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MRAP OUIII AR 653 7-16 PERT WALL
DESIGN SPECS FOR THE MONTICELLO MILLSITE PERT
WALL GROUNDWATER DEMOSTRATION 12/98

Permeable Reactive Treatment (PeRT) Wall

Design Specifications for the Monticello Millsite PeRT Wall Groundwater Demonstration Project

December 1998

U.S. Department of Energy

GRAND JUNCTION OFFICE

Work Performed Under DOE Contract No. DE-AC13-95GJ87335 for the U.S. Department of Energy

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Permeable Reactive Treatment (PeRT) Wall Project

Design Specifications for the Monticello Millsite PeRT Wall Demonstration Project

December 1998

Prepared for
U.S. Department of Energy
Albuquerque Operations Office
Grand Junction Office

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Contents

Technical Specifications - Divisions 1 Thru 16

		Revision Number	Date
Division 1: General Requirements			
01010	Summary of Work	K0002300	12/98
01020	Construction Health and Safety	K0002300	12/98
01039	Coordination and Meetings	K0002300	12/98
01060	Compliance with Codes and Standards	K0002300	12/98
01300	Submittals	K0002300	12/98
01500	Temporary Facilities	K0002300	12/98
01540	Security	K0002300	12/98
01710	Site Maintenance and Cleanup	K0002300	12/98
Division 2: Site Work			
02111	Site Access, Snow Removal, and Work Area Integrity	K0002300	12/98
02140	Dewatering	K0002300	12/98
02207	Aggregate Materials	K0002300	12/98
02208	Treatment Media	K0002300	12/98
02215	Geotextiles	K0002300	12/98
02222	Excavating, Trenching, And Backfilling	K0002300	12/98
02411	Metal Sheet Piling	K0002300	12/98
Division 3 Thru 16 - Not Used			

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Division 1: General Requirements

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Section 01010: Summary of Work

Part 1—General

1.1 Document Purpose

The purpose of this document is to present the design specifications for the construction of a PeRT wall in Monticello, Utah. This document, in combination with detailed plate drawings, forms the basis for a request for proposal package.

1.2 Project Background

The Monticello Millsite is a former uranium and vanadium processing mill in the city of Monticello, Utah, that operated from the mid-1940s until 1960. Approximately 1 million tons of uranium ore were processed at the mill; the resultant tailings were stored in four piles: Carbonate, Vanadium, Acid, and East Tailings Piles. The total volume of tailings and tailings-contaminated soil from the peripheral and vicinity properties is estimated to be 2,500,000 cubic yards. The tailings piles were stabilized and covered with soil in 1961 to eliminate the possibility of further dispersal or use. A perennial stream (Montezuma Creek) flows through the 78-acre millsite; some of the tailings are in direct contact with this stream and the alluvial aquifer. The groundwater located below the millsite (owned by U.S. Department of Energy [DOE]) and the groundwater below land downstream of the millsite (privately owned) is contaminated above Federal and State standards.

The Monticello Millsite and nearby contaminated properties are regulated under the Comprehensive Environmental Response, Compensation, and Liability Act. The Monticello Millsite was placed on the National Priorities List in 1989 because of potentially elevated risks associated with contaminated materials related to past milling activities. The DOE, the U.S. Environmental Protection Agency (EPA), and the State of Utah have entered into a Federal Facilities Agreement that specifies DOE as the lead agency and gives oversight authority to the EPA and the State of Utah for the remediation of the groundwater.

There are three operable units (OUs) associated with the Monticello Millsite. The millsite (OU I) and nearby surrounding properties contaminated with tailings (OU II) are currently being remediated. The tailings are being transported to a nearby repository. Remediation of the millsite is expected to be complete during the summer of 1999. Contaminated surface water and groundwater are included as part of OU III. An Interim Record of Decision (ROD) has been developed for OU III that includes a Permeable Reactive Treatment (PeRT) wall as an interim remedy. The PeRT wall will be evaluated for up to 5 years before a final decision is made.

1.3 Site Description

The elevation of the Monticello Millsite ranges from 6,850 to 7,025 feet with 3-percent grades along the valley floor and greater than 10-percent grades along the valley side slopes. The climate is characterized by four distinct seasons that range from cold, windy winters to

mild summers. Late summer and early fall are the rainy seasons during which the greatest share of 15 inches of annual precipitation falls. Prevailing winds are typically dry and are most commonly from the south-southwest.

1.4 Project Overview

The DOE has numerous sites with groundwater contaminated by organics, inorganics including radionuclides, and inorganic/organic mixtures. During the past two decades pump and treat remediation systems have become the convention, but data collected from these installations have shown pump and treat to be inadequate and costly to meet all clean up goals. In response to this inadequacy, a new technology known as PeRT walls has emerged as a potential improvement over pump-and-treat remediation. The Monticello Ground Water Treatment project involves construction of a PeRT wall to intersect a groundwater plume contaminated with inorganic compounds including uranium, arsenic, selenium, vanadium, and manganese. This project will be the first full-scale installation of a PeRT wall to remediate radionuclides and metals. The contaminants of concern are amendable to available reactive media. The contaminated groundwater flows through a shallow alluvial aquifer that is underlain by impermeable bedrock. The flow is naturally "funneled" through a zone less than 700 feet wide.

The PeRT wall will consist of permeable and impermeable sections. The southern and northern impermeable walls will be constructed using steel sheet piling driven deep enough to key into the underlying bedrock aquitard. The PeRT wall will be constructed by driving steel sheet piling down to bedrock forming a rectangular box approximately 100-feet long by 10-feet wide. The soil inside the box will be excavated and replaced with the reactive media (iron filings provided by MACTEC–ERS) and gravel packs on the upstream and downstream side of the iron. The upstream gravel pack will be approximately 2-feet wide composed of 10 percent (by volume) coarse zero valent iron material (provided by MACTEC–ERS) mixed uniformly with 3/8-inch washed pea gravel. The middle 6-feet of the PeRT Wall will contain iron filings provided by MACTEC–ERS. The optimum choice of iron filings was determined in laboratory and field scale testing using site groundwater. The downstream gravel pack will be approximately 2-feet wide composed solely of 3/8-inch washed pea gravel. A 2-inch inside diameter schedule 40 PVC pipe with 3/16-inch holes added for air sparging will be placed at the bottom (1 foot above bedrock) of the downstream gravel pack. One end of the pipe will be capped and glued; an elbow will be attached to the other end with a solid schedule 40 PVC pipe running vertical to 6 feet above the ground surface. Three schedule 40 PVC 2-inch inside diameter air sparging vents will be placed equally spaced across the 100 foot length of the wall. They shall be set 2 feet below the top of the 3/8-inch washed pea gravel and run 6 feet above the existing grade. The bottom of the vents shall be connected horizontally with tee's to 2-inch inside diameter schedule 40 PVC pipe with 3/16-inch holes added for pressure relief. The pipe will be capped and glued on both ends. It is essential that during construction of the PeRT Wall the three distinct vertical layers have only minimal intermixing. After the reactive materials and gravel are placed in the excavated box, the sheet pilings perpendicular to the groundwater flow will be removed (two 100-foot sections).

The soil and sediment on the property where the PeRT wall is being installed is currently being remediated. This property will be verified clean and backfilled before the start of the project. The construction site will be level to the approximate elevation shown on the drawings. After the PeRT Wall is installed and the Subcontractor has left the site, MACTEC–ERS will add approximately 2½ feet of fill material to reach the final grade.

1.5 Scope of Work

Work under this subcontract shall be performed in accordance with the subcontract Terms and Conditions for Operable Unit I project at Monticello. These Specifications and design drawings are included with the Request For Proposal (RFP). The work shall consist of furnishing all labor, tools, equipment, materials, transportation, services and incidentals, and performing all operations necessary for the construction shown and noted on the design drawings and as specified in these Specifications and other applicable RFP documents. To ensure completion of the project in accordance with the period of performance as stated in the subcontract RFP documents, the Subcontractor shall have labor and equipment resources available and dedicated to the project.

1.6 Proposed Schedule

SD–07 Schedule MA

A. See table below (days are calendar days)

Days	Activity After Award and Notice to Proceed	Milestone
0	Award and Notice to Proceed	
17	Mobilization	•
21	Complete snow removal and site preparation for iron filings delivery and unloading	•
28	Complete sheet pile preparation	•
28	Complete site set up	
31	Complete key trench	
39	Complete construction of sheet pile box	•
40	Start north impermeable wall	
48	Complete excavation of sheet pile box	•
62	Complete preparation of sheet pile box and installation of treatment media and 3/8-inch pea gravel	•
70	Complete the removal of temporary sheet pile perpendicular to groundwater flow at sheet pile box	•
71	Start south impermeable wall	•
82	Complete installation of sheet pile for impermeable walls	•
88	Complete seal/grout joints in the impermeable walls	•
96	Project complete. Final Inspection	•

Note: Delivery of the 25 truck loads of iron filings shall start 24 days after award and notice to proceed and complete in 14 days.

B. Work shall be conducted between the hours of 7:00 a.m. and 8:00 p.m.

1.7 Schedule

SD–07 Schedule MA

A. The Subcontractor shall submit to MACTEC–ERS a final project work schedule in duplicate within 5 working days after receipt of written Notice of Award. MACTEC–ERS acceptance shall be contingent upon sufficient detailed breakdown and assignment of realistic durations for each task, within the subcontract performance and milestones. Identify the first work day of each week, critical path activities, and product delivery dates including those furnished by MACTEC–ERS. The schedule shall depict fabrication and installation of materials and shall include material delivery dates required to support construction activities; the schedule shall show mobilization and demobilization times and shall be presented in a graphic format. The schedule shall also include a Manloading Schedule depicting the estimated number of craftsmen to be used on a weekly basis along with an on-the-job equipment use schedule for activities included on the schedule. The Subcontractor may elect to use a bar chart, logic diagram, PERT chart, CPM network, Gantt Chart or other technique as deemed appropriate.

B. The Subcontractor shall notify MACTEC–ERS immediately if the schedule slips.

C. The Subcontractor shall notify the MACTEC–ERS Contract Administrator at 75 percent of contract completion.

D. Submit revised schedules with each Application for Payment identifying changes since the previously submitted schedules.

E. Indicate estimated percentage of completion for each item of work at each submission.

Section 01020: Construction Health and Safety

Part 1—General

1.1 Scope

A. All work performed shall be conducted in accordance with safety regulations promulgated by DOE, the Occupational Safety and Health Administration (OSHA), the site-specific Project Safety Plan (PSP), subcontract documents, and other Federal, State, County, and local agencies.

B. The radiologically contaminated soil and sediment on the property where the PeRT wall will be installed is currently being remediated. The property will be verified radiologically clean to meet EPA standards and backfilled before the start of this project.

1.2 Related Work

A. Divisions 1 and 2 of these Specifications

B. Project Safety Plan

1.3 Submittals

SD–08 Statements

A. Submittals shall be made in accordance with Section 01300 (Submittals).

B. Reference the Project Safety Plan and submit a list of specific tasks and associated hazards.

1.4 References

The publications listed below form a part of these Specifications to the extent referenced. The publications are referred to in the text by the basic designation only.

American National Standards Institute (ANSI)

ANSI Z89.1	Protective headwear for Industrial Workers Requirements
ANSI Z41	Standards for Personal Protection – Protective Footwear
ANSI B30.5	Mobile and Locomotive Cranes

Part 2—Products

(Not Used)

Part 3—Execution

3.1 OSHA Compliance

A. The Subcontractor and all lower-tier Subcontractors shall comply with all applicable OSHA requirements identified under 29 CFR 1926, as enforced by the Utah Occupational Safety and Health (UOSH).

B. Health and Safety Program

The Subcontractor shall agree to comply with the MACTEC–ERS-developed PSP (see attached exhibit) for the Monticello Millsite PeRT Wall Groundwater Treatment System.

C. Safety Inspections

The Subcontractor shall conduct daily inspections of the job site for unsafe conditions or practices. The inspection shall be documented and made available for review by MACTEC–ERS on a daily basis. Corrective action shall be taken to mitigate hazardous job-site conditions.

The Subcontractor shall make vehicles, heavy equipment, and materials available to MACTEC–ERS for an initial safety and radiological inspection prior to commencement of work. The Subcontractor shall allow MACTEC–ERS to conduct initial OSHA inspections prior to the start of work for each piece of equipment delivered to the job site (assume 1 hour each). If vehicles, heavy equipment, or materials do not meet applicable regulatory standards, including OSHA, Utah Department of Transportation, and DOE requirements, the vehicles, heavy equipment, or materials shall not be used on the job site until approved by MACTEC–ERS.

3.2 Hazard Identification and General Health and Safety Requirements

A. Industrial Hygiene

1. Although not anticipated, potential chemical and biological hazards may be encountered on the job site that may require periodic monitoring by MACTEC–ERS. In the event of a suspected chemical or biological hazard, appropriate measures shall be taken to protect personnel at the direction of MACTEC–ERS.

2. Noise surveys shall be conducted by MACTEC–ERS for areas that may have the potential to exceed the OSHA standard. Any area that exceeds a time-weighted

average of 85 dba shall require personnel to wear hearing protection. The Subcontractor shall comply with OSHA standard 29 CFR 1910.85. Hearing protection, if required, shall be supplied by the Subcontractor for all employees.

SD–01 Data

3. The Subcontractor shall submit to MACTEC–ERS a copy of the material safety data sheets (MSDS) for each chemical the Subcontractor intends to use on the job site and receive approval from MACTEC–ERS prior to bringing chemical on site. MSDS books shall be provided by and made available by the Subcontractor. The books must be clearly marked and accessible to personnel at all times. MSDS books stored in equipment or vehicles are not acceptable.

B. Special Subcontractor Responsibilities

1. Air Quality: Interior and exterior locations shall be maintained below OSHA-permissible exposure limits for hazardous atmosphere as determined by MACTEC–ERS observation and/or monitoring using administrative and/or engineering controls.

2. Dust Control: Visible dust as determined by MACTEC–ERS shall not be allowed. The Subcontractor shall take the necessary measures to eliminate dust. During the Subcontract performance period, including non-working hours such as nights, weekends, and holidays, the Subcontractor shall control all dust on the job site. The Subcontractor shall provide equipment 24 hours a day for dust control. The Subcontractor shall comply with, using techniques that may include, but are not limited to, the following:

   a. Minimizing exposed work areas.

   b. Enforcing lower speed limits.

   c. Suppressing dust generation by spraying the area with water or a MACTEC–ERS-accepted dust retardant.

C. Refueling Plan

SD–08 Statements

Submit a description of the OSHA-compliant method by which vehicles and equipment shall be refueled and fuel and fluids used to maintain vehicles and equipment are stored.

D. Confined Spaces

If suspect confined spaces are identified they will be evaluated by MACTEC–ERS and a determination made as to the applicability of the standard. 29 CFR 1926.651, "Specific Excavation Requirements," will be invoked to control work in evacuations.

E. Industrial Safety Concerns

1. Signs, Signals, and Barricades: The Subcontractor shall identify signs, signals, and barricades that will be required to control hazards.

2. A Safe Work Permit (SWP) or Job Hazard Analysis (JHA) shall be used for unanticipated tasks that are not covered by a written procedure or job safety analysis. MACTEC–ERS may require SWPs or JHAs for tasks such as cutting/welding, using chain saws, working on energized electrical lines, etc.

3. Hoisting and Rigging: When using cranes for lifting purposes, the Subcontractor shall comply with Section 3.3.

3.3 Ordinary Lift Requirements

Note: *No critical lifts are planned. The following section supersedes Terms and Conditions Section 20.1.2.d.*

A. Ordinary lifts will be planned in accordance with this policy.

1. The Subcontractor is responsible for compliance with all OSHA requirements applicable to the lift, equipment, and services.

2. The Subcontractor shall perform all required tests and inspections as part of this subcontract.

   a. Inspection of the crane and all rigging equipment that will be used.

   b. OSHA Compliance Certification—The Subcontractor shall certify that all equipment and personnel comply with applicable OSHA requirements (29 CFR 1910 and 29 CFR 1926). This certification shall be signed by the Subcontractor's competent person and responsible management and shall be available on site for inspection by DOE or MACTEC–ERS personnel.

3. Any modifications or attachments to hoisting and rigging equipment must be approved in advance by MACTEC–ERS.

B. Prelift Meeting

1. Before any lift is performed, personnel in charge of the lift shall conduct a prelift (tailgate) meeting involving all participants involved, including Subcontractor and MACTEC–ERS personnel.

2. As part of this prelift meeting, all personnel who will participate in the lift will perform a physical walk-through of the lift plan at the lift site. During the walk-through, all participants shall examine the site for conditions that could adversely

affect the lift, each individual's responsibilities, and the potential hazards of the lift. (**Note:** There are overhead power lines on site.)

3. No individual may participate in any portion of the lift without having participated in the prelift meeting and the walk-through.

4. The agenda of the prelift meeting and the signed attendance sheet will be maintained as records and available on site for inspection by DOE or MACTEC–ERS personnel.

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Section 01039: Coordination and Meetings

Part 1—General

1.1 Coordination and Project Conditions

A. The Subcontractor shall coordinate scheduling, submittals, and work of the various sections of the RFP documents to ensure efficient and orderly sequence of installation of interdependent construction elements with provisions for accommodating items installed later.

B. The Subcontractor shall coordinate completion and clean-up of work of separate sections in preparation for final completion.

1.2 Field Engineering

A. The Subcontractor shall locate and protect survey control and reference points for the sheet pile box and impermeable walls (provided by MACTEC–ERS).

B. The Subcontractor shall verify construction boundaries; set-backs and easements; confirm drawing dimensions and elevations.

C. The Subcontractor shall provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices to construct the PeRT wall.

1.3 Notice of Award

A. MACTEC–ERS will schedule a meeting at the Grand Junction, Colorado, office after Notice of Award.

B. Attendance required: MACTEC–ERS Contract Administrator and Subcontractor.

C. Agenda:

1. Distribution of Subcontract Documents.

2. Submission of list of lower-tier Subcontractors, list of products, schedule of values, and progress schedule.

3. Designation of personnel representing the parties in the Subcontract.

4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Subcontract closeout procedures.

5. Scheduling.

6. Application for payment procedures.

1.4 Preconstruction Conference

A. MACTEC–ERS will schedule a meeting at the project site 3 days prior to mobilization start. Documentation will be distributed by MACTEC–ERS.

B. Attendance required: MACTEC–ERS and Subcontractor, Subcontractor's Superintendent, and major lower-tier Subcontractors.

C. Agenda:

1. Site inspection and documentation of preconstruction site conditions.

2. Use of premises by MACTEC–ERS and Subcontractor.

3. Review of proposal.

4. Construction facilities and controls provided by MACTEC–ERS.

5. Survey layout.

6. Security and housekeeping procedures.

7. Application for payment procedures.

8. Procedures for testing.

9. Procedures for maintaining record documents.

10. Requirements for start-up of equipment.

11. Inspection and acceptance of equipment put into service during construction period.

12. Health and Safety requirements.

13. Pre-entry site briefing if work is to start immediately.

1.5 Progress Meetings

A. MACTEC–ERS will schedule and administer weekly meetings throughout progress of the work.

B. Attendance required: Subcontractor Project Superintendent, major lower-tier Subcontractors and suppliers as appropriate to agenda topics for each meeting.

C. Agenda:

1. Review of work progress.
2. Field observations, problems, and decisions.
3. Identification of problems which impede planned progress.
4. Review of submittals schedule and status of submittals.
5. Review of off-site fabrication and delivery schedules.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Coordination of projected progress.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to work.

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Section 01060: Compliance with Codes and Standards

Part 1—General

1.1 Scope

Work under this project shall comply with the following codes and standards and all other applicable Federal, State, and local codes, standards, rules, and regulations.

1.2 Related Work

Divisions 1 through 2 of these Specifications

1.3 Submittals

SD–13 Certificates

A. Submittals shall be made in accordance with Section 01300 (Submittals).

B. Submittals shall be made when required on the Project Submittal List.

C. Submit copies of all permits, complete with approval signatures, obtained for the Project. Submit completed permits 5 days prior to commencing the applicable work.

D. Submit copies of all licenses required to conduct work in the State of Utah 5 days prior to commencing work.

1.4 List of Codes and Standards

A. American National Standards Institute (ANSI),
(formerly ASA or USASI)
American National Standards Institute
1430 Broadway
New York, NY 10018

B. American Society for Testing and Materials (ASTM)
1916 Race Street
Philadelphia, PA 19103

C. National Electrical Code (NEC)
National Fire Protection Association (NFPA)
60 Batterymarch Street
Boston, MA 02110

D. National Fire Code (NFC)
National Fire Protection Association Inc.
Batterymarch Park
Quincy, MA 02269

E. NFPA 101 (Life Safety Code)
National Fire Protection Association Inc.
Batterymarch Park
Quincy, MA 02269

F. *U.S. Code of Federal Regulations*
Title 29, Labor
Part1910, Occupational Safety and Health Standards
Part 1926, Safety and Health Regulations for Construction

Part 2—Products

(Not Used)

Part 3—Execution

3.1 Compliance with Codes and Standards

The Subcontractor and lower-tier Subcontractors shall comply with codes and standards noted above and as noted in other sections of these specifications and on the design drawings.

Part 4—Quality Control

4.1 Quality Assurance - Control of Installation

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

D. Perform work by persons qualified to produce required and specified quality.

E. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

G. Assure that all proprietary technology is installed to preserve all warranties and guaranties associated with the technologies.

4.2 Tolerances

A. Monitor fabrication and installation tolerance control of products to produce acceptable work. Comply with manufacturers' tolerances. Do not permit tolerances to accumulate. Manufacturers specifications must be present on site during installations.

B. Tolerances applicable to the installation of the sheet piling are referenced in Section 02411 (Metal Sheet Piling).

4.3 References and Standards

For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

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Section 01300: Submittals

Part 1—General

1.1 Submittal Procedures

A. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

B. Identify project, Subcontractor, lower tier Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.

C. Apply Subcontractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and contract documents.

D. For each submittal for review, the Subcontractor shall allow 5 days for MACTEC–ERS to review each submittal excluding delivery time to and from the Subcontractor.

E. Identify variations from subcontract documents and product or system limitations which may be detrimental to successful performance of the completed work.

F. Provide space for MACTEC–ERS review stamps.

G. When revised for resubmission, identify all changes made since previous submission.

H. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

I. Submittals not requested will not be recognized or processed.

1.2 Submittal Descriptions (SD)

A. A list of submittal types that may be used in the specifications are as follows;

SD–01 Data

If requested submit product data to MACTEC–ERS for review for the limited purpose of checking for conformance with information given and the design concept expressed in the subcontract documents. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

If requested submit design data for information for the limited purpose of assessing conformance with information given and the design concept expressed in the subcontract documents.

SD–04 Drawings

If requested submit (shop) drawings to MACTEC–ERS for review for the limited purpose of checking for conformance with information given and the design concept expressed in the subcontract documents. Submit [two] copies which will be retained by MACTEC–ERS.

SD–07 Schedules

Submit schedules per Section 01010, Part 1, 1.5 (Proposed Schedule) and 1.6 (Schedule).

SD–08 Statements

If requested submit statements and descriptions as required.

SD–09 Reports

If requested submit certified material test reports as required.

SD–13 Certificates

If requested submit certificates indicating material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

Certificates may be recent or previous test results on material or product, but must be acceptable to MACTEC–ERS.

SD–14 Samples

If requested submit samples to MACTEC–ERS for review for the limited purpose of checking for conformance with information given and the design concept expressed in the subcontract documents. Include identification on each sample, with full project information.

SD–18 Records

If requested submit records as required.

B. Submittals are classified as follows:

MACTEC–ERS Approval Required (MA)

For Information Only (FIO)

C. Submittals for this specification design package are listed in the Submittal Register (Table 1).

Part 2—Products

SD–08 Data MA

2.1 Proposed Products List

A. Submittals shall be in accordance with Section 1300 (Submittals).

B. Within 5 days after date of Subcontract Agreement, submit list of major products proposed for use with name of manufacturer, trade name, and model number of each product.

C. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

Part 3—Execution

The Subcontractor shall submit all items listed on the Submittal Register or as required by the specifications. Submittals requiring MA shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's MSDSs and in compliance with existing laws and regulations.

At the end of this section is the Submittal Register (Table 1) listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required.

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Table 1. Submittal Register

					Specification Section									
Title and Location Monticello Site PeRT Wall Specification/Monticello, Utah					Subcontractor							Subcontract Number		
Activity No. (A)	Transmittal No. (B)	Item No. (C)	Specification Paragraph Number (D)	Description of Item Submitted (E Thru N)	Classification[a] (O Thru Q)	Subcontractor Schedule Dates			Subcontractor Action			MACTEC–ERS Action		Remarks (Z)
						Submit (R)	Approval Needed By (S)	Material Needed By (T)	Code (U)	Date (V)	Submit to MACTEC–ERS (W)	Code (X)	Date (Y)	
			01010	**SD-07 Schedule**										
			1.5, A, B,—1.6, A, B, C, D, E	Project Work Schedule	MA									
			01020	**SD-01 Data**										
			3.2, A, 3	MSDS Sheets	FIO									
			01020	**SD-08 Statements**										
			3.2, C	Refueling Plan	FIO									
			01020	**SD-08 Statments**										
			1.3, B	Project Safety Plan Tasks and Hazards	MA									
			01060	**SD-13 Certificates**										
			1.3, C, D	Permits and Licenses	FIO									
			01300	**SD-01 Data**										
			2.1, A, B, C	Proposed Product List	MA									
			02207	**SD-01 Data**										
			1.4, A, B	Aggregate Materials	FIO									
			02208	**SD-08 Statements**										
			1.5, A, B, C	Proposed Procedure	MA									
			02215	**SD-01 Data**										
			1.4	Material Data	MA									
			02222	**SD-08 Statements**										
			3.2	Excavation Plan	MA									
			3.2	Equipment	MA									
			02411	**SD-01 Data**										
			1.1	Pile Driving Equipment	MA									
			02411	**SD-04 Drawings**										
			1.1	Layout Drawings	MA									
			1.1	As-Built Drawings	MA									
			02411	**SD-01 Data / SD-04 Drawings**										

Table 1(continued). Submittal Register

					Specification Section									
Title and Location Monticello Site PeRT Wall Specification/Monticello, Utah					Subcontractor							Subcontract Number		
Activity No. (A)	Transmittal No. (B)	Item No. (C)	Specification Paragraph Number (D)	Description of Item Submitted (E Thru N)	Classification* (O Thru Q)	Subcontractor Schedule Dates			Subcontractor Action			MACTEC–ERS Action		Remarks (Z)
						Submit (R)	Approval Needed By (S)	Material Needed By (T)	Code (U)	Date (V)	Submit to MACTEC–ERS (W)	Code (X)	Date (Y)	
			Part 1—General	PeRT Wall Construction and Reinforcement Bracing Plan	MA									
			02411	**SD-08 Statements**										
			1.1	Pulling and Redriving	MA									
			02411	**SD-09 Reports**										
			1.1	Materials Tests	FIO									
			02411	**SD-18 Records**										
			1.1	Driving	FIO									

*FIO = For Information Only, MA = Contractor Approved

Section 01500: Temporary Facilities

Part 1—General

The Subcontractor shall be responsible for providing or arranging with lower-tier Subcontractors for all temporary utilities, facilities, and controls during the construction period. All such facilities shall be removed at the termination of their usefulness. For intrusive work within radiological control boundaries, use only qualified trained lower tier Subcontractors and personnel. Intrusive work within radiological control boundaries is not anticipated.

1.1 Temporary Office

The Subcontractor shall provide a temporary office at the work site to conduct project related business, hold safety meetings, progress meetings, etc. Provide MACTEC–ERS personnel a minimum space of 8 foot × 8 foot with a flat desk surface 3 foot × 6 foot 8 inches and one file cabinet. Provide electricity to the trailer for light and heat. See Section 1.2.

1.2 Temporary Electricity

The Subcontractor shall provide temporary electrical service. Connection can be made to the existing power panel located on the drawing (Contact: Empire Electric Association, Inc., 801 North Broadway, Cortez, Colorado 81321; 1-800-709-3726). Cost of electricity meters, wiring, and connections shall be the Subcontractor's responsibility.

1.3 Temporary Water

Wash water and drinking water shall be provided per OSHA and must be made available at the site. Water for dust control purposes shall be pumped from the adjacent creek temporary diversion at a point designated by MACTEC–ERS. The Subcontractor shall provide all temporary piping or water storage and pumping equipment hoses, etc. for the control of visible dust.

1.4 Temporary Toilets

The Subcontractor shall provide chemical toilets for the use of all employees engaged in the work. The toilets shall be portable and shall be maintained in a clean and sanitary condition at all times. Each toilet shall be equipped with a separate urinal.

1.5 Temporary Washing Facilities

The Subcontractor shall provide adequate washing facilities per OSHA 1926.51(F).

1.6 Temporary Fence

Provide labor and material for installation of orange perforated fencing "Mirasafe Warning and Barrier Fence," or equivalent. The location shall be in the work area at MACTEC–ERS

direction. Provide a quantity of 400 linear feet if directed by MACTEC–ERS per the unit line item. Fence shall be 4 feet in height with steel T-posts 10 feet on centers. All corners shall be angle braced. A double strand twisted smooth wire at the top of the fence shall be fastened to each corner and line post. The plastic fencing fabric shall be secured to each corner and line post and also secured to the top wire with Hog ring fasteners at 2½ foot increments.

1.7 Silt Fence

A unit line item quantity of 400 linear feet of silt fence shall be installed if directed by MACTEC–ERS per U.S. Department of Transportation guidelines to protect all downgradient surface water receptors, including streams and wetlands.

Section 01540: Security

Part 1—General

1.1 Security Program

A. Protect work and materials from theft, vandalism, and unauthorized entry.

B. Initiate program at project mobilization.

C. Maintain program throughout construction period until final completion.

1.2 Entry Control

A. Site access shown on drawings.

B. Subcontractor shall restrict the entrance of unauthorized and untrained personnel on to the project site.

C. Subcontractor will maintain a log of workers and visitors and make the log available to MACTEC–ERS on request.

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Section 01710: Site Maintenance and Cleanup

Part 1—General

In accordance with the Terms and Conditions, the Subcontractor shall perform all site maintenance and cleanup as specified herein.

1.1 During Construction

A. The Subcontractor shall oversee cleaning and shall ensure that the grounds are maintained free from accumulations of waste and rubbish, observing the following requirements:

1. At reasonable intervals, and not less than once a week, cleanup the site and access. Dispose of waste and debris off the site.

2. Provide containers for the collection of waste and debris.

B. Ensure that no visible dust is present using engineering controls and water acquired per Section 01500 1.3 Temporary Water and Section 01020, 3.2, B.2.

1.2 Pollution Control

A. Cleanup and disposal operations shall be conducted in compliance with local ordinances and anti-pollution laws.

B. Rubbish and waste shall not be burned or buried on site.

C. Volatile fluid wastes shall not be emptied into storm sewers, sanitary sewers, streams, or waterways, or poured on the ground.

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Division 2: Site Work

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Section 02111: Site Access, Snow Removal, and Work Area Integrity

Part 1–General

1.1 Access

The Subcontractor shall use due precaution to avoid damage to roadways or property used to move personnel, trucks, or equipment onto the project site, whether such property is publicly or privately owned. The Subcontractor shall be responsible for and shall repair any damages to such access routes beyond that which existed prior to construction.

1.2 Site Maintenance

A. The Subcontractor shall maintain the integrity of the surface and structure of all access roads and the work and staging area within the construction area in a condition that will assure the work will be completed as designed under all adverse weather conditions and within the period of performance.

B. A unit line item for 4,000 cubic yards class 6 roadbase is included on the unit price spreadsheet form to maintain the surface integrity and structure of all access roads, construction, and staging area. The unit price shall include all labor, material, and equipment to place, compact, remove, and dispose of roadbase in a lawful manner at the conclusion of the project. The Subcontractor shall notify the Contractor prior to utilization of this roadbase and shall not exceed the subcontract quantity without an approved change order.

C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

1.3 Snow Removal

A. The Subcontractor shall initiate removal of all snow covering the defined construction and staging area to facilitate the delivery and unloading of the iron filings and related treatment media. Snow removal shall be started in areas so as not to stop or impede delivery, unloading, storage, and protection of the iron filings and related treatment media. Snow removal shall continue until the defined construction and staging area is cleared of snow prior to setup, and sheet pile delivery and preparation.

B. The Subcontractor shall include 5 additional days of snow removal per unit line item over and above initial removal to keep the site clear of snow.

C. Snow shall be piled downgradient of the construction and staging area.

D. See Appendix A—Climactic Data, Utah Climate Center, Utah State University.

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Appendix A

Climatic Data, Utah Climate Center, Utah State University

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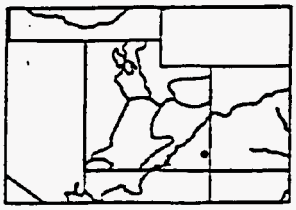
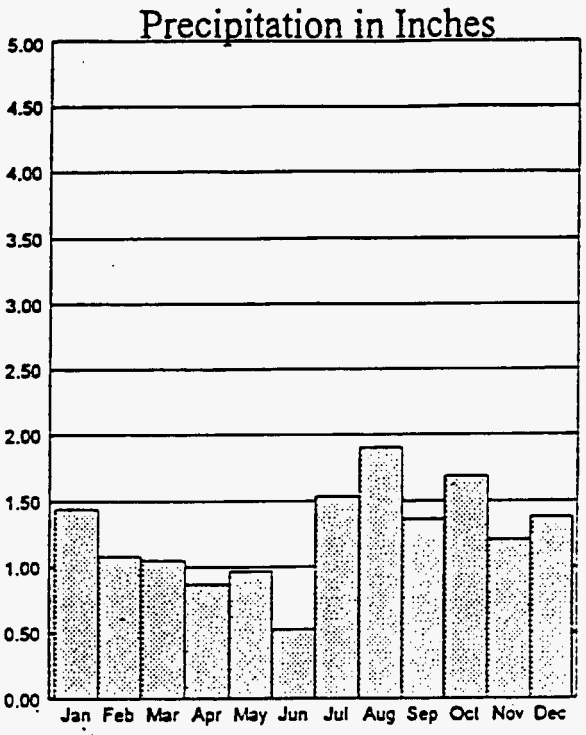
Utah Climate Center
Utah State University

MONTICELLO
Monthly Data Summary

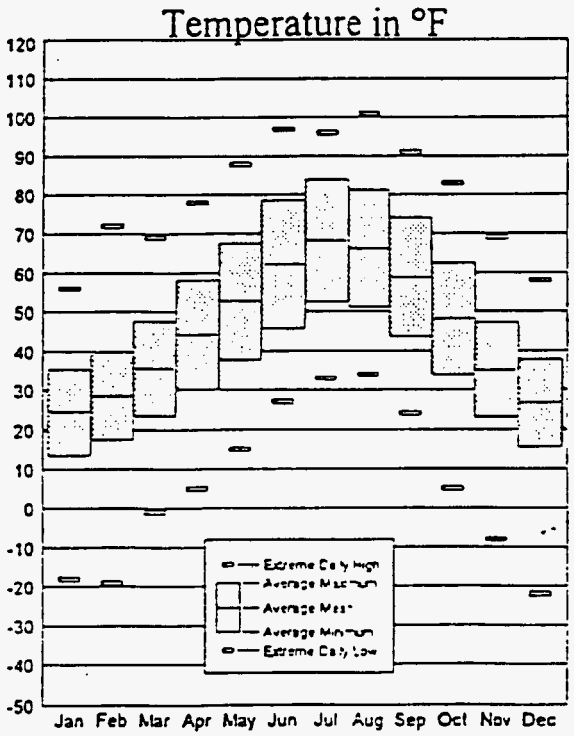


County: SAN JUAN
Latitude: 37.867
Longitude: -109.300
Elevation: 6820 Feet
Period: 1948-1994



Temperature

Average Maximum	59.5
Average Minimum	32.3
Highest Daily	101
Lowest Daily	-22



Precipitation

Average Annual	14.99
Greatest Annual	23.07
Least Annual	6.56
Greatest Daily	3.38

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Use of this data is encouraged, but must credit the Utah Climate Center

Utah Climate Center

MONTICELLO
Monthly Data Summary

Maximum Temperature in °F

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Monthly normal	35.1	40.0	47.6	57.9	67.7	78.7	84.3	81.3	73.4	61.8	47.1	37.2	59.3
Standard deviation	8.3	8.4	8.4	8.9	8.0	7.1	4.4	5.0	6.9	9.1	9.5	8.7	7.8
Average monthly	35.4	39.9	47.5	58.2	67.5	78.6	83.9	81.2	74.0	62.4	47.2	37.8	59.5
Standard deviation	8.1	8.2	8.9	8.8	7.8	6.9	4.4	5.0	6.7	9.3	9.5	8.4	7.7
High monthly average	45.6	50.1	56.8	64.6	74.7	84.4	86.9	84.8	79.8	71.3	57.5	47.1	86.9
Year of occurence	1981	1954	1972	1954	1984	1990	1978	1969	1956	1950	1949	1980	1978
Low monthly average	26.0	33.3	38.5	50.4	58.8	72.9	79.9	73.6	66.9	52.3	39.6	28.8	26.0
Year of occurence	1979	1949	1952	1970	1957	1949	1992	1968	1986	1969	1972	1978	1979
Record high daily	56†	72	69†	78	88†	97	96	101	91	83	69†	58†	101
Day of occurence	22	25	10	29	31	28	6	8	2	1	5	16	8
Year of occurence	1981	1986	1989	1992	1984	1950	1989	1969	1948	1956	1975	1980	1969
Record low daily	5†	1	19	32†	40	54	63	60	43	26	20†	4†	1
Day of occurence	6	6	28	4	9	8	31	23	30	30	28	23	6
Year of occurence	1971	1989	1975	1983	1979	1979	1953	1992	1959	1972	1976	1990	1989
Days w/max >= 100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Days w/max >= 90	0.0	0.0	0.0	0.0	0.0	1.2	2.8	0.6	0.1	0.0	0.0	0.0	4.7
Days w/max <= 32	11.2	4.9	1.3	0.1	0.0	0.0	0.0	0.0	0.0	0.2	2.1	8.1	28.4

Minimum Temperature in °F

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Monthly normal	12.7	17.1	23.3	29.7	37.5	45.3	52.6	50.9	42.9	33.3	23.4	14.9	32.0
Standard deviation	10.1	9.7	7.6	6.9	6.5	6.8	4.8	5.5	6.6	7.0	8.3	9.5	7.4
Average monthly	13.6	17.4	23.5	30.3	37.8	45.6	52.5	51.1	43.7	33.9	23.1	15.6	32.3
Standard deviation	9.9	9.6	7.4	7.0	6.5	6.6	4.7	5.2	6.4	7.0	8.3	9.3	7.3
High monthly average	23.6	25.0	28.6	35.2	42.4	49.8	58.1	56.6	49.3	42.2	29.3	23.6	58.1
Year of occurence	1956	1954	1989	1992	1958	1994	1971	1969	1948	1950	1962	1950	1971
Low monthly average	6.2	8.2	17.7	24.8	34.3	40.3	48.9	45.6	38.5	27.7	15.3	6.8	6.2
Year of occurence	1979	1949	1969	1975	1975	1967	1993	1968	1968	1976	1979	1978	1979
Record high daily	38	39	46	50†	54†	65†	68†	65†	61	52†	46	39	68
Day of occurence	24	19	23	21	21	29	21	9	1	12	14	6	21
Year of occurence	1970	1986	1990	1989	1984	1994	1964	1971	1990	1971	1965	1965	1964
Record low daily	-18	-19	-1	5	15	27†	33	34†	24†	5	-8	-22	-22
Day of occurence	30	7	6	2	7	2	6	25	30	30	27	22	22
Year of occurence	1979	1989	1973	1975	1968	1990	1982	1968	1955	1971	1952	1990	1990
Days w/min <= 32	30.5	27.5	28.0	18.8	6.8	0.6	0.0	0.0	1.4	12.9	26.3	30.5	187.1
Days w/min <= 0	3.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.6	6.5
Days w/min <= -20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Mean Temperature in °F

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Monthly normal	23.9	28.6	35.4	43.8	52.6	62.0	68.4	66.1	58.2	47.6	35.2	25.1	45.7
Standard deviation	8.3	8.2	7.7	7.2	6.6	6.3	3.5	4.2	5.8	7.0	8.0	8.1	6.7
Average monthly	24.5	28.6	35.5	44.2	52.7	62.1	68.2	66.2	58.8	48.2	35.1	26.7	45.9
Standard deviation	8.1	8.1	7.4	7.2	6.5	6.1	3.6	4.1	5.8	7.2	8.0	7.9	6.7
High monthly average	33.0	37.6	42.4	49.9	57.7	67.0	71.9	70.7	63.5	56.7	41.4	35.0	71.9
Year of occurence	1956	1954	1972	1992	1984	1990	1971	1969	1956	1950	1965	1950	1971
Low monthly average	16.3	20.7	28.3	38.5	47.2	57.9	64.7	59.6	53.2	42.0	27.9	17.7	16.3
Year of occurence	1979	1949	1952	1970	1957	1949	1992	1968	1951	1984	1979	1978	1979

† Also occurred on earlier date(s).

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Utah Climate Center

MONTICELLO
Monthly Data Summary

Precipitation in Inches

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Monthly normal	1.41	1.00	1.18	0.85	0.92	0.57	1.57	1.90	1.58	1.62	1.37	1.49	15.47
Standard deviation	0.17	0.14	0.12	0.10	0.10	0.08	0.15	0.20	0.18	0.17	0.17	0.17	0.14
Average monthly	1.44	1.08	1.05	0.86	0.97	0.53	1.53	1.91	1.36	1.68	1.21	1.38	14.99
Standard deviation	0.17	0.14	0.11	0.10	0.11	0.08	0.16	0.19	0.16	0.18	0.15	0.16	0.14
High monthly total	6.25	4.03	3.09	2.65	3.49	2.26	4.60	4.26	4.82	7.64	4.32	4.79	7.64
Year of occurence	1980	1993	1983	1957	1993	1973	1953	1982	1962	1972	1978	1978	1972
Low monthly total	0.01	0.00	0.02	0.00	0.03	0.00†	0.03	0.20	0.00†	0.00†	0.00	0.00†	0.00†
Year of occurence	1972	1972	1972	1969	1984	1980	1993	1978	1957	1964	1989	1989	1989
Record high daily	1.72	1.89	0.95†	1.12	1.36	1.10	2.09	3.38	1.93	2.02	1.78	2.40	3.38
Day of occurence	17	8	3	2	15	18	31	1	27	19	6	18	1
Year of occurence	1979	1994	1989	1986	1993	1949	1956	1968	1962	1949	1987	1978	1968
Days w/pcp >= .01	6.2	5.9	6.6	5.3	6.0	2.9	7.7	8.6	6.2	5.5	5.0	5.7	72.7
Days w/pcp >= .10	3.6	2.8	3.1	2.7	2.8	1.5	3.9	4.9	3.3	3.9	2.7	3.2	39.1
Days w/pcp >= .50	0.9	0.5	0.4	0.4	0.4	0.3	0.8	1.0	0.7	1.2	0.7	0.9	8.1

Snow and Sleet in Inches

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Monthly normal	16.2	10.9	9.9	2.4	0.5	0.0	0.0	0.0	0.0	0.7	6.9	14.3	61.8
Standard deviation	1.9	1.5	1.1	0.6	0.2	0.0	0.0	0.0	0.0	0.2	1.1	1.5	0.7
Average monthly	16.5	11.3	8.3	2.2	0.5	0.0	0.0	0.0	0.0	0.8	6.0	12.9	58.4
Standard deviation	1.9	1.4	1.0	0.5	0.2	0.0	0.0	0.0	0.0	0.3	1.0	1.5	0.6
High monthly total	62.0	36.0	33.9	15.0	8.0	0.0†	0.0†	0.0†	0.0†	9.0	22.0	47.5	62.0
Year of occurence	1949	1979	1970	1975	1979	1994	1994	1994	1994	1991	1983	1967	1949
Low monthly total	0.0†	0.0†	0.0†	0.0†	0.0†	0.0†	0.0†	0.0†	0.0†	0.0†	0.0†	0.0†	0.0†
Year of occurence	1972	1972	1994	1992	1994	1994	1994	1994	1994	1993	1989	1989	1989
Record high daily	24.0	17.0	12.0	12.0	5.0	0.0†	0.0†	0.0†	0.0†	5.0	12.0	13.0	24.0
Day of occurence	4	24	31	5	5	30	31	31	30	30	25	19	4
Year of occurence	1973	1987	1970	1983	1993	1994	1994	1994	1994	1991	1983	1967	1973
Days w/snow >= .1	4.6	3.9	3.4	1.0	0.2	0.0	0.0	0.0	0.0	0.5	2.3	4.2	20.1
Days w/snow >= 5	1.2	0.7	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.0	3.7
Days w/snow >= 10	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.9

Degree Days

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Heating normal	1266	1026	913	630	363	128	9	37	211	536	885	1197	7227
Heating average	1247	1026	910	618	382	123	11	35	194	517	887	1179	7134
Cooling normal	0	0	0	0	0	38	115	70	7	0	0	0	231
Cooling average	0	0	0	0	0	37	111	71	9	0	0	0	230
Growing 40 normal	21	46	132	271	443	613	765	729	547	345	125	34	4082
Growing 40 average	22	44	131	274	447	617	764	734	561	355	125	36	4116
Growing 50 normal	0	6	43	135	276	439	569	519	355	192	38	2	2579
Growing 50 average	1	6	39	137	273	439	565	519	366	200	38	2	2588

† Also occurred on earlier date(s).

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MONTICELLO, UTAH (425805)

Period of Record Monthly Climate Summary

Period of Record : 7/ 1/1948 to 6/30/1997

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	35.4	40.2	47.7	58.1	67.6	78.6	84.0	81.3	74.0	62.4	47.2	37.9	59.6
Average Min. Temperature (F)	13.7	17.7	23.5	30.3	37.9	45.6	52.6	51.2	43.7	33.8	23.2	15.7	32.5
Average Total Precipitation (in.)	1.50	1.08	1.02	0.89	0.98	0.55	1.51	1.86	1.38	1.66	1.20	1.32	14.95
Average Total SnowFall (in.)	17.6	11.5	8.1	2.8	0.5	0.0	0.0	0.0	0.0	0.7	6.2	12.7	60.1
Average Snow Depth (in.)	8	7	3	0	0	0	0	0	0	0	1	4	2

Western Regional Climate Center, Greg McCurdy, gmwrcc@sage.dri.edu

Section 02140: Dewatering

Part 1—General

1.1 Description

The Subcontractor shall provide and maintain adequate dewatering equipment to remove and dispose of all ground water entering the sheet pile box excavation. Control of surface water shall be considered as part of the work under this specification.

Dewatering is required during the excavation of the sheet piling "box" and after excavation is complete, but before the gravel and treatment media are placed in the box. The water generated during excavation of the sheet piling box is expected to be very high in total suspended solids. The Subcontractor shall excavate and build up a bermed area within the construction/staging area large enough to contain and store one and one-quarter times the 426 cubic yards of soil excavated and water pumped from the box. Drier material (approximately 93 cubic yards plus) with no free moving liquids above the alluvial aquifer can be stockpiled outside the bermed area. The water generated (the Subcontractor shall assume 25 gallons per minute) after the box is excavated shall be pumped directly to the west of the construction site to Pond 3. The box shall be pumped free of water until the treatment media is installed.

The excavations shall be kept dewatered, as required, to construct the treatment cell to design depths and impermeable walls. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.

1.2 Requirement

A. The dewatering system shall be of sufficient size and capacity necessary to lower and minimize ground water at the bottom of the sheet pile box. The Subcontractor shall provide a backup pump and related system for dewatering. The Subcontractor shall expedite backfilling to minimize dewatering.

B. Maintain stability of sides, slopes, and bottom of excavation at all times.

C. Control of surface and subsurface water are part of dewatering requirements. Maintain adequate control of water to ensure stability of excavated and constructed slopes, control erosion, and avoid the flooding of the excavation. Drain surface water away from excavations.

D. Notify MACTEC–ERS field personnel 3 working days prior to installation of discharge lines to Pond No. 3, as specific training is required to enter radiological-contaminated areas. Do not enter or breech any controlled or contaminated areas. MACTEC–ERS will provide labor to connect discharge line across any contaminated areas.

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Section 02207: Aggregate Materials

Part 1—General

1.1 Description

The aggregate materials or pea gravel will be used in the upgradient and downgradient 2-foot wide gravel packs (adjacent to the 6 feet of reactive material).

1.2 Related Sections

Section 02223—Excavation, Trenching, and Backfilling.

1.3 References

A. AASHTO - M147 - Materials for Aggregate and Soil-Aggregate.

B. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

1.4 Submittals for Information

SD–01 Data

A. Submittals shall be in accordance with Section 1300 (Submittals).

B. Materials Source: Submit name of material suppliers and gradation of material.

Part 2—Products

2.1 Coarse Aggregate Materials

Aggregate type 3/8-inch diameter washed pea gravel: Gravel shall be free of clay, shale, organic matter; graded in accordance with ASTM C136 ASTM D2487 Group Symbol GM GC; to the following limits:

A. Minimum Size: 1/4 inch

B. Maximum Size: 3/8 inch

C. 0 percent passing No. 200 sieve

2.2 Source Quality Control

If materials do not meet specified requirements, change material or material source and retest.

Part 3—Execution

3.1 Stockpiling

A. Stockpile materials on site at a location within the construction boundaries.

B. Stockpile in sufficient quantities to meet project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.2 Stockpile Cleanup

Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

Section 02208: Treatment Media

Part 1—General

1.1 Description

Two types of treatment media will be used (1) coarse zero valent iron material for the upgradient gravel layer and (2) an approximately –8 to +50 mesh iron filings as the primary treatment medium for the PeRT Wall.

1.2 Quantities

Coarse zero valent iron	200 cubic feet
Iron filings	6,000 cubic feet

The coarse zero valent iron will be supplied in bags (each measuring 8 cubic feet) with lifting straps. The iron filings will be in 3,000-pound bulk bags with top handles allowing the bags to be lifted with a fork lift or crane.

1.3 Availability

All treatment media will be supplied by MACTEC–ERS. The treatment media will be delivered to the project site on 25 flat bed trucks starting March 1, 1999. The Subcontractor shall be required to unload these materials and store them on the construction/staging area. The Subcontractor is responsible for the safe access and egress of the flat bed trucks. Maintenance, access, unloading, turn-a-round, and egress are the responsibility of the Subcontractor.

1.4 Storage

The treatment media shall be covered, protected, and maintained in dry condition at all times by the Subcontractor.

1.5 Submittal

SD–08 Statements

A. Submittals should be in accordance with Section 01300 (Submittals).

B. Submit proposed procedure and method to mix the coarse zero valent iron with 3/8-inch washed pea gravel.

C. Submit proposed procedure to place iron filings and maintain separation of the materials in the PeRT Wall as designed.

Part 2—Installation

2.1 Installation

A. When placing material, maintain separation of the materials in the PeRT wall as designed. No mixing of the iron filings with the gravel zones shall occur.

B. Uniformly mix 3/8-inch washed pea gravel with 10 percent by volume of the coarse zero valent iron prior to installation on the upgradient side of the PeRT wall.

Section 02215: Geotextiles

Part 1—General

1.1 Description

This work shall consist of furnishing and placing a geotextile per unit line item for the purpose of covering the top of the treatment media the length and width of the PeRT wall box.

1.2 Geotextile Specifications AASHTO to Designation: M288–96

A Class 3 geotextile conforming to AASHTO designation M288–96 with the following specifications will be used.

Table 1. Subsurface Drainage Geotextile Requirements

	Test Methods	Units	Requirements Percent In-Situ Soil Passing 0.075 mm		
			<15	15 to 50	>50
Permittivity	ASTM D 4491	sec^{-1}	0.5	0.2	0.1
Apparent Opening Size	ASTM D4751	mm	0.43	0.25	0.22

1.3 Construction Installation Requirements

A. Shipping and Storage

Only approved geotextile rolls or panels shall be delivered to the project site. All geotextile shall be labeled, shipped, stored, and handled in accordance with ASTM D 4873. No hooks, tongs, or other sharp instruments shall be used for handling geotextile.

The geotextile shall be kept dry and wrapped such that it is protected from the elements during unloading and storage. At no time shall the geotextile be exposed to ultraviolet light for a period exceeding 14 days. If stored outdoors, the geotextile shall be elevated and protected with a waterproof cover.

B. Placement

Prior to placement of the geotextile, all surfaces shall be free of debris, depressions or obstructions which may damage the geotextile. It shall be placed loosely (not taut), but with no wrinkles or folds. Care will be taken to place the geotextile in contact with the soil so that no void spaces occur between the geotextile and the soil. Overlap geotextile 12 inches minimum at all joints. Any damage to the geotextile shall be repaired by

placing a patch extending 2 feet in all directions beyond the damaged area. Geotextile shall extend 12 inches beyond the outside edges of the PeRT wall box.

1.4 Submittals

Submittals shall be made in accordance with Section 01300 (Submittals).

Submittal Material Data: SD–01 Data

Section 02222: Excavation, Trenching, and Backfilling

Part 1—General

Metal sheet pilings will be driven to form a 100 foot × 10 foot box extending 2 feet into the soft bedrock that will be excavated and backfilled with treatment media and 3/8-inch washed pea gravel. The only anticipated trenching activities are an initial key trench required to place the sheet pilings. Backfilling of the key trench and the area above the PeRT wall will be done with suitable on-site materials.

1.1 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

American Society for Testing and Materials (ASTM)

ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.2 Related Sections

Section 02140—Dewatering

1.3 Definitions

Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

Part 2—Products

2.1 Backfill Materials

Common materials will be generated during the excavation of the key trench and the metal sheet piling box. Some of this material will be required for backfill. Suitable common backfill material requires rock greater than 6 inches be removed. Otherwise suitable material which contains excess moisture content and cannot be compacted to required specification shall not be classified as unsuitable material unless it cannot be dried by manipulation, aeration, or blending with other materials as determined by the Subcontractor.

2.2 Materials to Be Placed in the Excavation

Materials to be placed in the excavated sheet pile box include treatment media (see Section 02206) and aggregate materials (see Section 02207).

Part 3—Execution

3.1 Preparation

A. Identify required lines, levels, contours, and datum locations.

B. Protect bench marks, survey control points, existing structures, creek bank, fences, paving, and curbs from excavating equipment and vehicular traffic.

3.2 Excavation

SD–08 Statements

A. For excavations greater than 3 feet deep, slope banks with machine if necessary to angle of repose or less until shored.

Submit excavation plan and equipment to be used.

B. Grade top perimeter of excavation as necessary to prevent surface water from draining into excavation.

C. Notify MACTEC–ERS of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

D. Stockpile excavated material in area designated on site by MACTEC–ERS.

Excavation shall be performed to the lines and grades indicated. Earth excavation shall include removal and stockpiling of material. During excavation, material suitable for backfilling (Section 02222, Part 2.1) shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to one-half the depth of the excavation, but in no instance closer than 5 feet. The Subcontractor shall notify MACTEC–ERS if any excavated material is suspected to contain hazardous, toxic, biological, or radiological substances.

3.3 Trench Excavation

(KEY) Trench excavations (generally less than 2-feet deep) are anticipated as part of the steps required to drive sheet piles.

However, if trench walls greater than 3 feet high are required, they shall be cut back to a stable slope as required by OSHA. Trench walls which are cut back shall be excavated to at

least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content or vibration from the pile driver.

3.4 Stockpiles

Stockpiles of excavated materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. Stockpiles of suitable materials shall be protected from excess moisture and erosion. Remove rock from excavated material that will be used for backfill. Rocks with a volume in excess of 6 inches should be removed prior to placing excavated material back into the excavation.

3.5 Backfilling and Compaction

Compaction applies to common suitable materials only. Backfill shall be placed in layers not exceeding 24-inches loose thickness for compaction by wheel rolling. Cohesionless soils shall be compacted at a moisture content as required to facilitate compaction without bulking. Each layer shall be compacted to the following minimum density:

- Compact to 80 percent of maximum dry density. MACTEC–ERS reserves the right to test for compaction compliance.

3.6 Testing

Compaction testing shall be conducted by MACTEC–ERS as required.

3.7 Submittals

Submittals shall be made in accordance with Section 01300 (Submittals).

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Section 02411: Metal Sheet Piling

Part 1—General

1.1 Metal Sheet Piling

SD–01 Data/SD–04 Drawings; MA

Metal sheet piling will be used to develop a water-tight box, to contain the treatment media and aggregate material. The box shall be 100 feet long × 10 feet wide driven 2 feet into the soft bedrock/aquitard. All soil shall be excavated out of the box to bedrock and filled with treatment media and gravel (the reactive gate of the PeRT wall). The two 100 foot sections of metal sheet piling that surround the treatment media are perpendicular to the groundwater flow and will be removed after the reactive materials and gravel are placed in the box. The 10 foot side sections of the box will remain in place. Metal sheet piling will also be used for the impermeable walls. The northern and southern impermeable walls will be driven 2 feet into the soft bedrock/aquitard. The Subcontractor shall reference the characterization report (Exhibit A) to determine the depth of the soft bedrock/aquitard and length of sheet pile for the north and south impermeable walls. These sheet pilings will be sealed and left in place. In addition, the Subcontractor may use sheet piling to temporarily separate the reactive materials with the two gravel packs. Any sheet piling used for this purpose must be removed after the materials are in place.

Note: Submit shop drawings for the installation, reinforcement, bracing layout, and materials that will be used to construct the water-tight box to contain the treatment media and aggregate materials.

The publication listed below forms a part of this specification to the extent referenced. The publication is referred to in the text by basic designation only.

ASTM A 6/A 6M	(1995b) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

SD–04 (Shop) Drawings; MA

Detail drawings for sheet piling including fabricated sections shall show complete piling dimensions and details, driving sequence and location of installed piling. Detail drawings shall include details and dimensions of templates and other temporary guide structures for installing piling. Detail drawings shall provide details of the method of handling piling to prevent permanent deflection, distortion or damage to piling interlocks. Provide as builts when complete. Piling interlocks will have a permeability of 10^{-7} cm/s or less.

SD–01 Data

Pile Driving Equipment; MA.

Complete descriptions of sheet piling driving equipment including hammers, extractors, protection caps, and other installation appurtenances shall be submitted for approval prior to commencement of work.

SD–08 Statements

Pulling and Redriving; MA.

The proposed method of pulling sheet piling shall be submitted and approved prior to pulling any piling.

SD–09 Reports

Materials Tests; FIO.

Certified materials test reports showing that sheet piling and appurtenant metal materials meet the specified requirements shall be submitted for each shipment and identified with specific lots prior to installing materials. Material test reports shall meet the requirements of ASTM A 6/A 6M.

SD–18 Records

Driving; FIO.

Records of the sheet piling driving operations shall be submitted after driving is completed. These records shall provide a system of identification which shows the disposition of approved piling in the work, driving equipment performance data, piling penetration rate data, piling dimensions, and top and bottom elevations of installed piling. All warranties and guarantees specified by the patent holder shall be enforced.

1.2 Delivery, Storage and Handling

Materials delivered to the site shall be applicable for designated use and shall be accompanied by certified test reports. All materials required to be new shall be delivered to the site new and undamaged. The manufacturer's logo and mill identification mark shall be provided on all permanently installed sheet piling as required by the referenced specifications. Sheet piling shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks. Storage of sheet piling should also facilitate required inspection activities.

1.3 Progression of Work

The 100 foot long × 10 foot wide sheet pile watertight box shall be driven and completed first. The northern impermeable wall can be driven next, but the southern impermeable wall shall not be driven until the two 100-foot sections of the sheet pile watertight box are removed after the treatment media is installed.

Part 2—Parts

2.1 Steel Sheet Piling Type:

A. Waterloo Barrier Sheet Piling WEZ95 or MACTEC–ERS approved equal with permeability of 10^{-7} cm/s or less (impermeable wall sheet piling joints shall be sealed).

Section	Thickness in. (mm)	Height in. (mm)	Nominal Width in. (mm)	Section Area in.^{2} (mm)^2	Weight lbs/lin. ft. (kg/lin.m)	Weight lbs/ft^2 (kg/m^2)	Moment of Inertia in^4/wall ft. (cm^4/wall m)	Radius of Gyration in. (mm)	Section Modulus in^{3}wall ft. (cm^3/wall m)
WEZ95	0.375 (9.50)	10.81 (275)	25.0 (635)	14.9 (96.2)	50.5 (75.2)	24.3 (119)	134 (18300)	4.33 (110)	24.9 (1340)

B. The interlocks of sheet piling shall be free-sliding, provide a swing angle suitable for the intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed. Sheet piling shall be provided with standard pulling holes on the tops of the sheet pile and foot plates on the bottoms.

Part 3—Execution

3.1 Installation

A. Placing and Driving

1. Placing

Any preparations or materials required on the sheet piling to drive the piling shall be performed by the Subcontractor. Any excavation required within the area where sheet pilings are to be installed shall be completed prior to placing sheet pilings. Pilings shall be carefully located. Pilings shall be placed plumb with tolerances not to exceed 10 mm per meter (1/8 inch per foot) of length and true to line. Temporary templates shall be provided to insure that the pilings are placed and driven to the correct alignment. Pilings properly placed and driven shall be interlocked throughout their length with adjacent pilings to form a continuous wall throughout the length or run.

2. Driving

Prior to driving pilings, horizontal lines shall be painted on both sides of each piling at a fixed distance from the bottom so that it shall be visible during installation. This

line shall indicate the profile of the bottom elevation of installed pilings. Rate of installation and potential problem areas can be identified by abrupt changes in its elevation. Pilings shall be driven with the proper size hammer and by approved methods so as not to subject the pilings to damage and to ensure proper interlocking throughout their lengths. Driving hammers shall be maintained in proper alignment during driving operations by use of leads or guides attached to the hammer. Caution shall be taken in the sustained use of vibratory hammers when a hard driving condition is encountered to avoid interlock-melt or damages. The use of vibratory hammers should be discontinued and impact hammers employed when the penetration rate due to vibratory loading is one foot or less per minute. A protecting cap shall be employed in driving when using impact hammers to prevent damage to the tops of pilings. Pilings damaged during driving or driven out of interlock shall be removed and replaced at the Subcontractor's expense. Pilings damaged during driving shall be stored at the site as directed. Pilings shall be driven without the aid of a water jet. Adequate precautions shall be taken to insure that pilings are driven plumb. If at any time the forward or leading edge of the piling wall is found to be out-of-plumb in the plane of the wall the piling being driven shall be pulled and driven to correct plumbness. Pilings in each run or continuous length of piling wall shall be driven alternately in increments of depth to the required depth or elevation. No piling shall be driven to a lower elevation than those behind it in the same run except when the pilings behind it cannot be driven deeper. If the piling next to the one being driven tends to follow below final elevation it may be pinned to the next adjacent piling. **If obstructions restrict driving a piling to the specified penetration the obstructions shall be removed with an excavator or penetrated with a chisel beam.** If the Subcontractor demonstrates that removal or penetration is impractical the Subcontractor shall make changes in the design alignment of the piling structure as directed to insure the adequacy and stability of the structure. Pilings shall be driven to depths shown and shall extend up to the elevation indicated for the top of pilings.

B. Cutting-Off and Splicing

Pilings driven to refusal or to the point where additional penetration cannot be attained and are extending above the required top elevation (required top elevation at the PeRT wall [sheet pile box] and north impermeable wall is 6 inches below grade. Required elevation at the south impermeable wall is 3 feet below grade) in excess of the specified tolerance shall be cut off to the required elevation. Pilings driven below the required top elevation and pilings damaged by driving and cut off to permit further driving shall be extended as required to reach the top elevation by splicing when directed at no additional cost. The tops of pilings excessively battered during driving shall be trimmed when directed at no additional cost. Piling cut-offs shall become the property of the Subcontractor and shall be removed from the site. All cutting shall be done in a neat and workmanlike manner. Bolt holes in steel piling shall be drilled or may be burned and reamed by approved methods which will not damage the surrounding metal. Holes other than bolt holes shall be reasonably smooth and the proper size for rods and other items to be inserted.

C. Inspection of Driven Piling

The Subcontractor shall inspect the interlocked joints of driven pilings extending above ground. Pilings found to be out of interlock shall be removed and replaced at the Subcontractor's expense.

D. Pulling and Redriving

In the pulling and redriving of piles as directed, the Subcontractor shall pull selected pilings after driving to determine the condition of the underground portions of pilings. Any piling so pulled and found to be damaged to the extent that its usefulness in the structure is impaired shall be removed and replaced at the Subcontractor's expense. Pilings pulled and found to be in satisfactory condition shall be redriven when directed.

3.2 Removal

The removal of sheet pilings shall consist of pulling, sorting, cleaning the interlocks, inventorying, and storing.

A. Pulling

Pulling holes shall be provided in pilings as required. Extractors shall be of suitable type and size. Care shall be exercised during pulling of pilings to avoid damaging piling interlocks and adjacent construction. If it is determined that adjacent permanent construction has been damaged during pulling, the Subcontractor will be required to repair this construction at no cost. Pilings shall be pulled one sheet at a time. Pilings fused together shall be separated prior to pulling unless the Subcontractor demonstrates that the pilings cannot be separated. The Subcontractor will not be paid for the removal of pilings damaged beyond structural use due to proper care not being exercised during pulling.

B. Sorting, Cleaning, Inventorying, and Storing

Pulled pilings shall be sorted, cleaned, inventoried, and stored by type into groups as:

1. Piling usable without reconditioning.

2. Piling requiring reconditioning.

3. Piling damaged beyond structural use.

3.3 Quantities

The estimated quantities of sheet piling listed in the unit price schedule of the contract to be furnished by the Subcontractor are given for bidding purposes only (see Exhibit A, Characterization Report for additional information)(length of sheet piling required at the north impermeable wall, south impermeable wall, and sheet pile box is shown on the

drawings included in the proposal package). Sheet piling quantities for payment shall consist of the linear feet of piling acceptably installed and removed. Installed quantities shall consist of all piling including fabricated sections driven between the required top and bottom elevations of pilings plus any additions resulting from changes in design or alignment as provided in Section 02411, 3.1, A.2 DRIVING. Removed quantities shall consist of the lengths of piling pulled from below the ground level.