for pipe 42 inches or greater in diameter.

## <u>COATINGS</u>

Coatings must conform to the requirements of ASTM-B745, ASTM-A760 for the specified material and type of coating. Refer to NRCS Material Specification, MS-582, Galvanizing

# C. <u>PLASTIC PIPE</u>

The pipe must conform to American Society of Testing Material (ASTM) Specification applicable for the manufacture of this pipe. Refer to NRCS Material Specification, MS-547, Plastic Pipe.

<u>Material</u>	SDR <sup>1</sup>	<u>SCH 40 &amp; 80</u>	<u>PIP<sup>2</sup></u>
	ASTM	ASTM	ASTM
Polyethylene, PE	D-2239		
PE-3608, PE-4710	D-3035		
High Density Polyethylene, HDPE, PE-3608, PE-4710	D-3350, F-714		
Polyvinyl Chloride, PVC	AWWA C-900 D-2241	D-1785 D-2466	ASTM-2241-A1

\*For pipelines conveying potable water, the material also requires approval of the National Sanitary Foundation, NSF.

- <sup>1</sup> SDR, Standard Dimension Ratio
- <sup>2</sup> PIP, Plastic Irrigation Pipe

# <u>FITTINGS</u>

The fittings must be of a material, size and pressure rating compatible with the pipe materials and withstand a working pressure equal to or greater than the pipe.

# <u>JOINTS</u>

- a. Solvent welding of joints must be in accordance with the recommendation of the pipe manufacturer.
- B. Rubber gasket joints and the gasket material must conform to ASTM D-3139, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- c. All joints and connections must withstand a working pressure equal to or greater than the pipe.

## HDPE JOINTS

Pipe joints must conform to the details prescribed by the manufacturer and shown on the drawings. Pipe joints must be sound and watertight at the working pressure equal to or greater than the pipe. The joints must be made in a manner so that the inside of the pipe is free from obstructions. Threaded joints on HDPE pipe are not acceptable. Only the following types of joints are approved by the technical representative.

Joints can be made in three different ways: Heat fusion, Electrofusion and mechanical connectors. For installation in cold weather, extra care must be taken to ensure the proper fusion heating procedures are followed, as outlined by the pipe manufacture.

- 1. Heat fusion joints are accomplished in three types: Butt, Saddle and Socket fusion. The following procedures are a summary of the installation procedures. Follow the pipe manufactures installation methods or ASTM F-2620 for specific installation requirements.
  - a. <u>Butt fusion</u> is very common and economical. All joints made with this method must be done with a butt fusion machine for the size of pipe being used. The procedures to follow for performing a butt fusion include but not limited to:
    - (1) The ends of the pipes need to be securely fastened in the machine
    - (2) The pipe ends must be properly faced or prepared with parallel surfaces
    - (3) The proper alignment of the pipe profile
    - (4) Heat the pipe interfaces in the machine as per pipe manufacturer's requirements.
    - (5) Join the two profiles together
    - (6) Hold the pipes under pressure until the fusion is complete as per pipe manufacturer's requirements.
  - b. <u>Saddle fusion</u> is performed by heating the outside of the pipe and the matching surface of the fitting and pressing both surfaces together for the fusion process. Saddle fusion is only permitted with the proper mechanical assist tools. The procedures to follow for the saddle fusion are similar to that of the butt fusion procedures. Note that the

proper heater adapters and saddle fusion machines are required.

- c. <u>Socket fusion</u> is accomplished by heating the inside of a fitting and the outside of the pipe. The fitting should be the proper size for the size of pipe being fused to it. Use the proper heater attachments to ensure that the material is heated to the proper temperature. Insert the pipe end into the fitting while there are both heated and apply the proper pressure until the fusion is complete. It is important during this procedure that the pipe is not twisted inside the fitting to make the connection.
- 2. Electrofusion is accomplished by putting a fitting around the pipe and using a machine to apply an electric current in the area that needs to be fused together. The pipe must be cleaned and clamped in the fitting and the proper machine to apply the electric current used. Follow the pipe manufactures installation methods or ASTM F-1290 for specific installation requirements.
- 3. Mechanical compression fittings must be made out of material with the proper burst strength and life expectancy of the installed HDPE pipe. The technical representative will only accept mechanical fittings that prevent pipe pull out. Follow the pipe manufactures installation methods.

## D. <u>STEEL PIPE</u>

Steel pipe must conform to the requirements of the applicable American Society of Testing Material, ASTM specification listed below for the kind of pipe and the type, weight, grade, and finish specified:

ASTM Specifications	
Welded and seamless steel pipe	A-53
(Standard Pipe)	
Electric-resistance-welded pipe (30-inch and under)	A-135
Arc-welded pipe (4-inch and over)	A-139

Arc-welded steel plate pipe (16-inch and over)	A-134	
AWWA Standard		
Fabricated electrically welded steel water pipe		C-200
Mill-type steel water pipe	C-200	
Refer to NRCS Material Specification, MS-54, Steel	Pipe	

## <u>FITTINGS</u>

Fittings must conform to the requirements of ASTM A-858 and A-865 for the types and kinds specified.

## E. <u>CORRUGATED POLYETHYLENE PIPE</u>

The manufacturer of corrugated polyethylene pipe must be governed by the American Association of State Highway and Transportation Officials, AASHTO.

The pipe must comply with the requirements for test methods, dimensions and markings in AASHTO specification M-294-S. The pipe and fittings must be made from PE compounds which conform to the requirements of cell class 324420C as defined and described in ASTM D-3350.

Refer to NRCS Material Specification, MS-548, Corrugated Polyethylene Pipe

# F. <u>ABOVE GROUND, MULTI-OUTLET PIPE- GATED PIPE</u>

# MATERIAL

Rigid pipe must be aluminum or plastic material certified for above ground use. Rigid pipe and appurtenances must be furnished with a coupling system that is interchangeable with the selected pipe material.

Rubber gaskets must be according to the manufacturer's standard design dimensions and tolerances for the pipe material selected.

Minimum wall thickness for aluminum gated pipe must be 0.050 inches for 6 through 10 inches in diameter and 0.058 for 12 inch diameter pipe. Corrosion protection must be provided for aluminum pipe when:

- Conveying water with a copper content exceeding 0.02 ppm
- In contact with soil having a resistivity of less than 500 ohm-cm
- In contact with soil having a pH less than 4 or greater than 9

Minimum wall thickness of rigid PVC pipe must be 0.120 inches. The pressure rating of the pipe must be 22 p.s.i. or greater, prior to gate installation.

Minimum wall thickness of lay-flat polyethylene pipe must be 6 mil (0.006 inches)
# CONSTRUCTION SPECIFICATION CS-UT-267, CONSTRUCTION FABRICS

# 1. <u>SCOPE</u>

This construction specification is applicable for furnishing and installation of woven and non-woven construction fabrics to the lines and grades as shown in the drawings.

# 2. <u>MATERIALS</u>

The materials will conform to the type specified on the drawings and must meet or exceed Material Specification, MS-592, Geotextile for the type of fabric to be installed. The bedding and covering must be of the material quality and depth as shown on the drawing.

# 3. <u>SITE PREPARATION</u>

The final grading of the earthwork must be completed before installation. The site must be free from depressions, ridges and angular rocks greater than 1 inch. The foundation must be unyielding to prevent forces that will elongate, tear or puncture the fabric. The area must be free from all sharp objects and foreign material such as wood, wire and metal. Bedding must be in place prior to the installation of fabric material.

# 4. <u>INSTALLATION</u>

If bedding is shown on the drawing, it must be installed prior to placement of the fabric. In channels, the fabric must be installed in the direction of flow. On slopes, the fabric may be installed across the slope or perpendicular to the slope. The ends and edges must be overlapped or shingled a minimum of 8 inches in the direction of flow and anchored. The fabric must be covered, seeded and/or fertilized as shown on the drawings.

## 5. <u>ANCHORING</u>

Unless otherwise shown on the drawings, the upper and lower ends of fabric on slopes that exceed 5:1 must be anchored by burial in a twelve-inch deep trench and covered and/or stapled. If the fabric is not covered, it must be secured by stapling in a diamond pattern with a minimum of two staples per square yard which includes all edges and ends stapled at a maximum spacing of four foot on center. Staples must be suitable for use with erosion control fabrics.

## 6. <u>ITEMS OF WORK AND CONSTRUCTION DETAILS</u>

Nonwoven Geotextile fabric will be required behind all rock structures as shown on the design.

# CONSTRUCTION SPECIFICATION CS-UT-256, ROCK STRUCTURE

# 1. <u>SCOPE</u>

The work consists of furnishing and installing loose rock structures including filter layers or bedding as specified on the drawings.

# 2. <u>MATERIALS</u>

Rock Rip Rap must conform to the requirements of Material Specification 523, Rock Rip Rap, or if so specified from designated sources. It must be free from dirt, clay, sand, rock fines, and other material not meeting the required gradation limits. Rock must be approved by the technical representative prior to installation.

# 3. <u>SITE PREPARATION</u>

The site must be excavated and backfilled to the lines and grades shown on the drawings. Fill material must be obtained from approved excavations. Prior to filling, the existing ground surface must be scarified to ensure a bond with the fill material. The fill material must be compacted to the density of the surrounding undisturbed areas. Excess excavated material must be disposed of by spreading in areas shown on the drawings or removed from the site.

## 4. <u>REMOVAL OF TREES AND VEGETATION</u>

Removal of trees and brush must only be to the extent necessary to do the work and done in a manner as to avoid damage to remaining trees, other vegetation and property. Shade, food, and/or den trees to be saved must be marked with ribbon. Stumps and root wads will not be removed unless they are within the excavation areas shown on the drawings.

Disposal of trees, brush, and other materials must be done in a manner that is compatible with federal, state and local law, regulations, and/or ordinances that cause the least detrimental effect to the environment.

# 5. <u>FILTER OR BEDDING</u>

When the drawings specify fabric filter, aggregate filter or bedding beneath structures, the filter or bedding material must be spread uniformly on the prepared subgrade surfaces to the depth specified. Compaction of filter layers or bedding is not required, but the surface of such layers must be finished and reasonably free of mounds, dips, or windrows. Construction Specification CS-267 applies for the installation of Construction Fabrics.

## 6. <u>EQUIPMENT-PLACED ROCK</u>

The rock must be placed by equipment to the depths specified. The structure must be constructed to the full course thickness in a manner that prevents

displacement of the underlying materials. The rock must be placed in a manner that will ensure that the rock is reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact with one another. The smaller rocks and spalls fill the voids between the larger rocks. End dumping or dozer placement of rock is not permitted.

## 7. <u>GRADATION</u>

Rock and filter materials must be of the gradation shown on the drawings.

#### 8. <u>SEEDING AND FERTILIZATION</u>

Disturbed areas must be seeded in accordance with the Critical Area Planting specification sheet(s) provide by the technical representative.

## 9. <u>SPRIGGING OF WOODY VEGETATION</u>

When specified, woody cuttings must be planted at locations using the methods detailed on the drawings and in Construction Specification 234, Dormant Stock Planting.

## 10. <u>MAINTENANCE</u>

Substantial maintenance will be needed. Eroded areas must be promptly filled and re-vegetated as specified above for seeding and sprigging. Fertilizer should be applied at a recommended rate and watering may be necessary to sustain the plantings.

# **CONSTRUCTION SPECIFICATION CS 94, CONTRACTOR QUALITY CONTROL**

## 1. <u>SCOPE</u>

The work consists of developing, implementing, and maintaining a quality control system to ensure that the specified quality is achieved for all materials and work performed.

# 2. <u>EQUIPMENT AND MATERIALS</u>

Equipment and material used for quality control shall be of the quality and condition required to meet the test specifications cited in the contract. Testing equipment shall be properly adjusted and calibrated at the start of operations and the calibration maintained at the frequency specified. Records of equipment calibration tests shall be available to the engineer at all times. Equipment shall be operated and maintained by qualified operators as prescribed in the manufacturer's operating instructions, the references specified, and as specified in section 10 of this specification. All equipment and materials used in performing quality control testing shall be as prescribed by the test standards referenced in the contract or in section 10.

All equipment and materials shall be handled and operated in a safe and proper manner and shall comply with all applicable regulations pertaining to their use, operation, handling, storage, and transportation.

## 3. <u>QUALITY CONTROL SYSTEM</u>

**Method 1**—The contractor shall develop, implement, and maintain a system of quality control to provide the specified material testing and verification of material quality before use. The system activities shall include procedures to verify adequacy of completed work, initiate corrective action to be taken, and document the final results. The identification of the quality control personnel and their duties and authorities shall be submitted to the contracting officer in writing within 15 calendar days after notice of award.

*Method 2*—The contractor shall develop, implement, and maintain a system adequate to achieve the specified quality of all work performed, material incorporated, and equipment furnished before use. The system established shall be documented in a written plan developed by the contractor and approved by the contracting officer. The system activities shall include the material testing and inspection needed to verify the adequacy of completed work and procedures to be followed when corrective action is required. Daily records to substantiate the conduct of the system shall be maintained by the contractor. The quality control plan shall cover all aspects of quality control and shall address, as a minimum, all specified testing and inspection requirements. The plan provided shall be consistent with the planned performance in the contractor's approved construction schedule. The plan shall identify the contractor's onsite quality control manager and provide an organizational listing of all quality control personnel and their specific duties. The written plan shall be submitted to the contracting officer within 15 calendar days after notice of award. The contractor shall not proceed with any construction activity that requires inspection until the written plan is approved by the contracting officer.

**All methods**—The quality control system shall include, but not be limited to, a rigorous examination of construction material, processes, and operation, including testing of material and examination of manufacturer's certifications as required, to verify that work meets contract requirements and is performed in a competent manner.

#### 4. <u>QUALITY CONTROL PERSONNEL</u>

**Method 1**—Quality control activities shall be accomplished by competent personnel. A competent person is: One who is experienced and capable of identifying, evaluating, and documenting that materials and processes being used will result in work that complies with the contract; and, who has authority to take prompt action to remove, replace, or correct such work or products not in compliance. Off-site testing laboratories shall be certified or inspected by a nationally recognized entity. The Contractor shall submit to the Contracting Officer, for approval, laboratory certification or inspection information. The Contractor shall submit to the Contractor shall submit to the Contracting Officer, for approval, laboratory of the competent personnel who will perform the quality control activities.

*Method 2*—Quality control activities shall be accomplished by competent personnel who are separate and apart from line supervision and who report directly to management. A competent person is one who is experienced and capable of identifying, evaluating, and documenting that material and processes being used will result in work that complies with the contract, and who has authorization to take prompt action to remove, replace, or correct such work or products not in compliance. Offsite testing laboratories shall be certified or inspected by a nationally recognized entity. The Contractor shall submit to the Contracting Officer, for approval, laboratory certification or inspection information. The contractor shall submit to the contracting officer, for approval, the names, qualifications, authorities, certifications, and availability of the competent personnel who will perform the quality control activities.

## 5. <u>POST-AWARD CONFERENCE</u>

The contractor shall meet with the contracting officer before any work begins and discuss the contractor's quality control system. The contracting officer and the contractor shall develop a mutual understanding regarding the quality control system, including procedures for correcting quality control issues.

#### 6. <u>RECORDS</u>

The contractor's quality control records shall document both acceptable and deficient features of the work and corrective actions taken. All records shall be on forms approved by the contracting officer, be legible, and be dated and signed by the competent person creating the record.

Unless otherwise specified in section 10 of this specification, records shall include:

- a. Documentation of shop drawings including date submitted to and date approved by the contracting officer, results of examinations, any need for changes or modifications, manufacturer's recommendations and certifications, if any, and signature of the authorized examiner.
- b. Documentation of material delivered including quantity, storage location, and results of quality control examinations and tests.
- c. Type, number, date, time, and name of individual performing quality control activities.
- d. The material or item inspected and tested, the location and extent of such material or item, and a description of conditions observed and test results obtained during the quality control activity.
- e. The determination that the material or item met the contract provisions and documentation that the engineer was notified.
- f. For deficient work, the nature of the defects, specifications not met, corrective action taken, and results of quality control activities on the corrected material or item.

# 7. <u>REPORTING RESULTS</u>

The results of contractor quality control inspections and tests shall be communicated to the engineer immediately upon completion of the inspection or test. Unless otherwise specified in section 10, the original plus one copy of all records, inspections, tests performed, and material testing reports shall be submitted to the engineer within one working day of completion. The original plus one copy of documentation of material delivered shall be submitted to the engineer before the material is used.

## 8. <u>ACCESS</u>

The contracting officer and the engineer shall be given free access to all testing equipment, facilities, sites, and related records for the duration of the contract.

## 9. <u>PAYMENT</u>

**Method 1**—For items of work for which lump sum prices are established in the contract, payment is made as the work proceeds, after presentation by the contractor of invoices showing related costs and evidence of charges by suppliers, subcontractors, and others for furnishing supplies and work performed. If the total of such payments is less than the lump sum contract price for this item, the remaining balance is included in the final contract payment. Payment of the lump sum contract price constitutes full compensation for completion of the work.

Payment is not made under this item for the purchase cost of material and equipment having a residual value.

*Method 2*—For items of work for which lump sum prices are established in the contract, payment is prorated and paid in equal amounts on each monthly estimate. The number

of months used for prorating shall be the number estimated to complete the work. The final month's prorate amount is made with the final payment. Payment as described above constitutes full compensation for completion of the work.

Payment is not made under this item for the purchase cost of material and equipment having a residual value.

**All methods**—Compensation for any item of work described in the contract, but not listed in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 10.

# **CONSTRUCTION SPECIFICATION CS 27, DIVERSIONS AND WATERWAYS**

## 1. <u>SCOPE</u>

The work consists of all excavations, shaping, grading, and earthfills required to construct the diversions and waterways as shown on the drawings or as staked in the field.

# 2. <u>MATERIAL</u>

The earth material used in constructing the earthfill portions of the diversions or waterways shall be suitable material obtained from required excavations or earth material obtained from designated borrow areas. Material for earthfills shall be free from frozen material, brush, roots, sod, stones over 6 inches in diameter, or other objectionable material.

# 3. FOUNDATION PREPARATION

Foundations for earthfill shall be stripped to remove vegetation and other unsuitable materials or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the earthfill or otherwise acceptably scored and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the earthfill, and the surface material of the foundation shall be compacted and bonded with the first layer of earthfill as specified for subsequent layers of earthfill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of 2 inches in depth normal to the slope and shall be at such a moisture content that the earthfill can be compacted against them to produce a good bond between the earthfill and the abutments.

# 4. <u>PLACEMENT</u>

Earthfill material shall not be placed until the required foundation preparation is complete, inspected, and approved for placement. Earthfill shall not be placed upon a frozen surface. Earthfill shall be placed in horizontal layers not exceeding 9 inches in thickness. The moisture content of the earthfill materials shall be sufficient to obtain firm and suitable compaction. Compaction shall be obtained by routing the hauling and spreading equipment over the earthfill material so that the entire surface of each layer is traversed by not less than one track tread of the loaded equipment, or equivalent methods approved by the engineer.

## 5. <u>EXCAVATION</u>

Excavation shall be to the lines and grades shown on the drawings or as staked in the field. All surplus and unsuitable material is designated as waste and shall be disposed of at locations shown on the drawings or at a location approved by the engineer.

## 6. <u>MEASUREMENT AND PAYMENT</u>

*Method 1*—For items of work for which specific unit prices are established in the contract, the length of waterway or diversion is determined to the nearest linear foot by

measurement along the centerline of the waterway or diversion. Such payment will constitute full compensation for all labor, material, equipment, and all other items necessary and incidental to the performance of the work.

*Method* 2—For items of work for which specific lump sum prices are established in the contract, the quantity of waterways or diversions is not measured for payment. Payment for waterways and diversions is made at the contract lump sum price and shall constitute full compensation for all labor, material, equipment, and all other items necessary and incidental to the performance of the work.

*Method 3*—The pay limits for excavation and earthfill shall be as designated on the drawings. Payment for excavation and earthfill to construct the waterways and diversions is separately measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Payment for excavation and earthfill is made at the unit price bid and shall constitute full compensation for all labor, material, equipment, and all other items necessary and incidental to the performance of the work.

*All methods*—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 7 of this specification.

# **CONSTRUCTION SPECIFICATION CS 95, GEOTEXTILE**

#### 1. <u>Scope</u>

This work consists of furnishing all material, equipment, and labor necessary for the installation of geotextiles.

#### 2. <u>Quality</u>

Geotextiles shall conform to the requirements of Material Specification 592 and this specification.

#### 3. <u>Storage</u>

Before use, the geotextile shall be stored in a clean, dry location out of direct sunlight, not subject to extremes of either hot or cold temperatures, and with the manufacturer's protective cover undisturbed. Receiving, storage, and handling at the job site shall be in accordance with the requirements listed in ASTM D 4873.

#### 4. <u>Surface preparation</u>

The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. It shall be reasonably smooth and free of loose rock and clods, holes, depressions, projections, muddy conditions, and standing or flowing water (unless otherwise specified in section 7 of this specification).

## 5. <u>Placement</u>

Before the geotextile is placed, the soil surface will be reviewed for quality assurance of the design and construction. The geotextile shall be placed on the approved prepared surface at the locations and in accordance with the details shown on the drawings and specified in section 7 of this specification. It shall be unrolled along the placement area and loosely laid, without stretching, in such a manner that it conforms to the surface irregularities when material or gabions are placed on or against it. The geotextile may be folded and overlapped to permit proper placement in designated area(s).

Method 1—The geotextile shall be joined by machine sewing using thread material meeting the chemical requirements for the geotextile fibers or yarn. Thread shall be polypropylene, polyester, or Kevlar<sup>™</sup> aramid thread, unless a specific thread type is specified. The thread shall be consist of two parallel stitched rows at a spacing of about 1 inch and shall not cross (except for any required re-stitching). The stitching shall be a lock-type stitch. Each row of stitching shall be located a minimum of 2 inches from the geotextile edge. Unless otherwise specified, the seam tensile strength as measured according to ASTM D4884 shall be a minimum of 90 percent of the geotextile tensile strength in the weakest principal direction as measured according to ASTM D4632.

The geotextile shall be temporarily secured during placement of overlying material to prevent slippage, folding, wrinkling, or other displacement of the geotextile. Unless

otherwise specified, methods of securing shall not cause punctures, tears, or other openings to be formed in the geotextile.

**Method 2**—The geotextile shall be joined by overlapping a minimum of 18 inches (unless otherwise specified) and secured against the underlying foundation material. Securing pins, approved and provided by the geotextile manufacturer, shall be placed along the edge of the panel or roll material to adequately hold it in place during installation. Pins shall be steel or fiberglass formed as a U, L, or T shape or contain "ears" to prevent total penetration through the geotextile. Steel washers shall be provided on all but the U-shaped pins. The upstream or upslope geotextile shall overlap the abutting downslope geotextile. At vertical laps, securing pins shall be inserted through the bottom layers along a line through approximately the mid-point of the overlap. At horizontal laps and across slope labs, securing shall be inserted through the bottom layer only. Securing pins shall be placed along a line about 2 inches in from the edge of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to remain in place unless otherwise specified.

Should the geotextile be torn or punctured, or the overlaps or sewn joint disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used and overlaying the existing geotextile. When the geotextile seams are required to be sewn, the overlay patch shall extend a minimum of 1 foot beyond the edge of any damaged area and joined by sewing as required for the original geotextile except that the sewing shall be a minimum of 6 inches from the edge of the damaged geotextile. Geotextile panels joined by overlap shall have the patch extend a minimum of 2 feet from the edge of any damaged area.

Geotextile shall be placed in accordance with the following applicable specification according to the use indicated in section 7:

*Slope protection*—The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. In no case shall material be dropped on uncovered geotextile from a height of more than 3 feet.

Subsurface drains—The geotextile shall not be placed until drainfill or other material can be used to provide cover within the same working day. Drainfill material shall be placed in a manner that prevents damage to the geotextile. In no case shall material be dropped on uncovered geotextile from a height of more than 5 feet.

*Road stabilization*—The geotextile shall be unrolled in a direction parallel to the roadway centerline in a loose manner permitting conformation to the surface irregularities when the roadway fill material is placed on its surface. In no case shall

material be dropped on uncovered geotextile from a height of more than 5 feet. Unless otherwise specified, the minimum overlap of geotextile panels joined without sewing shall be 24 inches. The geotextile may be temporarily secured with pins recommended or provided by the manufacturer, but they shall be removed before the permanent covering material is placed.

#### 6. <u>Measurement and payment</u>

**Method 1**—For items of work for which specific unit prices are established in the contract, the quantity of geotextile for each type placed within the specified limits is determined to the nearest specified unit by measurements of the covered surfaces only, disregarding that required for anchorage, seams, and overlaps. Payment is made at the contract unit price. Such payment constitutes full compensation for the completion of the work.

*Method* **2**—For items of work for which specific unit prices are established in the contract, the quantity of geotextile for each type placed with the specified limits is determined to the nearest specified unit by computing the area of the actual roll size or partial roll size installed. The computed area will include the amount required for overlap, seams, and anchorage as specified. Payment is made at the contract unit price. Such payment constitutes full compensation for the completion of the work.

**Method 3**—For items of work for which specific lump sum prices are established in the contract, the quantity of geotextile is not measured for payment. Payment for geotextiles is made at the contract lump sum price and constitutes full compensation for the completion of the work.

**All methods**—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 7 of this specification.

# **CONSTRUCTION SPECIFICATION CS 62, GROUTED ROCK RIPRAP**

## 1. <u>SCOPE</u>

The work consists of furnishing, transporting, and the installation of grouted rock riprap revetments and blankets, including filter or bedding where specified.

# 2. <u>MATERIAL</u>

**Rock for riprap** shall conform to the requirements of Material Specification 523, or, if so specified, shall be obtained from designated sources. It shall be free from dirt, clay, sand, rock fines, and other material not meeting the required gradation limits.

At least 30 days before rock is delivered from other than designated sources, the contractor shall designate, in writing, the source from which rock material will be obtained and provide information satisfactory to the engineer that the material meets contract requirements. The contractor shall provide the engineer free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in section 13 of this specification.

Rock from approved sources shall be excavated, selected, and processed to meet the specified quality and grading requirements at the time the rock is installed.

When specified in section 13 of this specification or when requested by the contracting officer, a gradation quality control check shall be made by the contractor and subject to inspection by the engineer. The test shall be performed at the work site in accordance to ASTM D 5519 Test Method B Size, Size-Range Grading, on a test pile of representative rock. The weight or size of the test pile shall be large enough to ensure a representative gradation of rock from the source and to provide test results within a 5 percent accuracy.

Based on a specific gravity of 2.65 (typical of limestone and dolomite), and assuming the individual rock is shaped midway between a sphere and a cube, typical size/weight relationships are:

Sieve size	Approx. weight	Weight of	
	of rock	test pile	
16 inches	300 pounds	6,000 pounds	
11 inches	100 pounds	2,000 pounds	
6 inches	15 pounds	300 pounds	

The results of the test shall be compared to the gradation required for the project. Test pile results that do not meet the construction specifications shall be cause for the rock to the rejected. The test pile that meets contract requirements shall be left on the job site as a sample for visual comparison. The test pile shall be used as part of the last rock riprap to be placed.

**Filter or bedding aggregates,** when required, shall conform to Material Specification 521, Aggregates for Drainfill and Filters, unless otherwise specified.

**Portland cement** shall conform to the requirements of Material Specification 531 for the specified type.

**Pozzolan** conforming to Specification ASTM C 618, Class C or F, in amounts not to exceed 25 percent based on absolute volume, may be substituted for an equivalent amount of portland cement in the grout mixture unless otherwise specified in section 13 of this specification.

**Aggregates** shall conform to the requirements of Material Specification 522, Aggregates for Portland Cement Concrete, except that the grading for coarse aggregate shall be as specified in section 13 of this specification.

Water shall be clean and free from injurious amounts of oils, acid, alkali, organic matter, or other deleterious substances.

**Air-entraining admixtures** shall conform to the requirements of Material Specification 533, Chemical Admixtures for Concrete.

**Curing compound** shall conform to the requirements of Material Specification 534, Concrete Curing Compound.

**Other admixtures,** when required, shall be as specified in section 13 of this specification.

Geotextiles shall conform to the requirements of Material Specification 592.

## **3.** <u>SUBGRADE PREPARATION</u>

The subgrade surface on which the grouted rock riprap, filter, bedding, or geotextile is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved material and shall conform to the requirements of the specified class of earthfill.

Rock riprap, filter, bedding, or geotextile shall not be placed until the foundation preparation is completed and the subgrade surface has been inspected and approved.

# 4. <u>PLACEMENT OF ROCK RIPRAP</u>

*Method 1 Equipment-placed rock*—The rock riprap shall be placed by equipment on the surface and to the depth specified. It shall be installed to the full section thickness in one operation and in such a manner as to avoid serious displacement of the underlying material. The rock for riprap shall be delivered and placed in a manner that ensures that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.

Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing is required as necessary to prevent damage to any new and existing structures.

*Method 2 Hand-placed rock*—The rock riprap shall be placed by hand on the surface and to the depth specified. It shall be securely bedded with the larger rocks firmly in contact

one to another without bridging. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on its vertical edge except where it is installed like paving stone and the thickness of the rock equals the specified depth of the riprap section.

# 5. <u>FILTER OR BEDDING</u>

When the contract specifies filter, bedding, or geotextile beneath the rock riprap, the designated material shall be placed on the prepared subgrade surface as specified. Compaction of filter or bedding aggregate is not required, but the surface of such material shall be finished reasonably smooth and free of mounds, dips, or windrows.

## 6. <u>DESIGN OF THE GROUT MIX</u>

The mix proportions for the grout mix shall be as specified in the construction details in section 13 of this specification. During installation, the engineer may require adjustment of the mix proportions whenever necessary. The mix shall not be altered without the approval of the engineer.

#### 7. HANDLING AND MEASUREMENT OF GROUT MATERIAL

Material shall be stockpiled and batched by methods that prevent segregation or contamination of aggregates and ensure accurate proportioning of the mix ingredients.

Except as otherwise provided in section 13 of this specification, cement and aggregates shall be measured as follows:

- Cement shall be measured by weight or in bags of 94 pounds each. When cement is measured in bags, no fraction of a bag shall be used unless weighed.
- Aggregates shall be measured by weight. Mix proportions shall be based on the batch weight of each aggregate saturated, surface-dry weight plus the weight of surface moisture it contains at the time of batching.
- Water shall be measured, by volume or by weight, to an accuracy within 1 percent of the total quantity of water required for the batch.
- Admixtures shall be measured within a limit of accuracy of plus or minus 3 percent.

## 8. <u>MIXERS AND MIXING</u>

The mixer, when operating at capacity, shall be capable of combining the ingredients of the grout mix into a thoroughly mixed and uniform mass and of discharging the mix with a satisfactory degree of uniformity.

The mixer shall be operated within the limits of the manufacturer's guaranteed capacity and speed of rotation.

The time of mixing after all cement and aggregates have been combined in the mixer shall be a minimum of 1 minute for mixers having a capacity of 1 cubic yard or less. For larger capacity mixers, the minimum time shall be increased 15 seconds for each cubic yard or fraction thereof of additional capacity. The batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates, with the

balance of the mixing water introduced into the mixer before a fourth of the total minimum mixing time has elapsed.

When ready-mix grout is furnished, the contractor shall furnish to the engineer at the time of delivery a ticket showing the time of loading and the quantities of material used for each load of grout mix delivered.

No mixing water in excess of the amount required by the approved job mix shall be added to the grout mix during mixing or hauling or after arrival at the delivery point.

## 9. <u>CONVEYING AND PLACING</u>

The grout mix shall be delivered to the site and placed within 1.5 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to accelerated stiffening of the concrete, the time between the introduction of the cement to the aggregates and complete discharge of the grout batch shall be a maximum of 45 minutes. The engineer may allow a longer time provided the setting time of the grout is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case concrete shall be conveyed from the mixer to the final placement as rapidly as practicable by methods that prevent segregation of the aggregates, loss of mortar, displacement of the rock riprap, or a combination of these.

Grout mix shall not be allowed to free fall more than 5 feet unless suitable equipment is used to prevent segregation.

The grout mix shall not be placed until the rock riprap has been inspected and approved by the engineer for the placement of grout.

Rock to be grouted shall be kept moist for a minimum of 2 hours before grouting.

The rock riprap shall be flushed with water before placing the grout to remove the fines from the rock surfaces. The rock shall be kept moist before the grouting and without placing in standing or flowing water. Grout placed on inverts or other nearly level areas may be placed in one operation. On slopes, the grout shall be placed in two nearly equal applications consisting of successive lateral strips about 10 feet in width starting at the toe of the slope and progressing upward. The grout shall be delivered to the place of final deposit by approved methods and discharged directly on the surface of the rock. A metal or wood splash plate is used to prevent displacement of the rock directly under the grout discharge. The flow of grout shall be directed with brooms, spades, or baffles to prevent grout from flowing excessively along the same path and to assure that all intermittent spaces are filled. Sufficient barring shall be conducted to loosen tight pockets of rock and otherwise aid in the penetration of grout to ensure the grout fully penetrates the total thickness of the rock blanket. All brooming on slopes shall be uphill. After the grout has stiffened, the entire surface shall be rebroomed to eliminate runs and to fill voids caused by sloughing. The surface finish, following the completion of grout installation, shall consist of one-third of the rock extended above the level of grout. The exposed rock will not have a plastered appearance.

After completion of any strip or panel, no individual(s) or equipment shall be permitted on the grouted surface for 24 hours. The grouted surface shall be protected from injurious action by the sun, rain, flowing water, mechanical injury, or other potential damaging activity.

#### **10.** <u>CURING AND PROTECTION</u>

The completed finished surface shall be prevented from drying for a minimum curing period of 7 days following placement. Exposed surfaces shall be maintained in a moist condition continuously for the 7-day curing period or until curing compound has been applied as specified in this section. Moisture shall be maintained by sprinkling, flooding, or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, sand, or other approved material. Water or moist covering shall be used to protect the grout during the curing process without causing damage to the grout surface by erosion or other mechanisms that may cause physical damage.

The grouted rock may be coated with an approved curing compound as an alternative method to maintaining a continuous moisture condition during the curing period. The compound shall be sprayed on the moist grout surface as soon as free water has disappeared and all surface finishing has been completed. The compound shall be applied at a minimum uniform rate of 1 gallon per 175 square feet of surface and shall form a continuous adherent membrane over the entire surface. Curing compound shall not be applied to surfaces requiring bond to subsequently placed grout and/or concrete. If the membrane is damaged during the curing period, the damaged area shall be resprayed at the rate of application specified for the original treatment.

Grout mix shall not be placed when the daily minimum temperature is less than 40 degrees Fahrenheit unless facilities are provided to ensure that the temperature of the material is maintained at a minimum temperature of 50 degrees Fahrenheit and not more than 90 degrees Fahrenheit during placement and the curing period. Grout mix shall not be placed on a frozen surface. When freezing conditions prevail, rock to be grouted must be covered and heated to within a range of 50 to 90 degrees Fahrenheit for a minimum of 24 hours before placing grouting material.

## 11. <u>INSPECTING AND TESTING FRESH GROUT</u>

The grout material shall be checked and tested throughout the grouting operation. Sampling of fresh grout shall be conducted in conformance with ASTM C 172. The volume of each batch will be determined by methods prescribed in ASTM C 138.

The engineer shall have free access to all parts of the contractor's plant and equipment used for mixing and placing grout during the period of the contract. Proper facilities shall be provided for the engineer to sample material and view processes implemented in the mixing and placing of grout as well as for securing grout test samples. All tests and inspections shall be conducted so that only a minimum of interference to the contractor's operation occurs.

For ready-mixed grout, the contractor shall furnish to the engineer a statement-ofdelivery ticket for each batch delivered to the site. The ticket shall provide as a minimum: weight in pounds of cement, aggregates (fine and coarse), water; weight in ounces of airentraining agent; time of loading; and the revolution counter reading at the time batching was started.

# **12.** <u>MEASUREMENT AND PAYMENT</u>

*Method 1*—For items of work for which specific unit prices are established in the contract, the volume of grouted rock riprap, including filter layers or bedding, is determined to the nearest cubic yard from the specified thickness shown on the drawings and the area on which acceptable placement has been installed. Payment for grouted rock riprap is made at the contract unit price. Such payment is considered full compensation for all labor, material, equipment, and all other items necessary and incidental to the completion of the grouted rock riprap, filter layers and bedding, and geotextile material.

*Method* 2—For items of work for which specific unit prices are established in the contract, the volume of riprap and the volume of filter layers or bedding is determined to the nearest cubic yard from the specified thickness shown on the drawings and the area in which acceptable placement has been installed. The volume of grout is determined from the calculated batch volume and the number of mixed batches delivered to the site and placed in accordance with the specification. The area of geotextile is determined to the nearest square yard from measurements of geotextile material installed according to the contract requirements. Payment is made at the contract unit price for each type of rock riprap, filter or bedding, concrete grout, and geotextile. Such payment is considered full compensation for all labor, material, equipment, and all other items necessary and incidental to the completion of the work.

*Method 3*—For items of work for which specific unit prices are established in the contract, the quantity of each type of rock riprap placed within the specified limits is computed to the nearest 0.1 ton by actual weight. The quantity of each type of filter or bedding aggregate delivered and placed within the specified limits is computed to the nearest 0.1 ton. For each load of rock riprap placed as specified, the contractor shall furnish to the engineer a statement-of-delivery ticket showing the weight to the nearest 0.1 ton. For each load of filter or bedding aggregate, the contractor shall furnish to the engineer a statement-of-delivery ticket showing the weight to the nearest 0.1 ton. The volume of grout is determined from the calculated batch volume and the number of mixed batches delivered to the site and placed in accordance with the specifications and drawings. The area of geotextile is determined to the nearest square yard from measurements of geotextile material installed according to the contract requirements. Payment is made at the contract unit price for each type of rock riprap, filter or bedding, concrete grout, and geotextile. Such payment is considered full compensation for all labor, material, equipment, and all other items necessary and incidental to the completion of the work.

*All methods*—The following provision applies to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 13 of this specification.

# **CONSTRUCTION SPECIFICATION CS 61, ROCK RIPRAP**

# 1. <u>SCOPE</u>

The work shall consist of the construction of rock riprap revetments and blankets, including filter or bedding where specified.

# 2. <u>MATERIAL</u>

Rock riprap shall conform to the requirements of Material Specification 523, Rock for Riprap, or if so specified, shall be obtained from designated sources. It shall be free from dirt, clay, sand, rock fines, and other material not meeting the required gradation limits.

At least 30 days before rock is delivered from other than designated sources, the contractor shall designate in writing the source from which rock material will be obtained and provide information satisfactory to the contracting officer that the material meets contract requirements. The contractor shall provide the contracting officer's technical representative (COTR) free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in section 8.

Rock from approved sources shall be excavated, selected, and processed to meet the specified quality and grading requirements at the time the rock is installed.

Based on a specific gravity of 2.65 (typical of limestone and dolomite) and assuming the individual rock is shaped midway between a sphere and a cube, typical size/weight relationships are:

Sieve size of rock	Approx. weight of rock	Weight of test pile
16 inches	300 pounds	6,000 pounds
11 inches	100 pounds	2,000 pounds
6 inches	15 pounds	300 pounds

When specified in Section 8 or when it is necessary to verify the gradation of the rock riprap, a particle size analysis shall be performed in accordance with ASTM D5519, Test Method A or B. The analysis shall be performed at the work site on a test pile of representative rock. The mass of the test pile shall be at least 20 times the mass of the largest rock in the pile The results of the test shall be compared to the gradation required for the project. Test pile results that do not meet the construction specifications shall be cause for the rock to be rejected. The test pile that meets contract requirements shall be left on the job site as a sample for visual comparison. The test pile shall be used as part of the last rock riprap to be placed.

**Filter or bedding aggregates** when required shall conform to Material Specification 521, Aggregates for Drainfill and Filters, unless otherwise specified. Geotextiles shall conform to Material Specification 592, Geotextile.

#### 3. <u>SUBGRADE PREPARATION</u>

The subgrade surface on which the rock riprap, filter, bedding, or geotextile is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved material and shall conform to the requirements of the specified class of earthfill.

Rock riprap, filter, bedding, or geotextile shall not be placed until the foundation preparation is completed and the subgrade surface has been inspected and approved.

#### 4. EQUIPMENT-PLACED ROCK RIPRAP

The rock riprap shall be placed by equipment on the surface and to the depth specified. It shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying material. The rock for riprap shall be delivered and placed in a manner that ensures the riprap in place is reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.

Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing is required as necessary to prevent damage to any new and existing structures.

## 5. <u>HAND PLACED ROCK RIPRAP</u>

The rock riprap shall be placed by hand on the surface and to the depth specified. It shall be securely bedded with the larger rocks firmly in contact one to another without bridging. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on its vertical edge except where it is laid like paving stone and the thickness of the rock equals the specified depth of the riprap course.

## 6. FILTER OR BEDDING

When the contract specifies filter, bedding, or geotextile beneath the rock riprap, the designated material shall be placed on the prepared subgrade surface as specified. Compaction of filter or bedding aggregate is not required, but the surface of such material shall be finished reasonably smooth and free of mounds, dips, or windrows.

## 7. <u>MEASUREMENT AND PAYMENT</u>

**Method 1**—For items of work for which specific unit prices are established in the contract, the quantity of each type of rock riprap placed within the specified limits is computed to the nearest ton by actual weight. The volume of each type of filter or bedding aggregate is measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. For each load of rock riprap placed as specified, the contractor shall furnish to the COTR a statement-of-delivery ticket showing the weight to the nearest 0.1 ton.

Payment is made at the contract unit price for each type of rock riprap, filter, or bedding. Such payment is considered full compensation for completion of the work.

**Method 2**—For items of work for which specific unit prices are established in the contract, the quantity of each type of rock riprap placed within the specified limits is computed to the nearest 0.1 ton by actual weight. The quantity of each type of filter or bedding aggregate delivered and placed within the specified limits is computed to the nearest 0.1 ton. For each load of rock riprap placed as specified, the contractor shall furnish to the engineer a statement-of-delivery ticket showing the weight to the nearest 0.1 ton. For each load of filter or bedding aggregate, the contractor shall furnish to the COTR a statement-of-delivery ticket showing the weight to the nearest 0.1 ton.

Payment is made at the contract unit price for each type of rock riprap, filter, or bedding. Such payment is considered full compensation for completion of the work.

**Method 3**—For items of work for which specific unit prices are established by the contract, the volume of each type of rock riprap and filter or bedding aggregate is measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas.

Payment is made at the contract unit price for each type of rock riprap, filter, or bedding. Such payment is considered full compensation for completion of the work.

**Method 4**—For items of work for which specific unit prices are established by the contract, the volume of each type of rock riprap, including filter and bedding aggregate, is measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas.

Payment is made at the contract unit price for each type of rock riprap, including filter and bedding. Such payment is considered full compensation for completion of the work.

**Method 5**—For items of work for which specific unit prices are established by the contract, the quantity of each type of rock riprap placed within the specified limits is computed to the nearest ton by actual weight. For each load of rock for riprap placed as specified, the contractor shall furnish to the COTR a statement-of-delivery ticket showing the weight to the nearest 0.1 ton.

Payment is made at the contract unit price for each type of rock riprap, and includes compensation for any aggregate or geotextile installed as specified for filter or bedding. Such payment is considered full compensation for completion of the work.

**Method 6**—For items of work for which specific unit prices are established by the contract, the volume of each type of rock riprap is measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas.

Payment is made at the contract unit price for each type of rock riprap, and includes compensation for any aggregate or geotextile installed as specified for filter or bedding. Such payment is considered full compensation for completion of the work.

**All methods**—The following provision applies to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule, is included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in section 8.

No separate payment is made for testing the gradation of the test pile. Compensation for testing is included in the appropriate bid item for riprap.

# MATERIAL SPECIFICATION MS-592, GEOTEXTILE

# 1. <u>SCOPE</u>

This specification covers the quality of geotextile, including geotextile for temporary silt fence.

# 2. <u>GENERAL REQUIREMENTS</u>

Fibers (threads and yarns) used in the manufacture of geotextile shall consist of synthetic polymers composed of a minimum of 85 percent by weight polypropylenes, polyesters, polyamides, polyethylene, polyolefins, or polyvinylidene-chlorides. They shall be formed into a stable network of filaments or yarns retaining dimensional stability relative to each other. The geotextile shall be free of defects, such as holes, tears, and abrasions. The geotextile shall be free of any chemical treatment or coating that significantly reduces its porosity. Fibers shall contain stabilizers, inhibitors, or both to enhance resistance to ultraviolet light. Geotextile other than for temporary silt fence shall conform to the requirements in tables 592–1 or 592–2, as applicable. Geotextile for temporary silt fence shall conform to the requirements in tables 592–3.

Thread used for factory or field sewing shall be of contrasting color to the fabric and made of high strength polypropylene, polyester, or polyamide thread. Thread shall be as resistant to ultraviolet light as the geotextile being sewn.

# 3. <u>CLASSIFICATION</u>

Geotextiles shall be classified based on the method used to place the threads or yarns forming the fabric. The geotextiles will be grouped into woven and nonwoven types. Geotextile for temporary silt fence may be either woven or nonwoven. Slit film woven geotextile may not be used except for temporary silt fence.

*Woven*—Fabrics formed by the uniform and regular interweaving of the threads or yarns in two directions. Woven fabrics shall be manufactured from monofilament yarn formed into a uniform pattern with distinct and measurable openings, retaining their position relative to each other. The edges of fabric shall be selvedged or otherwise finished to prevent the outer yarn from unraveling.

*Nonwoven*—Fabrics formed by a random placement of threads in a mat and bonded by needle punching, heatbonding, or resin-bonding. Nonwoven fabrics shall be manufactured from individual fibers formed into a random pattern with distinct, but variable small openings, retaining their position relative to each other when bonded by needle punching, heat-, or resin-bonding. The use of heator resin-bonded nonwovens is restricted as specified in note 2 of table 592–2.

# 4. <u>SAMPLING AND TESTING</u>

The geotextile shall meet the specified requirements (tables 592–1, 592–2, or 592-3, as applicable) for the product type shown on the label. Product properties as listed in the latest edition of the "Specifiers Guide," Geosynthetics, (Industrial Fabrics Association International, 1801 County Road B, West Roseville, MN 55113-4061 or at http://www.geosindex.com) and that represent minimum average roll values, are acceptable documentation that the product style meets the requirements of these specifications. For products that do not appear in the above directory or do not have minimum average roll values listed, typical test data from the identified production run of the geotextile will be required for each of the specified tests (see table 592–1, 592–2, or 592-3, as applicable) as covered under clause AGAR 452.236-76.

# 5. <u>SHIPPING AND STORAGE</u>

The geotextile shall be shipped/transported in rolls wrapped with a cover for protection from moisture, dust, dirt, debris, and ultraviolet light. The cover shall be maintained undisturbed to the maximum extent possible before placement.

Each roll of geotextile shall be labeled or tagged to clearly identify the brand, class, and the individual production run in accordance with ASTM D 4873.

Property	Test method	Units	Class I	Class II & III	Class IV
Grab Tensile strength	ASTM D 4632	Pounds	247 min.	180 min.	315 min.
Elongation at failure	ASTM D 4632	Percent	<50	<50	<50
Trapezoidal Tear Strength	ASTM D 4533	pounds	90 min.	67 min.	112 min.
Puncture Strength	ASTM D 6241	Pounds	495 min.	371 min.	618 min.
Ultraviolet Stability (retained strength)	ASTM D 4355	Percent	50 min.	50 min.	50 min.
Permittivity	ASTM D 4491	Sec <sup>-1</sup>	As specified	As specified	As specified
Apparent opening size (AOS) <sup>/</sup>	ASTM D 4751	mm	As specified	As specified	As specified
Percent open area (POA)	USACE CWO-02215	Percent	As specified	As specified	As specified

Table 592–1 Requirements for woven geotextiles<sup>1/</sup>

1/ Minimum average roll value (weakest principal direction).

2/ U.S. standard sieve size.

Note: CWO is a USACE reference.

Property	Test method	Units	Class I	Class II <sup>2/</sup>	Class III <sup>2/</sup>	Class IV <sup>2/</sup>
Grab Tensile Strength	ASTM D 4632	Pounds	202 min.	157 min.	112 min.	202 min.
Elongation at Failure	ASTM D 4632	Percent	50 min.	50 min.	50 min.	50 min.
Trapezoidal Tear Strength	ASTM D 4533	Pounds	79 min.	56 min.	40 min.	79 min.
Puncture Strength	ASTM D 6241	Pounds	433 min.	309 min.	223 min.	433 min.
Ultraviolet Stability (retained strength)	ASTM D 4355	Percent	50 min.	50 min.	50 min.	50 min.
Permittivity	ASTM D 4491	sec <sup>-1</sup>	0.70 min. or as Specified	0.70 min. or as Specified	0.70 min. or as Specified	0.70 min. or as Specified
Apparent opening size (AOS) <sup>3/</sup>	ASTM D 4751	mm	0.22 max or as specified	0.22 max or as specified	0.22 max or as specified	0.22 max or as specified

Table 592-2 Requirements for nonwoven geotextiles 1/

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

2/ Needle punched geotextiles may be used for all classes. Heat-bonded or resin-bonded geotextiles may be used for classes III and IV only. They are particularly well suited to class IV.

3/ Maximum average roll value.

Property	Test method	Units	Requirements, Supported Silt Fence 2/	Requirements, Unsupported Silt Fence 2/	
				Woven Geotextile (Elongation <50% 3/)	Nonwoven Geotextile (Elongation <u>&gt;</u> 50% 3/)
Maximum Post Spacing		ft	4	6.5	4
Grab Tensile Strength	ASTM D 4632	Pounds			
Machine Direction			90	124	
X-Machine Direction			90	1001	
Permittivity	ASTM D 4491	sec <sup>-1</sup>	0.05	0.05	
Apparent opening size (AOS) 4/	ASTM D 4751	mm	0.60	0.60	
Ultraviolet Stability (retained strength)	ASTM D 4355	Percent	70 after 500 hours of exposure	70 after 500 h	ours of exposure

Table 592-3	Requirements	for Temporary	Silt Fence 1/
Table 392-3	Requirements	for remporary	Shi Fence I/

1/ All values are minimum average roll values (MARV) in the weakest principal direction, unless otherwise noted.

2/ Silt fence support shall consist of 14-gage steel wire with a mesh spacing of 6 inches each way or prefabricated polymeric mesh of equivalent strength.

3/ As measured in accordance with ASTM D 4632.

4/ Maximum average roll value.

# MATERIAL SPECIFICATION MS-547, PLASTIC PIPE

# 1. <u>SCOPE</u>

This specification covers the quality of Poly Vinyl Chloride (PVC), Polyethylene (PE), High Density Polyethylene (HDPE), and Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe, fittings, and joint materials.

# 2. <u>MATERIAL</u>

Pipe—The pipe shall be as uniform as commercially practicable in color, opaqueness, density, and other specified physical properties. It shall be free from visible cracks, holes, foreign inclusions, or other defects. The dimensions of the pipe shall be measured as prescribed in ASTM D 2122.

Unless otherwise specified, the pipe shall conform to the requirements listed in this specification and the applicable reference specifications in table 547–2, the requirements specified in Construction Specification 45, Plastic Pipe, and the requirements shown on the drawings.

*Fittings and joints*—Fittings and joints shall be of a schedule, SDR or DR, pressure class, external load carrying capacity, or pipe stiffness that equals or exceeds that of the plastic pipe. The dimensions of fittings and joints shall be compatible with the pipe and measured in accordance with ASTM D 2122. Joint and fitting material shall be compatible with the pipe material. The joints and fittings shall be as uniform as commercially practicable in color, opaqueness, density, and other specified physical properties. It shall be free from visible cracks, holes, foreign inclusions, or other defects.

Fittings and joints shall conform to the requirements listed in this specification, the requirements of the applicable specification referenced in the ASTM or AWWA specification for the pipe, the requirements specified in Construction Specification 45, and the requirements shown on the drawings.

*Solvents*—Solvents for solvent welded pipe joints shall be compatible with the plastic pipe used and shall conform to the requirements of the applicable specification referenced in the ASTM or AWWA specification for the pipe, fitting, or joint.

*Gaskets*—Rubber gaskets for pipe joints shall conform to the requirements of ASTM F 477, Elastomeric Seals (Gaskets) for Jointing Plastic Pipe.

## 3. <u>PERFORATIONS</u>

When perforated pipe is specified, perforations shall conform to the following requirements unless otherwise specified in Construction Specification 45 or shown on the drawings:

- a. Perforations shall be either circular or slots.
- b. Circular perforations shall be 1/4 ± 1/16-inch diameter holes arranged in rows parallel to the axis of the pipe. Perforations shall be evenly spaced along each row such that the center-to-center distance between perforations is not less than eight times the perforation diameter. Perforations may appear at the ends of short and random lengths. The minimum perforation opening per foot of pipe shall be as shown in table 547–1.

Table 547–1 Perforations

Nominal pipe size(in)	Minimum rows	number of	Minimum opening/foot (in <sup>2</sup> )
	circular	slot	~ /
4	2	2	0.22
6	4	2	0.44
8	4	2	0.44
10	4	2	0.44
12	6	2	0.66

Rows shall be arranged in two equal groups at equal distance from the bottom on each side of the vertical centerline of the pipe. The lowermost rows of perforations shall be separated by an arc of not less than 60 degrees or more than 125 degrees. The uppermost rows of perforations shall be separated by an arc not to exceed 166 degrees. The spacing of rows between these limits shall be uniform. The minimum number of rows shall be as shown in table 547–1.

- c. Slot perforations shall be symmetrically located in two rows, one on each side of the pipe centerline. Slot perforations shall be located within the lower quadrants of the pipe with slots no wider than 1/8 inch and spaced not to exceed 11 times the perforation width. Minimum perforation opening per lineal foot of pipe shall be as shown in table 547–1.
- d. On both the inside and outside of the pipe, perforations shall be free of cuttings or frayed edges and of any material that would reduce the effective opening.

Table 547–2Pipe specification

Pipe	Specification
Poly vinyl chloride (PVC) pipe	
Plastic pipe - Schedules 40, 80, 120	ASTM D 1785
	ASTM D 2466
Pressure rated pipe - SDR Series	AWWA C 900
	ASTM D 2241
Plastic drain, waste, and vent pipe and fittings	ASTM D 2665
Joints for IPS PVC pipe using solvent weld cement	ASTM D 2672
Composite sewer pipe	ASTM D 2680
Type PSM PVC sewer pipe and fittings	ASTM D 3034
Large-diameter gravity sewer pipe and fittings	ASTM F 679
Smooth-Wall Underdrain Systems for Highway Airport, and Similar Drainage	ASTM F 758
Profile gravity sewer pipe and fittings based on controlled inside diameter	ASTM F 794
Corrugated sewer pipe with a smooth interior and fittings	ASTM F 949
Pressure pipe, 4-inch through 12-inch for water distribution	AWWA C 900
Water transmission pipe, nominal diameters 14-inch through 36-inch	AWWA C 905

Polyethylene (PE) plastic pipe

Schedule 40	ASTM D 2104
12 to 60-inch annular corrugated profile-wall polyethylene (PE) pi F 2306	pe and fittings ASTM
SIDR-PR based on controlled inside diameter	ASTM D 2239
Schedules 40 and 80 Based on outside diameter	ASTM D 2447
SDR-PR based on controlled outside diameter	ASTM D 3035
High density polyethylene (HDPE) plastic pipe	
Plastic pipe and fittings	ASTM D 3350
SDR-PR based on controlled outside diameter	ASTM F 714
Heat joining polyolefin pipe and fittings	ASTM D 2657
Acrylonitrile-butadiene-styrene (ABS) pipe	
Plastic pipe, schedules 40 and 80	ASTM D 1527
Composite sewer pipe	ASTM D 2680

# MATERIAL SPECIFICATION MS 523, ROCK FOR RIPRAP

# 1. <u>SCOPE</u>

This specification covers the quality of rock to be used in the construction of rock riprap.

# 2. <u>QUALITY</u>

Individual rock fragments shall be dense, sound, and free from cracks, seams, and other defects conducive to accelerated weathering. Except as otherwise specified, the rock fragments shall be angular to subrounded. The least dimension of an individual rock fragment shall be not less than one-third the greatest dimension of the fragment. ASTM D4992 provides guidance on selecting rock from a source.

Except as otherwise provided, the rock shall be tested and shall have the following properties:

# Rock type 1

*Bulk specific gravity (saturated surface- dry basis)*—Not less than 2.5 when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.

- *Absorption*—Not more than 2 percent when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
  - **Soundness**—The weight loss in 5 cycles shall not be more than 10 percent when sodium sulfate is used or more than 15 percent when magnesium sulfate is used.

# Rock type 2

- **Bulk specific gravity (saturated surface- dry basis)**—Not less that 2.5 when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
- *Absorption*—Not more than 2 percent when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
  - **Soundness**—The weight loss in 5 cycles shall be not more than 20 percent when sodium sulfate is used or more than 25 percent when magnesium sulfate is used.

# Rock type 3

*Bulk specific gravity (saturated surface- dry basis)*—Not less than 2.3 when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.

- *Absorption*—Not more than 4 percent when tested in accordance with ASTM D6473 on samples prepared as described for soundness testing.
- **Soundness**—The weight loss in 5 cycles shall be not more than 20 percent when sodium sulfate is used or more than 25 percent when magnesium sulfate is used.

# 3. <u>METHODS OF SOUNDNESS TESTING</u>

**Rock cube soundness**—The sodium or magnesium sulfate soundness test for all rock types (1, 2, or 3) shall be performed on a test sample of  $5,000 \pm 300$  grams of rock fragments, reasonably uniform in size and cubical in shape, and weighing, after sampling, about 100 grams each. They shall be obtained from rock samples that are representative of the total rock mass, as noted in ASTM D4992, and that have been sawed into slabs as described in ASTM D5121. The samples shall further be reduced in size by sawing the slabs into cubical blocks. The thickness of the slabs and the size of the sawed fragments shall be deter- mined by the size of the available test apparatus and as necessary to provide, after sawing, the approximate 100-gram samples. The cubes shall undergo five cycles of soundness testing in accordance with ASTM D1512.

Internal defects may cause some of the cubes to break during the sawing process or during the initial soaking period. Do not test any of the cubes that break during this preparatory process. Such breakage, including an approximation of the percentage of cubes that break, shall be noted in the test report.

After the sample has been dried following completion of the final test cycle and washed to remove the sodium sulfate or magnesium sulfate, the loss of weight shall be determined by subtracting from the original weight of the sample the final weight of all fragments that have not broken into three or more fragments.

The test report shall show the percentage loss of the weight and the results of the qualitative examination.

*Rock slab soundness*—When specified, the rock shall also be tested in accordance with ASTM D5240. Deterioration of more than 25 percent of the number of blocks shall be cause for rejection of rock from this source. Rock shall also meet the requirements for average percent weight loss stated below.

For projects located north of the Number 20 Freeze-Thaw Severity Index Isoline (fig. 523–1). Unless otherwise specified, the average percent weight loss for Rock Type 1 shall not exceed 20 percent when sodium sulfate is used or 25 per- cent when magnesium sulfate is used. For Rock Types 2 and 3, the average percent weight loss shall not exceed 25 percent for sodium sulfate soundness or 30 percent for magnesium sulfate soundness.

For projects located south of the Number 20 Freeze-Thaw Severity Index Isoline, unless otherwise specified, the average percent weight loss for Rock Type 1 shall not exceed 30 percent when sodium sulfate is used or 38 percent when magnesium sulfate is used. For Rock Types 2 and 3, the average percent weight loss shall not exceed 38 percent for sodium sulfate soundness or 45 percent for magnesium sulfate soundness.

## 4. <u>FIELD DURABILITY INSPECTION</u>

Rock that fails to meet the material requirements stated above (if specified), may be accepted only if similar rock from the same source has been demonstrated to be sound after 5 years or more of service under conditions of weather, wetting and drying, and erosive forces similar to those anticipated for the rock to be installed under this specification.

A rock source may be rejected if the rock from that source deteriorates in 3 to 5 years under similar use and exposure conditions expected for the rock to be installed under this specification, even though it meets the testing requirements stated above.

Deterioration is defined as the loss of more than one- quarter of the original rock volume, or severe cracking that would cause a block to split. Measurements of deterioration are taken from linear or surface area particle counts to determine the percentage of deteriorated blocks. Deterioration of more than 25 percent of the pieces shall be cause for rejection of rock from the source.

## 5. <u>GRADING</u>

The rock shall conform to the specified grading limits after it has been placed within the matrix of the rock riprap. Grading tests shall be performed, as necessary, according to ASTMD5519, Method A, B, or C, as applicable.

**Figure 523–1** Number 20 freeze-thaw severity index isoline (map approximates the map in ASTM D5312)



# OPERATION AND MAINTENANCE OM-UT-578, STREAM CROSSING

## OPERATION AND MAINTENANCE ITEMS

A properly operated and maintained stream crossing is an asset to your farm or ranch. The estimated life span of this installation is 10 years. The life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

Failure to operate and maintain this system could result in actions to reclaim cost share and/or loss of any future financial or technical assistance.

Inspections and maintenance are required to achieve the intended function, benefits, and life of the practice. The Sponsor /operator is responsible to establish and implement an inspection and maintenance program. Items to inspect and maintain during the design life of the practice include, but are not limited to, the following:

- Inspect after significant storm events, such as those that exceed bankfull capacity, and at least annually to identify repair and maintenance needs.
- Inspect after ice flows.
- Remove any accumulation of organic material, woody material, or excess sediment.
- Repair or replace damaged or broken fencing before resuming access to the crossing.
- Remove debris collected in the fencing.
- Reseed areas where vegetation has been damaged or destroyed. For areas where access is normally allowed, reseed before resuming access.
- Repair and reseed any areas of erosion in the approaches, along the ramps, or other areas adjacent to the stream crossing. For eroded areas where access is normally allowed, repair and reseed before resuming access.
- Replace coarse aggregate displaced from the ramp surface before resuming access.
- Check areas where unusual settlement has occurred. Determine cause of settlement and fill or otherwise repair, as appropriate.
- Use the stream crossing only for the livestock, vehicles and/or machinery for which the stream crossing was designed.
- Keep machinery away from steep side slopes. Keep equipment operators informed of all potential hazards.
- Do not cross the stream during high flow events that jeopardize the safety of the livestock, vehicles and/or machinery normally using the crossing.
- Follow your grazing plan, where appropriate when the stream crossing is intended for livestock.

### OPERATION AND MAINTENANCE OM-UT-580, STREAMBANK AND SHORELINE PROTECTION

### OPERATION AND MAINTENANCE ITEMS

A properly maintained streambank and shoreline is an asset to your property. This practice was designed and installed to provide streambank and shoreline erosion protection. The estimated life span for this installation is at least 20 years. Life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

Failure to operate and maintain this system could result in actions to reclaim cost share and/or loss of any future financial or technical assistance.

This practice will require performance of periodic maintenance and may also require operational items to maintain satisfactory performance. A good operation and maintenance program includes:

- Check all rock riprap or vegetated sections and other structural sections for accelerated weathering and displacement. Replace to original grades if necessary.
- Maintain vigorous growth of vegetation. This includes reseeding, replanting, fertilization, weeding by hand, and application of herbicides when necessary. Periodic mowing may also be needed to control height.
- All settlement or cracks in the soil should be investigated to determine the cause and immediately repaired.
- If fences are installed, they shall be maintained to prevent unauthorized or livestock entry.
- Remove debris that may accumulate at this section, and immediately upstream or downstream from this installation.
- Repair any erosion or damage that occur immediately upstream and downstream of treated areas.
- Control livestock access on unfenced areas.
- Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.
- Immediately repair any vandalism, vehicular, or livestock damage.

• Other items specific to your project are listed in the "Special operation and maintenance requirements" section.

### OPERATION AND MAINTENANCE OM-UT-587, STRUCTURE FOR WATER CONTROL

### OPERATION AND MAINTENANCE ITEMS

A properly operated and maintained structure for water control is an asset to the farm. The structure was designed and installed to control water stage, discharge, distribution, delivery, or direction of flow. Estimated life span of this installation is at least 20 years. The life of the structure can be assured and usually increased by developing and carrying out a good operation and maintenance program.

Failure to operate and maintain this system could result in actions to reclaim cost share and/or loss of any future financial or technical assistance.

This practice will require periodic maintenance and may also require operational items to maintain satisfactory performance. A good operation and maintenance program includes:

- Maintain the width, height, and side slopes of soil berms.
- Maintain safety equipment at structure, including, fences, covers, lids, ladders, alarms, etc.
- Drain all structures when not being used. Remove accumulated soil, debris, and any blockage that restricts capacity.
- Repair any cracks or breaks. If settlement is present, investigate the cause and design repairs accordingly.
- Avoid the use of tillage equipment that accelerates soil removal. If livestock are present, prevent access to components subject to damage by livestock.
- Maintain pipe connections, repair grout, seals, or other items.
- Maintain inlets and outlets to avoid erosion that can undermine the stability of the structure.
- Eradicate or otherwise remove all rodents or burrowing animals and repair any damage caused by their activity.
- Check concrete surfaces for accelerated weathering, spalling, settlement, alignment or cracks. Repair immediately, as reinforcement steel can be exposed and reduce the life of the structure. Repair any vandalism, vehicular, or livestock damage.

CAUTION: If your structure qualifies as a confined space (a sump, dry well or deep structure with limited ventilation) then operation and maintenance activities should be performed with safety in mind. Be cautious of entering a confined space where gases may have settled or collected. OSHA requirements state that prior to anyone entering a confined space that proper preparation for safe entry and emergency extraction is required. Proper preparation may include, but is not limited to:

- (i) Partner supervision.
- (ii) Life lines -100 feet of  $\frac{1}{2}$  inch nylon rope of 5,400 lbs breaking strength.
- (iii) Block and tackle.
- (iv) Safety belts with lanyard.
- (v) Emergency escape unit with 5 minute oxygen packs.
- (vi) Non-explosive type lantern (6 volt).
- (vii) Combustible gas/oxygen detector. A portable combustible gas and oxygen detector is recommended.

(viii) US Coast Guard approved life jacket or belt in water filled areas It is suggested that permanent features be added and maintained for structures that may be entered without authorization, such as fencing, covers, locking devices, warning signs, and/or other high visibility measures.



# CONSTRUCTION PLANS PREPARED FOR SAN JUAN PACK CREEK EWP 2021 PHASE 1 DESIGNED BY UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE

#### CLEARANCES AND PERMITS

IT SHALL BE THE RESPONSIBILITY OF THE SPONSOR TO OBTAIN ALL NECESSARY CLEARANCES, PERMITS, RIGHTS OF WAY, AND TO COMPLY WITH ALL ORDINANCES AND LAWS PERTAINING TO THE CONSTRUCTION OF THIS PROJECT.

IT SHALL BE THE RESPONSIBILITY OF THE SPONSOR TO ASSURE THAT THE PROJECT IS CONSTRUCTED ACCORDING TO THE ATTACHED DRAWINGS AND SPECIFICATIONS. ANY CHANGES SHALL BE SUBMITTED IN WRITING TO THE NRCS 48 HOURS PRIOR TO IMPLEMENTATION FOR APPROVAL.

#### GENERAL NOTES

THE CONSTRUCTION PLANS INCLUDE THESE DRAWINGS AS WELL AS THE ATTACHED SPECIFICATIONS AND OPERATIONS AND MAINTENANCE PLAN.

LOCATION OF UTILITIES

NO REPRESENTATION IS MADE AS TO THE EXISTENCE OR NON-EXISTENCE OF ANY UTILITIES PUBLIC OR PRIVATE.

THE COOPERATOR MUST OBTAIN THE EXACT LOCATION AND DEPTH OF ALL UTILITIES FROM THE UTILITY COMPANIES PRIOR TO EXCAVATION OR CONSTRUCTION ACTIVITIES.

NRCS CONTACT INFORMATION: Jason Dodds NRCS Engineer 2390 West Highway 56, Suite 14 Cedar City, UT 84721 435-868-3947 Office 435-590-7661 Mobile

# **NRCS SHALL BE NOTIFIED 72 HOURS PRIOR TO CONSTRUCTION.**

I HAVE REVIEWED THESE PLANS, DETAILS, SPECIFICATIONS AND O&M AGREEMENTS, AND FIND THEM ACCEPTABLE.

SPONSOR

**Blue Stakes** 

KNOW WHAT'S BELOW! CONTACT BLUE STAKES OF UTAH 811 TO HAVE UTILITY LINES LOCATED AND MARKED. VISIT BLUESTAKES.ORG OR CALL 811 AT LEAST 48 HOURS **BEFORE EXCAVATING, IT'S** FREE AND IT'S THE LAW!

Sheet Nu

	Sheet List Table
Number	Sheet Title
1	COVER SHEET
2	OVERALL PLAN VIEW
3	3-STEP GRADE CONTROL STRUCTURE
4	4-STEP GRADE CONTROL STRUCTURE
5	LOW WATER CROSSING
6	LOW WATER CROSSING DETAILS
7	IRRIGATION OUTLET STRUCTURE
8	J-HOOK DETAILS
9	IRRIGATION OUTLET DETAILS
10	ROCK WALL DETAILS
11	WATER AND POWER CROSSING

DATE

signed_JD	awn <u>JD &amp; J Rob 12/2023</u>	ecked JHR & SMS 6&12/2023	JASON DODDS Date: 2024.01 23 06:17:29 0.7000
COVER SHEFT	SAN JIJAN PACK CRFFK FWP 2021 PHASF 1		an Juan County Soil Conservation District San Juan County, Utah
Day United States	Department of Bood	crees.dw No	Conservation Service





1. THE GRADE CONTROL STRUCTURE WILL HAVE APPROXIMATELY THREE 2 FT DROPS TO DISSIPATE ENERGY THESE STRUCTURES WILL HAVE TO BE FIELD FIT DURING THE TIME OF CONSTRUCTION AS THE STREAM IS

INDIVIDUAL ROCK FRAGMENTS SHALL BE DENSE, SOUND, AND FREE ACCELERATED WEATHERING. EXCEPT AS OTHERWISE SPECIFIED, THE ROCK FRAGMENTS SHALL BE ANGULAR TO SUB-ANGULAR. THE LEAST DIMENSION OF AN INDIVIDUAL ROCK FRAGMENT SHALL BE NOT LESS THAN ONE-THIRD THE GREATEST DIMENSION OF THE FRAGMENT. ASTM SOURCE. NRCS MUST APPROVE ALL ROCK MATERIAL. NRCS WILL

6. KEY INTO BANK A MINIMUM OF 10'. ROCK SIZE FOR KEY = 19"-36". APPROXIMATE AMOUNT OF ROCK FOR THIS STRUCTURE: 166 YDS<sup>3</sup>... VOLUME OF ROCK WAS ESTIMATED BY MULTIPLYING THE AREA OF THE

1/22 Shee			United States	STEP CRANE CO	NTROI	STRUCTUE	L	Desianed_JD	Date 6/2023
2/24 et 3	odd:	No	Department of	SAN . II IAN PACK CRFFU				Drawn JD & J Rob	12/2023
2:30 of	cre s.dw No		Agriculture				- J	Checked JHR & SMS	6&12/2023
) PM 11	ek 'g	Conservation	ion Service	San Juan County Soil Conservation Distri	ict	San Juan County	, Utah	Approved JD	1/22/2024





22/24 2:30 PM; Pack creek dodds.dwg; Layout: 5 LOW WATER CROSS









1. CONCRETE WILL MEET OR EXCEED NRCS SPECIFICATIONS CS-UT-31 CONCRETE FOR MINOR STRUCTURES AND HAVE A MINIMUM STRENGTH OF 4,500 PSI.

2. ALL REBAR SHALL BE #5 ON 12" CC BOTH DIRECTIONS.





Date 6/2023	12/2023	6&12/2023	1/22/2024
Designed_JD	Drawn JD & J Rob	Checked JHR & SMS	Approved <sup>JD</sup>
ET DETAILS	FWP 2021 PHASF 1		San Juan County, Utah
IRRIGATION OLITI			an County Soil Conservation District
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ETE WILL MEET OR EXCEED NRCS SPECIFICATIONS -31 CONCRETE FOR MINOR STRUCTURES AND A MINIMUM STRENGTH OF 4,500 PSI. BAR SHALL BE #5 ON 12" CC BOTH DIRECTIONS.	6/2023 12/2023 6&12/2023 1/22/2023	+707/77
ATE CHANNEL BÖTTOM TO BOTTOM ACCOMMODATE ACEMENT OF THE STRUCTURE. BACKFILL WILL BE NUS NATIVE MATERIAL. LL WILL MATCH EXISTING CHANNEL BOTTOM	D & J Rob HR & SMS	
LL WILL BE COMPACTED USING THE CLASS C D AS OUTLINED IN CS-UT-23.	Designed Jl Drawn Jl Checked Jl 	Approved
	R CROSSING WP 2021 PHASE 1	San Juan County, Utah
RIER	WATER AND POWER	uan County Soil Conservation District
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# CONSTRUCTION PLANS PREPARED FOR SAN JUAN PACK CREEK EWP 2021 PHASE 2 DESIGNED BY UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE

#### CLEARANCES AND PERMITS

IT SHALL BE THE RESPONSIBILITY OF THE SPONSOR TO OBTAIN ALL NECESSARY CLEARANCES, PERMITS, RIGHTS OF WAY, AND TO COMPLY WITH ALL ORDINANCES AND LAWS PERTAINING TO THE CONSTRUCTION OF THIS PROJECT.

IT SHALL BE THE RESPONSIBILITY OF THE SPONSOR TO ASSURE THAT THE PROJECT IS CONSTRUCTED ACCORDING TO THE ATTACHED DRAWINGS AND SPECIFICATIONS. ANY CHANGES SHALL BE SUBMITTED IN WRITING TO THE NRCS 48 HOURS PRIOR TO IMPLEMENTATION FOR APPROVAL.

### GENERAL NOTES

THE CONSTRUCTION PLANS INCLUDE THESE DRAWINGS AS WELL AS THE ATTACHED SPECIFICATIONS AND OPERATIONS AND MAINTENANCE PLAN.

### LOCATION OF UTILITIES

NO REPRESENTATION IS MADE AS TO THE EXISTENCE OR NON-EXISTENCE OF ANY UTILITIES PUBLIC OR PRIVATE.

THE COOPERATOR MUST OBTAIN THE EXACT LOCATION AND DEPTH OF ALL UTILITIES FROM THE UTILITY COMPANIES PRIOR TO EXCAVATION OR CONSTRUCTION ACTIVITIES.

NRCS CONTACT INFORMATION: Jason Dodds NRCS Engineer 2390 West Highway 56, Suite 14 Cedar City, UT 84721 435-868-3947 Office 435-590-7661 Mobile

# **NRCS SHALL BE NOTIFIED 72 HOURS PRIOR TO CONSTRUCTION.**

I HAVE REVIEWED THESE PLANS, DETAILS, SPECIFICATIONS AND O&M AGREEMENTS, AND FIND THEM ACCEPTABLE.

SPONSOR

Blue Stakes of UTAH LINES VISIT CALL Bluestakes.org

KNOW WHAT'S BELOW! CONTACT BLUE STAKES OF UTAH 811 TO HAVE UTILITY LINES LOCATED AND MARKED. VISIT BLUESTAKES.ORG OR CALL 811 AT LEAST 48 HOURS BEFORE EXCAVATING. IT'S FREE AND IT'S THE LAW! Sheet Nu

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S	heet List Table
ımber	Sheet Title
	COVER SHEET
	PLAN VIEW
	PROFILE VIEWS - R&R 1 AND TR 2
	PROFILE VIEWS - R&R 3 AND TR 4
	PROFILE VIEWS - R&R 5
	PROFILE VIEW R&R'S 6, 7 & 8
	CROSS SECTION VIEWS - 1 & 2
	CROSS SECTION VIEWS - 3 & 4
	CROSS SECTION VIEWS - 5 & 6
	CROSS SECTION VIEW - 7
	ROCK N ROLL LOGS DETAIL
	STREAMBANK PROTECTION DETAILS
	TREE HARVEST DETAIL

DATE

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IMPORTANT NOTE: THE GRADE STABILIZATION LOCATIONS AND ELEVATIONS SHOWN ARE APPROXIMATE AND WILL NEED TO BE FIELD FIT BY NRCS PRIOR TO CONSTRUCTION.



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ROCK-N-ROLL STRUCTURE 3

IMPORTANT NOTE: THE GRADE STABILIZATION LOCATIONS AND ELEVATIONS SHOWN ARE APPROXIMATE AND WILL NEED TO BE FIELD FIT BY NRCS PRIOR TO CONSTRUCTION.



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IMPORTANT NOTE: THE ELEVATIONS SHOWN ARE APPROXIMATE AND WILL NEED TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.



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**IMPORTANT NOTE:** THE ELEVATIONS SHOWN ARE APPROXIMATE AND WILL NEED TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.



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IMPORTANT NOTE: THE ELEVATIONS SHOWN ARE APPROXIMATE AND WILL NEED TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

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1<u>1/2023</u> 1<u>2/2023</u> 22/2024 1 OPTIONAL Rob SEALANT PAINT ઝ SMS esigned\_D ٩ 9 KHHH awn ž S ď STEP 1  $\sim$ TAILS PHASE LL. 210 0N 20: EWP EWP NAPALY INTE NOTE: A WATER-JET (HYDRO-DRILL) MAY BE USED TO A THE AND A THE A CREATE THE PILOT HOLE IN SILT, LOAM, AND SOME CLAY SOILS. PROTE REEK I IT DOES NOT WORK WELL IN 2' MIN LARGE GRAVELS AND COBBLES.  $\odot$ STREAMBANK STEP 2 SAN 6" MAX NOTE: IF PILOT HOLE IS MADE WITH A WATER JET (HYDRO DRILL), o jo United State: Department Agriculture BACKFILLING WITH WATER SOIL SLURRY MAY NOT BE NECESSARY. Ś S United <u>STEP 3</u>



OBTAIN WILLOW OR WILLOW TYPE ADVENTITIOUSLY ROOTABLE STOCK. MATERIAL SHOULD BE FROM AN AREA WITH SIMILAR SOIL, CLIMATE, AND LOCATION RELATIVE TO THE STREAM. THE MATERIAL SHALL BE AT LEAST TWO YEARS OLD AND FREE OF DISEASE, ROT, OR INSECT INFESTATION. MATERIAL SHALL BE HARVESTED WHILE DORMANT AND SOAKED (1 TO 14 DAYS) BEFORE INSTALLATION. NRCS SHALL APPROVE THE SITE BEFORE MATERIAL IS HARVESTED. FOLLOW DETAILS IN THE CONSTRUCTION SPECIFICATION CS-UT-231. CREATE A PILOT HOLE THAT IS PERPENDICULAR TO THE GROUND SURFACE AND DEEP ENOUGH TO REACH THE LOWEST WATER TABLE OF THE YEAR. THE HOLE SHALL BE  $\frac{2}{3}$  TO  $\frac{3}{4}$  THE LENGTH OF THE LIVE POLE. TAMP LIVE POLES INTO HOLE. TOP OF CUTTING SHALL BE ABOVE COMPETING VEGETATION. BACK FILL



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Drawing No.





DETAIL 04 TREE HARVEST DETAIL NOT TO SCALE

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