Millsite Dam Rehabilitation
EMERY COUNTY, UT

Ferron Canal & Reservoir Company

80% DRAFT

CONTRACT DOCUMENTS AND SPECIFICATIONS

Prepared by
Utah Division of Water Resources

November 2015
BIDDING REQUIREMENTS

Invitation to Bid................................................................. 00 10 00
Instructions to Bidders.......................................................... 00 20 00
Information Available to Bidders........................................... 00 30 00
Bid Form............................................................................. 00 43 00
Bid Bond............................................................................. 00 43 50

CONTRACT FORMS

Notice of Award...................................................................... 00 51 00
Agreement ........................................................................... 00 52 00
Notice to Proceed................................................................... 00 55 00
Performance Bond................................................................. 00 61 00
Payment Bond........................................................................ 00 61 50
Application for Payment.......................................................... 00 62 00

CONDITIONS OF THE CONTRACT

General Conditions............................................................... 00 72 00
Supplementary Conditions..................................................... 00 73 00

ADDENDA

Addendum ............................................................................ 00 91 00

TECHNICAL SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

Summary of Work.................................................................... 01 10 00
Measurement and Payment Procedures.................................... 01 22 00
Applications for Payment......................................................... 01 22 50
Administrative Requirements.................................................. 01 30 00
Reference Standards............................................................... 01 32 00
Submittal Procedures............................................................... 01 33 00
Quality Requirements.............................................................. 01 40 00
Construction Surveying............................................................ 01 45 00
Temporary Facilities and Controls........................................... 01 50 00
Field Offices, Equipment, and Services................................. 01 59 00
Product Requirements............................................................ 01 60 00
Execution Requirements......................................................... 01 70 00
Protecting Existing Underground Utilities............................. 01 80 00
# Table of Contents

**DIVISION 03 - CONCRETE**
- Concrete Forms and Accessories ........................................ 03 10 00
- Concrete Reinforcement .................................................... 03 20 00
- Cast-in-Place Concrete ..................................................... 03 30 00

**DIVISION 05**
- Metal Fabrications .......................................................... 05 50 00
- Prefabricated Truss Bridge ................................................. 05 53 00

**DIVISION 31 - EARTHWORK**
- Clearing, Grubbing, and Stripping ....................................... 31 10 00
- Excavation and Trenching ................................................... 31 23 16
- Dewatering ........................................................................ 31 23 19
- Borrow Areas ..................................................................... 31 24 00
- Embankment Construction .................................................. 31 25 00
- Revegetation ...................................................................... 31 39 00

**DIVISION 32 - UTILITIES**
- Chain Link Fences ............................................................ 32 31 13
- Guard Gate System Installation .......................................... 33 05 20

**DIVISION 33 - UTILITIES**
- Manholes and Structures .................................................. 33 05 13
- Site Water Utility Distribution Piping ................................... 33 11 16
- Steel Pipe .......................................................................... 33 11 17
- High Density Polyethylene (HDPE) Pipe ............................... 33 11 18
- Instrumentation .................................................................. 33 55 00

END OF DOCUMENT
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contract description.
B. Contractor's use of site.
C. Owner supplied products.
D. Specification conventions.

1.2 CONTRACT DESCRIPTION

A. The project includes work to rehabilitate the existing Millsite Dam embankment, outlet, spillway, and other related features to bring the dam into compliance with current dam safety standards and raise the dam crest to restore reservoir capacity that has been filled with sediment. Major construction components include the following features:

- Rehabilitating the existing embankment by excavating portions of the downstream riprap and embankment materials, excavating loose foundation materials, and then stabilizing the slopes with a flattened downstream slope and downstream berm. Riprap and embankment materials for stabilizing the slopes will be processed from excavated embankment materials and from local borrow areas.

- Constructing an internal drain collection system along the downstream face of the dam and along the foundation, which will consist of filter sand filter, drain gravel, and collection pipe. All materials for the toe drain system will need to be furnished from an off-site source.

- Rehabilitating the existing outlet works of the existing dam. This will include: demolishing a portion of the existing concrete tunnel and vaults; extending the existing tunnel, 54-inch steel outlet pipe, and related utilities to the new downstream toe; replacing the existing 8-inch steel outlet pipe with a 12-inch steel outlet pipe; constructing a new outlet works vault with several pipe connections to the outlet pipes; installing new 36-inch and 10-inch plunger valves; disconnecting and connecting all the existing utilities, constructing a new plunge pool; and maintaining water service flows from the reservoir to designated water systems throughout rehabilitation work.

- Replacing the existing spillway with a new labyrinth weir spillway. This will include: demolishing the existing concrete spillway, excavating bedrock to the new spillway floor level, constructing a new concrete spillway, and constructing a new golf cart bridge over the spillway discharge chute.
- Additional work will include: maintenance work at the Millsite State Park to mitigate the impacts from the raised reservoir level, restore holes at the golf course that will be impacted from the construction work, and other general items resulting from the proposed project impacts.

1.3 CONTRACTOR'S USE OF SITE

A. Access to Site: The project is located approximately 3 miles east of Ferron, Utah, as shown in the Drawings.

B. The Drawings indicate which areas may be used by Contractor.

1.4 OWNER SUPPLIED PRODUCTS

A. Owner's Responsibilities:

1. Arrange for and deliver Owner-reviewed Shop Drawings, product data, and Samples, to Contractor.

2. Arrange and pay for delivery to site.

3. On delivery, inspect products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.

5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:

1. Review Owner-reviewed Shop Drawings, product data, and Samples.

2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.

3. Handle, store, install and finish products.

4. Repair or replace items damaged after receipt.

C. Products furnished to site and installed by Owner:

1. None.

D. Items furnished by Owner for installation by Contractor:

1. 54-inch diameter plunger valve.

2. 10-inch diameter plunger valve.
1.5 SPECIFICATION CONVENTIONS

A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words “shall be” are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION
This page is intentionally left blank.
SECTION 01 22 50

MEASUREMENT AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Measurement and payment criteria applicable to the Work performed under a unit price payment method.
B. Defect assessment and non-payment for rejected work.

1.2 AUTHORITY
A. Measurement methods delineated on the Bid Form complement the criteria of this section. In the event of conflict, the requirements of the Bid Form govern.
B. Take all measurements and compute quantities. The Engineer will verify measurements and quantities.
C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.3 UNIT QUANTITIES SPECIFIED
A. Quantities indicated in the Bid Schedule are for bidding and contract purposes only. Only quantities that are measured and verified by the Engineer determine payment.
B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit prices contracted.
C. If the actual Work requires a 20 percent or greater change in quantity than those quantities indicated, the Owner or Contractor may claim for a Contract Price adjustment.

1.4 MEASUREMENT OF QUANTITIES
A. Measurement Devices: Not used.
B. Measurement by Volume: Measured by cubic dimension using mean length, width, and height or thickness. All measurements shall be made from the Drawings unless work changes and requires field measurement.
C. Measurement by Area: Measured by square dimension using mean length and width or radius.
D. Linear Measurement: Measured by linear dimension at the item centerline or mean chord.
E. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.
1.5 PAYMENT

A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Engineer multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

C. Payment shall not be made for extra quantities as a result of waste or over delivery by supplier. Only quantities verified and measured by Engineer shall be paid.

1.6 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Engineer will direct one of the following remedies:

1. The defective Work may remain, but the unit price will be adjusted to a new price at the discretion of the Engineer.

2. The defective Work will be partially repaired to the instructions of the Engineer and the unit price will be adjusted to a new price, which will be negotiated between the Contractor and Owner.

C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.

D. The authority of the Engineer to assess the defect and identify payment adjustment is final.

1.7 NON-PAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.

2. Products determined as unacceptable before or after placement.

3. Products not completely unloaded from the transporting vehicle.

4. Products placed beyond the lines and levels of the required Work.

5. Products remaining on hand after completion of the Work.


1.8 SCHEDULE OF UNIT PRICES

A. See Bid Schedule in Contract Documents.
PART 2 PRODUCTS
Not used.

PART 3 EXECUTION
Not used.

END OF SECTION
This page is intentionally left blank.
PART 1 GENERAL

1.1 SECTION INCLUDES
   A. Procedures for preparation and submittal of applications for payment including substantiating data.

1.2 FORMAT
   A. Use Application for Payment form provided or approved by Engineer.

1.3 PREPARATION OF APPLICATIONS
   A. Present required information in typewritten form.
   B. Execute certification by signature of authorized officer.
   C. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed.
   D. List each authorized Change Order.
   E. Prepare final Application for Payment as specified in Section 01 70 00 – Closeout Procedures.

1.4 SUBMITTAL PROCEDURES
   A. Submit three copies of each Application for Payment.
   B. Submit with accepted submittal form as specified in Section 01 33 00 – Submittals.
   C. Provide one copy of substantiating data with submittal form for each copy of application.
   D. Show application number and date and line item by number and description.
   E. Payment Period: Submit at intervals stipulated in the Agreement.

1.5 SUBSTANTIATING DATA
   A. Data justifying dollar amounts in question.
   B. Partial release of liens from major Subcontractors and vendors.
   C. Affidavits attesting to off-site stored products.
   D. Construction Progress Schedules, revised and current as specified in Section 01 33 00.
PART 2 PRODUCTS
Not used.

PART 3 EXECUTION
Not used.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.
B. Field engineering.
C. Preconstruction meeting.
D. Progress meetings.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
B. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
C. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
D. Prior to Owner acceptance of Work, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

A. Owner and Engineer will provide a Resident Project Representative (RPR) as described in paragraph 9.03 of the Supplementary Conditions.

1.4 PRECONSTRUCTION MEETING

A. Engineer will schedule meeting to be held within 10 days of Notice of Award.
B. Attendance Required: Owner, Engineer, and Contractor.
C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.

4. Submission of list of Subcontractors and Suppliers, list of products, Schedule of Values, and construction Progress Schedule.


6. Procedures and processing of field decisions, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.

D. Engineer shall record minutes and distribute copies within 3 days after meeting to participants, with copies to Contractor, Owner, participants, and those affected by decisions made. Contractor shall review minutes and provide any clarification, objections, or additional comments to Engineer within 2 days of receiving minutes.

1.5 PROGRESS MEETINGS

A. Engineer will schedule and administer meetings throughout progress of the Work at weekly intervals.

B. Attendance Required: Job Superintendent, major Subcontractors and Suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.

C. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems impeding planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of Progress Schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding Work period.
10. Coordination of projected progress.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.
D. Engineer shall record minutes and distribute copies within 3 days after meeting to participants, with copies to Contractor, Owner, participants, and those affected by decisions made. Contractor shall review minutes and provide any clarification, objections, or additional comments to Engineer within 2 days of receiving minutes.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION
This page is intentionally left blank.
SECTION 01 32 50
REFERENCE STANDARDS

PART 1 GENERAL

1.1 REQUIREMENTS

A. Materials, Contractor designs, construction work, and other requirements that are specified by reference to published specifications, standards, or codes, shall be in compliance with the editions or revisions specified. Where no date is given for a referenced specification, standard, or code, the latest edition in effect on the date bids are advertised, including amendments or supplements, shall be used. In the event of conflicting requirements between a referenced specification, standard, or code and these specifications, these specifications shall govern. The requirements of referenced specifications, standards, or codes that are in conflict with laws, regulations, ordinances, or codes governing the Work, shall be brought to the attention of Engineer immediately; however, all Work shall comply with applicable, federal, state, and local regulatory requirements.

B. Contractor is responsible to obtain copies of reference publications necessary for the accomplishment of the Work.

C. The following are acronyms and abbreviations of the names of agencies or organizations promulgating specifications, standards, and codes that may appear in the Specifications or on the Drawings:

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
</table>
| AA      | Aluminum Association  
1525 Wilson Boulevard, Suite 600  
Arlington, VA 20006  
www.aluminum.org | (703) 358-2989 |
| AABC    | Associated Air Balance Council  
1518 K St., NW  
Washington, DC 20005  
www.aabchq.com | (202) 737-0202 |
| AAMA    | American Architectural Manufacturers Association  
1827 Walden Office Sq., Suite 550  
Schaumburg, IL 60173-4268  
www.aamanet.org | (847) 303-5664 |
| AASHTO  | American Association of State Highway and Transportation Officials  
444 N Capitol St., NW, Suite 249  
Washington, DC 20001  
www.aashto.org | (202) 624-5800 |
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABMA</td>
<td>American Bearing Manufacturers Association</td>
<td>(202) 367-1155</td>
</tr>
<tr>
<td></td>
<td>2025 M Street, NW, Suite 800 Washington, DC 20036 <a href="http://www.abma-dc.org">www.abma-dc.org</a></td>
<td></td>
</tr>
<tr>
<td>ACGIH</td>
<td>American Conference of Governmental Industrial Hygienists</td>
<td>(513) 742-2020</td>
</tr>
<tr>
<td></td>
<td>1330 Kemper Meadow Dr. Cincinnati, Ohio 45240 <a href="http://www.acgih.org">www.acgih.org</a></td>
<td></td>
</tr>
<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
<td>(248) 848-3700</td>
</tr>
<tr>
<td></td>
<td>38800 Country Club Drive Farmington Hills, MI 48331 <a href="http://www.aci-int.org">www.aci-int.org</a></td>
<td></td>
</tr>
<tr>
<td>ADC</td>
<td>Air Diffusion Council</td>
<td>(847) 706-6750</td>
</tr>
<tr>
<td></td>
<td>1901 North Roselle Road, Suite 800 Schaumburg, IL 60195 <a href="http://www.flexibleduct.org">www.flexibleduct.org</a></td>
<td></td>
</tr>
<tr>
<td>ADSC</td>
<td>The International Association of Foundation Drilling</td>
<td>(214) 343-2091</td>
</tr>
<tr>
<td></td>
<td>Pacific Center I 14180 Dallas Parkway, Suite 510 Dallas, TX 75254 <a href="http://www.adsc-iafd.com">www.adsc-iafd.com</a></td>
<td></td>
</tr>
<tr>
<td>AF&amp;PA</td>
<td>American Forest and Paper Association</td>
<td>(800) 878-8878</td>
</tr>
<tr>
<td></td>
<td>1111 19th St., NW, Suite 800 Washington, DC 20036 <a href="http://www.afandpa.org">www.afandpa.org</a></td>
<td></td>
</tr>
<tr>
<td>AHA</td>
<td>American Hardboard Association</td>
<td>(847) 934-8800</td>
</tr>
<tr>
<td></td>
<td>1210 W. Northwest Hwy Palatine, IL 60067 <a href="http://www.ahardbd.org">www.ahardbd.org</a></td>
<td></td>
</tr>
<tr>
<td>AI</td>
<td>Asphalt Institute</td>
<td>(859) 288-4960</td>
</tr>
<tr>
<td></td>
<td>2696 Research Park Drive Lexington, KY 40511 <a href="http://www.asphaltinstitute.org">www.asphaltinstitute.org</a></td>
<td></td>
</tr>
<tr>
<td>AISC</td>
<td>American Institute of Steel Construction</td>
<td>(312) 670-2400</td>
</tr>
<tr>
<td></td>
<td>One East Wacker Dr., Suite 700 Chicago, IL 60601-1802 <a href="http://www.aisc.org">www.aisc.org</a></td>
<td></td>
</tr>
<tr>
<td>AISI</td>
<td>American Iron and Steel Institute</td>
<td>(202) 452-7100</td>
</tr>
<tr>
<td></td>
<td>1140 Connecticut Avenue NW Washington, DC 20036 <a href="http://www.steel.org">www.steel.org</a></td>
<td></td>
</tr>
<tr>
<td>AITC</td>
<td>American Institute of Timber Construction</td>
<td>(303) 792-9559</td>
</tr>
<tr>
<td></td>
<td>7012 S. Revere Pkwy, Suite 140 Centennial, CO 80112 <a href="http://www.aite-glulam.org">www.aite-glulam.org</a></td>
<td></td>
</tr>
<tr>
<td>Acronym</td>
<td>Name and Address</td>
<td>Telephone</td>
</tr>
<tr>
<td>---------</td>
<td>------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>AMCA</td>
<td>Air Movement and Control Association International, Inc. 30 W. University Dr. Arlington Heights, IL 60004 <a href="http://www.amca.org">www.amca.org</a></td>
<td>(847) 394-0150</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute 1819 L. Street, NW, 6th Floor Washington, DC 20036 www Ansi.org</td>
<td>(202) 293-8020</td>
</tr>
<tr>
<td>APA/EWA</td>
<td>APA-The Engineered Wood Association 7011 South 19th Tacoma, WA 98466 <a href="http://www.apawood.org">www.apawood.org</a></td>
<td>(253) 565-6600</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute 1220 L St., NW Washington, DC 20005-4070 <a href="http://www.api-ec.api.org">www.api-ec.api.org</a></td>
<td>(202) 682-8000</td>
</tr>
<tr>
<td>APSP</td>
<td>The Association of Pool and Spa Professionals 2111 Eisenhower Ave., Suite 500 Alexandria, VA 22314 <a href="http://www.nspi.org">www.nspi.org</a></td>
<td>(703) 838-0083</td>
</tr>
<tr>
<td>AREMA</td>
<td>American Railway Engineering and Maintenance-of-Way Association 10003 Derekwood Lane, Suite 210 Lanham, MD 20706-4362 <a href="http://www.arema.org">www.arema.org</a></td>
<td>(301) 459-3200</td>
</tr>
<tr>
<td>ARI</td>
<td>Air-Conditioning and Refrigeration Institute 4100 North Fairfax Drive, Suite 200 Arlington, VA 22203 <a href="http://www.ari.org">www.ari.org</a></td>
<td>(703) 524-8800</td>
</tr>
<tr>
<td>ARRA</td>
<td>Asphalt Recycling and Reclaiming Association #3 Church Circle, Suite 250 PMB 250 Annapolis, MD 21401 <a href="http://www.arra.org">www.arra.org</a></td>
<td>(410) 267-0023</td>
</tr>
<tr>
<td>ARTBA</td>
<td>American Road &amp; Transportation Builders Association 1219 28th Street NW Washington, D.C., 20007-3389 <a href="http://www.artba.org">www.artba.org</a></td>
<td>(202) 289-4434</td>
</tr>
<tr>
<td>ASCE</td>
<td>American Society of Civil Engineers World Headquarters 1801 Alexander Bell Dr. Reston, VA 20191-4400 <a href="http://www.asce.org">www.asce.org</a></td>
<td>(800) 548-2723 (703) 295-6300</td>
</tr>
<tr>
<td>ASHRAE</td>
<td>American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329 <a href="http://www.ashrae.org">www.ashrae.org</a></td>
<td>(800) 527-4723 (404) 636-8400</td>
</tr>
<tr>
<td>Acronym</td>
<td>Name and Address</td>
<td>Telephone</td>
</tr>
<tr>
<td>---------</td>
<td>------------------</td>
<td>-----------</td>
</tr>
</tbody>
</table>
| ASME    | American Society of Mechanical Engineers  
3 Park Ave.  
New York, NY 10016-5990  
www.asme.org | (800) 843-2763 |
| ASSE    | American Society of Sanitary Engineering  
901 Canterbury, Suite A  
Westlake, OH 44145  
www.asse-plumbing.org | (440) 835-3040 |
| ASTM    | ASTM International  
100 Barr Harbor Dr.  
PO Box C700  
West Conshohocken, PA 19428-2959  
www.astm.org | (610) 832-9585 |
| AWI     | Architectural Woodwork Institute  
46179 Westlake Drive, Suite 120  
Potomac Falls, VA 20165  
www.awin.et.org | (571) 323-3636 |
| AWPA    | American Wood-Preservers' Association  
P.O. Box 361784  
Birmingham, AL 35236-1784  
www.awpa.com | (205) 733-4077 |
| AWS     | American Welding Society  
550 NW LeJeune Rd.  
Miami, FL 33126  
www.aws.org | (800) 443-9353 |
| AWWA    | American Water Works Association  
6666 W. Quincy Ave.  
Denver, CO 80235  
www.awwa.org | (303) 794-7711 |
| BAAQMD  | Bay Area Air Quality Management /District Office  
939 Ellis St.  
San Francisco, CA 94109  
www.baaqmd.gov | (415) 771-6000 |
| CDA     | Copper Development Association  
260 Madison Ave., 16th Floor  
New York, NY 10016  
www.copper.org | (800) 232-3282 |
| CGA     | Compressed Gas Association  
4221WalneyRoad, 5th Floor  
Chantilly, VA 20151-2923  
www.cganet.com | (703) 788-2700 |
| CISCA   | Ceilings and Interior Systems Construction Association  
1500 Lincoln Hwy, Suite 202  
St. Charles, IL 60174  
www.cisca.org | (630) 584-1919 |

Reference Standards  
01 32 50-4
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISPI</td>
<td>Cast Iron Soil Pipe Institute 5959 Shallowford Rd., Suite 419 Chattanooga, TN 37421 <a href="http://www.cispi.org">www.cispi.org</a></td>
<td>(423) 892-0137</td>
</tr>
<tr>
<td>CLFMI</td>
<td>Chain Link Fence Manufacturers Institute 10015 OldColumbia Road, Suite B-215 Columbia, MD 21046 <a href="http://www.codewriters.com">www.codewriters.com</a></td>
<td>(301) 596-2583</td>
</tr>
<tr>
<td>CRI</td>
<td>The Carpet and Rug Institute 730 College Drive PO Box 2048 Dalton, GA 30722-2048 <a href="http://www.carpet-rug.org">www.carpet-rug.org</a></td>
<td>(706) 278-3176</td>
</tr>
<tr>
<td>CRSI</td>
<td>Concrete Reinforcing Steel Institute 933 N. Plum Grove Rd, Schaumburg, IL 60173-4758 <a href="http://www.crsi.org">www.crsi.org</a></td>
<td>(847) 517-1200</td>
</tr>
<tr>
<td>CSSB</td>
<td>Cedar Shake and Shingle Bureau P.O. Box 1178 Sumas, WA 98295-1178 <a href="http://www.cedarbureau.org">www.cedarbureau.org</a></td>
<td>(604) 820-7700</td>
</tr>
<tr>
<td>CTI</td>
<td>Cooling Technology Institute 2611 FM 1960 West, Suite A-101 PO Box 73383 Houston, TX 77273-3383 <a href="http://www.cti.org">www.cti.org</a></td>
<td>(281) 583-4087</td>
</tr>
<tr>
<td>DASMA</td>
<td>Door and Access Systems Manufacturers Association International 1300 Sumner Avenue Cleveland, OH 44115-2851 <a href="http://www.dasma.com">www.dasma.com</a></td>
<td>(216) 241-7333</td>
</tr>
<tr>
<td>DHI</td>
<td>The Door and Hardware Institute 14150 Newbrook Dr., Suite 200 Chantilly, VA 20151 <a href="http://www.dhi.org">www.dhi.org</a></td>
<td>(703) 222-2010</td>
</tr>
<tr>
<td>DIN</td>
<td>Deutsches Institut für Normung Burggrafenstraße 6 10787 Berlin, Germany www2.din.de</td>
<td>+49 30 2601-0</td>
</tr>
<tr>
<td>DIPRA</td>
<td>Ductile Iron Pipe Research Association 245 Riverchase Parkway East, Suite O Birmingham, AL 35244 <a href="http://www.dipra.org">www.dipra.org</a></td>
<td>(205) 402-8700</td>
</tr>
<tr>
<td>EIMA</td>
<td>EIFS Industry Members Association 3000 Corporate Center Dr., Suite 270 Morrow, GA 30260 <a href="http://www.eima.com">www.eima.com</a></td>
<td>(800) 294-3462</td>
</tr>
<tr>
<td>Acronym</td>
<td>Name and Address</td>
<td>Telephone</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency Headquarters</td>
<td>(202) 272-0167</td>
</tr>
<tr>
<td></td>
<td>Ariel Rios Building</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1200 Pennsylvania Avenue NW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washington, DC 20460</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.epa.gov">www.epa.gov</a></td>
<td></td>
</tr>
<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
<td>(866) 835-5322</td>
</tr>
<tr>
<td></td>
<td>800 Independence Ave., SW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washington, DC 20591</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.faa.gov">www.faa.gov</a></td>
<td></td>
</tr>
<tr>
<td>FIBA</td>
<td>USA Basketball</td>
<td>(719) 590-4800</td>
</tr>
<tr>
<td></td>
<td>5465 Mark Dabling Boulevard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Colorado Springs, CO 80918-3842</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.fiba.com">www.fiba.com</a></td>
<td></td>
</tr>
<tr>
<td>FM</td>
<td>FM Global</td>
<td>(401) 275-3000</td>
</tr>
<tr>
<td></td>
<td>Corporate Headquarters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1301 Atwood Avenue</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.O. Box 7500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Johnston, RI 02919</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.fmglobal.com">www.fmglobal.com</a></td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>Federal Specification Unit</td>
<td>(703) 305-5682</td>
</tr>
<tr>
<td></td>
<td>General Services Admin.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Federal Supply Service</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FSS Acquisition Management Center</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental Programs and Engineering Policy Division</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washington, DC 20406</td>
<td></td>
</tr>
<tr>
<td>FSC</td>
<td>Forest Stewardship Council</td>
<td>(202) 342-0413</td>
</tr>
<tr>
<td></td>
<td>1155 30th Street NW, Suite 300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washington, DC 20007</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.fscus.org">www.fscus.org</a></td>
<td></td>
</tr>
<tr>
<td>GA</td>
<td>Gypsum Association</td>
<td>(202) 289-5440</td>
</tr>
<tr>
<td></td>
<td>810 First St., NE, Suite 510</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washington, DC 20002</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.gypsum.org">www.gypsum.org</a></td>
<td></td>
</tr>
<tr>
<td>GANA</td>
<td>Glass Association of North America</td>
<td>(785) 271-0208</td>
</tr>
<tr>
<td></td>
<td>2945 SW Wanamaker Dr., Suite A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Topeka, KS 66614-5321</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.glasswebsite.com">www.glasswebsite.com</a></td>
<td></td>
</tr>
<tr>
<td>GS</td>
<td>Green Seal</td>
<td>(202) 872-6400</td>
</tr>
<tr>
<td></td>
<td>1001 Connecticut Ave., NW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Suite 827</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Washington, DC 20036-5525</td>
<td></td>
</tr>
<tr>
<td></td>
<td><a href="http://www.greenseal.org">www.greenseal.org</a></td>
<td></td>
</tr>
<tr>
<td>Acronym</td>
<td>Name and Address</td>
<td>Telephone</td>
</tr>
<tr>
<td>---------</td>
<td>------------------</td>
<td>-----------</td>
</tr>
</tbody>
</table>
| HI      | Hydronics Institute  
Division of Gas Appliance Manufacturers Association  
2107 Wilson Blvd., Suite 600  
Arlington, VA 22201  
www.gamanet.org | (703) 525-7060 |
| HMMA    | Hollow Metal Manufacturers Association  
Division of NAAMM  
8 South Michigan Ave., Suite 1000  
Chicago, IL 60603  
www.naamm.org | (312) 332-0405 |
| HPVA    | Hardwood Plywood and Veneer Association  
P.O. Box 2789  
Reston, VA 20195  
www.hpva.org | (703) 435-2900 |
| IAS     | International Approval Services  
U.S. Operations  
8501 E. Pleasant Valley Rd.  
Cleveland, Ohio 44131-5575 | (216) 524-4990 |
| ICC     | International Code Council  
5203 Leesburg Pike, Suite 600  
Falls Church, VA 22041-3401  
www.iccsafe.org | (888) 422-7233 |
| IEEE    | Institute of Electrical and Electronics Engineers  
3 Park Ave., 17th Floor  
New York, NY 10016-5997  
www.ieee.org | (212) 419-7900 |
| IES     | Illuminating Engineering Society of North America  
120 Wall Street, 17th Floor  
New York, NY 10005  
www.iesna.org | (212) 248-5000 |
| IGCC    | Insulating Glass Certification Council  
P.O. Box 9  
Henderson Harbor, NY 13651  
www.igcc.org | (315) 646-2234 |
| IGMA    | Insulating Glass Manufacturers Alliance  
1500 Bank Street, Suite 300  
Ottawa, ON K1H 1B8  
www.igmaonline.org | (613) 233-1510 |
| ILI     | Indiana Limestone Institute of America  
400 Stone City Bank Building  
Bedford, IN 47421  
www.iliai.com | (812) 275-4426 |
| KCMA    | Kitchen Cabinet Manufacturers Association  
1899 Preston White Dr.  
Reston, VA 20191-5435  
www.kcma.org | (703) 264-1690 |

Reference Standards  
01 32 50-7
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
</table>
| LPI     | Lightning Protection Institute  
25475 Magnolia Drive  
PO Box 99  
Maryville, MO 64468  
www.lightning.org | (800) 488-6864 |
| MBMA    | Metal Building Manufacturers Association  
1300 Sumner Ave.  
Cleveland, OH 44115-2851  
www.mbma.com | (216) 241-7333 |
| MFMA    | Maple Flooring Manufacturers Association, Inc.  
60 Revere Dr., Suite 500  
Northbrook, IL 60062  
www.maplefloor.org | (847) 480-9138 |
| MIA     | Marble Institute of America  
28901 Clemens Road, Suite 100  
Cleveland, OH 44145  
www.marble-institute.com | (440) 250-9222 |
| MIL     | Military Standardization Documents  
Defense Automated Printing Service  
700 Robbins Ave., Building 4D  
Philadelphia, PA 19111-5094 | (215) 697-2179 |
| MSS     | Manufacturers Standardization Society of the Valve  
and Fittings Industry  
127 Park Street NE  
Vienna, VA 22180  
www.mss-hq.com | (703) 281-6613 |
| NAAMM   | National Association of Architectural Metal Manufacturers  
8 South Michigan Ave., Suite 1000  
Chicago, IL 60603  
www.naamm.org | (312) 332-0405 |
| NACE    | NACE International  
1440 South Creek Drive  
Houston, TX 77084-4906  
www.nace.org | (281) 228-6200  
(800) 797-6223 |
| NAIMA   | North American Insulation Manufacturers Association  
44 Canal Center Plaza, Suite 310  
Alexandria, VA 22314  
www.naima.org | (703) 684-0084 |
| NBGQA   | National Building Granite Quarries Association, Inc.  
1220 L. St., NW, Suite 100-167  
Washington, DC 20005  
www.nbgqa.com | (800) 557-2848 |
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
</table>
| NCAA    | The National Collegiate Athletic Association  
700 W. Washington Street  
P.O. Box 6222  
Indianapolis, Indiana 46206-6222  
www.ncaa.org | (317) 917-6222 |
| NCMA    | National Concrete Masonry Association  
13750 Sunrise Valley Drive  
Herndon, VA 20171-4662  
www.ncma.org | (703) 713-1900 |
| NCRP    | National Council on Radiation Protection and Measurement  
7910 Woodmont Ave., Suite 400  
Bethesda, MD 20814-3095 | (301) 657-2652 |
| NEBB    | National Environmental Balancing Bureau  
8575 Grovemont Circle  
Gaithersburg, MD 20877  
www.nebb.org | (301) 977-3698 |
| NECA    | National Electrical Contractors Association  
3 Bethesda Metro Center, Suite 1100  
Bethesda, MD 20814  
www.necanet.org | (301) 657-3110 |
| NELMA   | Northeastern Lumber Manufacturers Association  
272 Tuttle Rd.  
Cumberland Center, ME 04021  
www.nelma.org | (207) 829-6901 |
| NEMA    | National Electrical Manufacturers Association  
1300 N 17th St., Suite 1752  
Rosslyn, VA 22209  
www.nema.org | (703) 841-3200 |
| NETA    | InterNational Electrical Testing Association  
P.O. Box 687  
Morrison, CO 80465  
www.netaworld.org | (303) 697-8441  
(888) 300-6382 |
| NFHS    | National Federation of State High School Associations  
P.O. Box 690  
Indianapolis, Indiana 46206  
www.nfhs.org | (317) 972-6900 |
| NFPA    | National Fire Protection Association  
One Batterymarch Park  
Quincy, MA 02169-7471  
www.nfpa.org | (800) 344-3555  
(617) 770-3000 |
| NFRC    | National Fenestration Rating Council  
8484 Georgia Avenue, Suite 320  
Silver Spring, MD 20910  
www.nfrc.org | (301) 589-1776 |
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
</table>
| NIBS    | National Institute of Building Sciences  
1090 Vermont Ave., NW, Suite 700  
Washington, DC 20005-4905  
www.nibs.org | (202) 289-7800 |
| NIST    | National Institute of Standards and Technology  
100 Bureau Dr., Stop 1070  
Gaithersburg, MD 20899-1070  
www.nist.gov | (301) 975-6478 |
| NLA     | National Lime Association  
200 North Glebe Rd., Suite 800  
Arlington, VA 22203  
www.lime.org | (703) 243-5463 |
| NLGA    | National Lumber Grades Authority  
960 Quayside Dr., #302  
New Westminster, BC V3M 6G2  
CANADA  
www.nlga.org | (604) 524-2393 |
| NOFMA   | National Oak Flooring Manufacturers Association  
22 North Front Street, Suite 660  
Memphis, TN 38103  
www.nofma.org | (901) 526-5016 |
| NPCA    | National Paint and Coatings Association  
1500 Rhode Island Ave., NW  
Washington, DC 20005  
www.paint.org | (202) 462-6272 |
| NPCA    | National Precast Concrete Association  
10333 N Meridian St, Ste. 272  
Indianapolis IN 46290  
www.precast.org | (317) 571-9500 |
| NRCA    | National Roofing Contractors Association  
10255 W, Higgins Rd., Suite 600  
Rosemont, IL 60018-5607  
www.nrca.net | (847) 299-9070 |
| NSF     | NSF International  
789 North Dixboro Road  
P.O. Box 130140  
Ann Arbor, MI 48113-0140  
www.nsf.org | (734) 769-8010 |
| NTMA    | National Terrazzo and Mosaic Association  
201 North Maple, Suite 208  
Purcelville, VA 20132  
www.ntma.com | (800) 323-9736 |
| NUCA    | National Utility Contractors Association  
4301 North Fairfax Dr., Suite 360  
Arlington, VA 22203  
www.nuca.com | (703) 358-9300 |

Reference Standards  
01 32 50-10
### Millsite Dam Rehabilitation

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
</table>
| PCA     | Portland Cement Association  
5420 Old Orchard Rd.  
Skokie, IL 60077  
www.cement.org | (847) 966-6200 |
| PCI     | Precast/Prestressed Concrete Institute  
209 W. Jackson Blvd., Suite 500  
Chicago, IL 60606  
www pci org | (312) 786-0300 |
| PDCA    | Painting and Decorating Contractors of America  
11960 Westline Industrial Drive, Suite 201  
St. Louis, MO 63146-3209  
www pdca com | (314) 514-7322  
(800) 332-7322 |
| PDI     | Plumbing and Drainage Institute  
800 Turnpike Street, Suite 300  
North Andover, MA 01845  
http://PDIonline.org | (800) 589-8956  
(978) 557-0720 |
| PEI     | Petroleum Equipment Institute  
P.O. Box 2380  
Tulsa, OK 74101-2380  
www.pei.org | (918) 494-9696 |
| PTI     | Post Tensioning Institute  
8601 North Black Canyon Highway, Suite 103  
Phoenix, AZ 85021  
www.post-tensioning.org | (602) 870-7540 |
| RIS     | The Redwood Inspection Service  
215 West Standley Street, Suite 5  
Ukiah, CA 95482  
www.redwoodinspectionservice.com | (707) 462-4449 |
| SCAQMD  | South Coast Air Quality Management District  
21865 E. Copley Dr.  
Diamond Bar, CA 91765  
www.aqmd.gov | (800) 288-7664  
(909) 396-2000 |
| SCMA    | Southern Cypress Manufacturers Association  
400 Penn Center Blvd., #530  
Pittsburgh, PA 15235  
www.cypressinfo.org | (877) 607-7262 |
| SDI     | Steel Deck Institute  
P.O. Box 25  
Fox River Grove, IL 60021  
www.sdi.org | (847) 458-4647 |
| SDI     | Steel Door Institute  
30200 Detroit Rd.  
Cleveland, OH 44145-1967  
www.steeldoor.org | (440) 899-0010 |
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIGMA</td>
<td>Sealed Insulating Glass Manufacturers Association&lt;br&gt;401 N. Michigan Ave.&lt;br&gt;Chicago, IL 60611</td>
<td>(312) 644-6610</td>
</tr>
<tr>
<td>SJI</td>
<td>Steel Joist Institute&lt;br&gt;3127 Mr. Joe White Avenue&lt;br&gt;Myrtle Beach, SC 29577-6760&lt;br&gt;www.steeljoist.org</td>
<td>(843) 626-1995</td>
</tr>
<tr>
<td>SMACNA</td>
<td>Sheet Metal and Air Conditioning Contractors' National Association&lt;br&gt;4201 Lafayette Center Dr.&lt;br&gt;Chantilly, VA 20151-1209&lt;br&gt;www.smacna.org</td>
<td>(703) 803-2980</td>
</tr>
<tr>
<td>SPIB</td>
<td>Southern Pine Inspection Bureau&lt;br&gt;4709 Scenic Hwy&lt;br&gt;Pensacola, FL 32504-9094&lt;br&gt;www.spib.org</td>
<td>(850) 434-2611</td>
</tr>
<tr>
<td>SPRI</td>
<td>Single Ply Roofing Institute&lt;br&gt;77 Rumford Avenue, Suite 3B&lt;br&gt;Waltham, MA 02453&lt;br&gt;www.spri.org</td>
<td>(781) 647-7026</td>
</tr>
<tr>
<td>SSPC</td>
<td>SSRC: The Society for Protective Coatings&lt;br&gt;40 24th St., 6th Floor&lt;br&gt;Pittsburgh, PA 15222-4656&lt;br&gt;www.sspc.org</td>
<td>(877) 281-7772&lt;br&gt;(412) 281-2331</td>
</tr>
<tr>
<td>STI</td>
<td>Steel Tank Institute&lt;br&gt;570 Oakwood Rd.&lt;br&gt;Lake Zurich, IL 60047&lt;br&gt;www.steeltank.com</td>
<td>(847) 438-8265</td>
</tr>
<tr>
<td>SWI</td>
<td>Steel Window Institute&lt;br&gt;1300 Sumner Ave.&lt;br&gt;Cleveland, OH 44115-2851&lt;br&gt;www.steelwindows.com</td>
<td>(216) 241-7333</td>
</tr>
<tr>
<td>SWRI</td>
<td>Sealant, Waterproofing and Restoration Institute&lt;br&gt;14 West Third Street, Suite 200&lt;br&gt;Kansas City, MO 64105&lt;br&gt;www.swronline.org</td>
<td>(816) 472-7974</td>
</tr>
<tr>
<td>TABB</td>
<td>Testing, Adjusting and Balancing Bureau&lt;br&gt;601 North Fairfax Street, Suite 250&lt;br&gt;Alexandria, VA 22314&lt;br&gt;www.tabbcertified.org</td>
<td>(703) 299-5646</td>
</tr>
<tr>
<td>TCIA</td>
<td>Tree Care Industry&lt;br&gt;3 Perimeter Road, Unit 1&lt;br&gt;Manchester, NH 03103</td>
<td>(800) 733-2622&lt;br&gt;(603) 314-5380</td>
</tr>
</tbody>
</table>

Reference Standards
01 32 50-12
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Name and Address</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCNA</td>
<td>Tile Council of North America, Inc. 100 Clemson Research Center Anderson, S.C. 29625 <a href="http://www.tileusa.com">www.tileusa.com</a></td>
<td>(864) 646-8453</td>
</tr>
<tr>
<td>TIA/EIA</td>
<td>Telecommunications Industry Association/Electronic Industries Alliance 2500 Wilson Blvd., Suite 300 Arlington, VA 22201</td>
<td>(703) 907-7700</td>
</tr>
<tr>
<td>TMS</td>
<td>The Masonry Society 3970 Broadway, Suite 201-D Boulder, CO 80304-1135 <a href="http://www.masonrysociety.org">www.masonrysociety.org</a></td>
<td>(303) 939-9700</td>
</tr>
<tr>
<td>TPI</td>
<td>Truss Plate Institute 218 North Lee Street, Suite 312 Alexandria, VA 22314 <a href="http://www.tpinst.org">www.tpinst.org</a></td>
<td>(703) 683-1010</td>
</tr>
<tr>
<td>TPI</td>
<td>Turfgrass Producers International 2 East Main Street East Dundee, IL 60118 <a href="http://www.turfgrassod.org">www.turfgrassod.org</a></td>
<td>(800) 405-8873 (847) 649-5555</td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters Laboratories Inc. 333 Pfingsten Rd. Northbrook, IL 60062-2096 <a href="http://www.ul.com">www.ul.com</a></td>
<td>(847) 272-8800</td>
</tr>
<tr>
<td>WCLIB</td>
<td>West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281 <a href="http://www.wclib.org">www.wclib.org</a></td>
<td>(503) 639-0651</td>
</tr>
<tr>
<td>WH</td>
<td>Intertek Testing Services 3210 American Drive Mississauga, Ontario L4V 1B3 CANADA <a href="http://www.intertek-etsmko.com">www.intertek-etsmko.com</a></td>
<td>(905) 678-7820</td>
</tr>
<tr>
<td>WIC</td>
<td>Woodwork Institute PO Box 980247 West Sacramento, CA 95798 <a href="http://www.wicnet.org">www.wicnet.org</a></td>
<td>(916) 372-9943</td>
</tr>
</tbody>
</table>

Reference Standards 01 32 50-13
PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION
SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.
B. Construction progress schedules.
C. Proposed products list.
D. Product data.
E. Samples.
F. Shop Drawings.
G. Design data.
H. Test reports.
I. Certificates.
J. Manufacturer's instructions.
K. Submittal schedule.

1.2 SUBMITTAL PROCEDURES

A. Transmit each submittal to Engineer with accepted form.
B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
C. Identify Project, Contractor, Subcontractor, and Supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
D. Apply Contractor'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 requirements of the Work and Contract Documents.
E. Schedule submittals to expedite Project, and deliver to Engineer at business address or at project site. Coordinate submission of related items.
F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.

H. Allow space on submittals for Contractor and Engineer review stamps.

I. When revised for resubmission, identify changes not called for by Engineer made since previous submission.

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

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

1.3 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial construction Progress Schedule at pre-construction meeting. After review, resubmit required revised data within ten days.

B. Submit revised Progress Schedule with each Application for Payment.

C. Distribute copies of reviewed schedules to Project site file, Subcontractors, Suppliers, and other concerned parties.

D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

E. Submit horizontal bar chart with separate line for each major portion of Work or operation, identifying first work day of each week.

F. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.

G. Indicate estimated percentage of completion for each item of Work at each submission.

H. Submit separate schedule of submittal dates for shop drawings, product data, and Samples, including the dates when reviewed submittals will be required from Engineer. Indicate decision dates for selection of finishes.

I. Revisions to Schedules:

1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.
1.4 PROPOSED PRODUCTS LIST
   A. At pre-construction meeting, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA
   A. Product Data: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents. Provide copies and distribute in accordance with Section 1.2 above and for record documents purposes described in Section 01 70 00.
   B. Submit number of copies Contractor requires, plus two copies Engineer will retain.
   C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
   D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
   E. After review, distribute in accordance with Section 1.2 above and provide copies for record documents described in Section 01 70 00.

1.6 SAMPLES
   A. Samples: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents. Produce duplicates and distribute in accordance with Section 1.2 above and for record documents purposes described in Section 01 70 00.
   B. Submit samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   C. Include identification on each sample, with full Project information.
   D. Submit number of samples specified in individual specification sections; Engineer will retain one sample.
   E. Reviewed samples which may be used in the Work are indicated in individual specification sections.
   F. Samples will not be used for testing purposes unless specifically stated in specification section.

1.7 SHOP DRAWINGS
   A. Shop Drawings: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract
Documents. Produce copies and distribute in accordance with Section 1.2 above and for record documents purposes described in Section 01 70 00.

1.8 DESIGN DATA
A. Submit for Engineer's knowledge as contract administrator or for Owner.
B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.9 TEST REPORTS
A. Submit for Engineer's knowledge as contract administrator or for Owner.
B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.10 CERTIFICATES
A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Engineer, in quantities specified for product data.
B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
C. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

1.11 MANUFACTURER'S INSTRUCTIONS
A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for product data.
B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.12 SUBMITTAL SCHEDULE
A. The following list of submittals was prepared in an effort to consolidate and enumerate the submittals required throughout the Specifications. Contractor is still responsible to submit all submittals required for the project, including those that were incidentally left off the list of submittals.
# List of Submittals *(has not been updated)*

<table>
<thead>
<tr>
<th>Submittal Number</th>
<th>Item</th>
<th>Reference Section &amp; Paragraph</th>
<th>Number of Copies</th>
<th>Due Date or Delivery Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Bid Form</td>
<td>00 20 00, 15.02 00 41 00, 7.01</td>
<td>1</td>
<td>Bid Opening</td>
</tr>
<tr>
<td>S2</td>
<td>Bid Security (Bond)</td>
<td>00 20 00, 15.02 00 41 00, 7.01</td>
<td>1</td>
<td>Bid Opening</td>
</tr>
<tr>
<td>S3</td>
<td>Current Business License Information</td>
<td>00 20 00, 15.02 00 41 00, 7.01</td>
<td>1</td>
<td>Bid Opening</td>
</tr>
<tr>
<td>S4</td>
<td>Proposed List of Subcontractors and Major Materials Suppliers</td>
<td>00 41 00, 7.01 00 73 00, 6.06.B</td>
<td>1</td>
<td>Bid Opening</td>
</tr>
<tr>
<td>S5</td>
<td>Project References</td>
<td>00 41 00, 7.01</td>
<td>1</td>
<td>Bid Opening</td>
</tr>
<tr>
<td>S6</td>
<td>Agreement</td>
<td>00 52 00</td>
<td>3</td>
<td>Within 15 days of Date of Notice of Award</td>
</tr>
<tr>
<td>S7</td>
<td>Performance Bond</td>
<td>00 61 00 01 30 00, 1.4</td>
<td>1</td>
<td>Within 15 days of Date of Notice of Award</td>
</tr>
<tr>
<td>S8</td>
<td>Payment Bond</td>
<td>00 61 50 01 30 00, 1.4</td>
<td>1</td>
<td>Within 15 days of Date of Notice of Award</td>
</tr>
<tr>
<td>S9</td>
<td>Application for Payment</td>
<td>00 62 00 01 22 70, 1.4</td>
<td>3</td>
<td>Intervals stipulated in Agreement</td>
</tr>
<tr>
<td>S10</td>
<td>Substantiating Data</td>
<td>01 22 70, 1.5</td>
<td>3</td>
<td>With Application for Payment</td>
</tr>
<tr>
<td>S11</td>
<td>Insurance Certificates</td>
<td>01 30 00, 1.4</td>
<td>1</td>
<td>Pre-construction meeting</td>
</tr>
<tr>
<td>S12</td>
<td>Finalized List of Subcontractors and Major Materials Suppliers</td>
<td>00 73 00, 6.06.B 01 30 00, 1.4</td>
<td>1</td>
<td>Pre-construction meeting</td>
</tr>
<tr>
<td>S13</td>
<td>List of Proposed Products</td>
<td>01 30 00, 1.4 01 33 00, 1.4</td>
<td>1</td>
<td>Pre-construction meeting</td>
</tr>
<tr>
<td>S14</td>
<td>Schedule of Values</td>
<td>01 30 00, 1.4</td>
<td>1</td>
<td>Pre-construction meeting</td>
</tr>
<tr>
<td>S15</td>
<td>Construction Progress Schedule</td>
<td>01 30 00, 1.4 01 33 00, 1.3</td>
<td>1</td>
<td>Pre-construction meeting</td>
</tr>
<tr>
<td>S16</td>
<td>Updated Construction Progress Schedule</td>
<td>01 22 70, 1.5 01 33 00, 1.3</td>
<td>3</td>
<td>Within 10 days of pre-construction meeting and with Application for Payment</td>
</tr>
<tr>
<td>S17</td>
<td>Comments on Pre-Construction Meeting Minutes</td>
<td>01 30 00, 1.4</td>
<td>1</td>
<td>Within 2 working days after receiving meeting minutes</td>
</tr>
<tr>
<td>S18</td>
<td>Comments on Progress Meeting Minutes</td>
<td>01 30 00, 1.5</td>
<td>1</td>
<td>Within 2 working days after receiving meeting minutes</td>
</tr>
<tr>
<td>S19</td>
<td>Product Data</td>
<td>01 33 00, 1.5 01 70 00, 1.6</td>
<td>2</td>
<td>As necessary for Engineer review and with Project Record Documents</td>
</tr>
<tr>
<td>S20</td>
<td>Construction Shop Drawings</td>
<td>01 33 00, 1.6 01 70 00, 1.6</td>
<td>2</td>
<td>As necessary for Engineer review and with Project Record Documents</td>
</tr>
<tr>
<td>Submittal Number</td>
<td>Item</td>
<td>Reference Section &amp; Paragraph</td>
<td>Number of Copies</td>
<td>Due Date or Delivery Time</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------------</td>
<td>------------------------------</td>
<td>------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>S21</td>
<td>Samples</td>
<td>01 33 00, 1.7 01 70 00, 1.6</td>
<td>2</td>
<td>As necessary for Engineer review and with Project Record Documents</td>
</tr>
<tr>
<td>S22</td>
<td>Design Data</td>
<td>01 33 00, 1.8</td>
<td>2</td>
<td>As necessary</td>
</tr>
<tr>
<td>S23</td>
<td>Test Reports</td>
<td>01 33 00, 1.9</td>
<td>2</td>
<td>As necessary</td>
</tr>
<tr>
<td>S24</td>
<td>Manufacturer’s Certificates</td>
<td>01 33 00, 1.10</td>
<td>2</td>
<td>As necessary</td>
</tr>
<tr>
<td>S25</td>
<td>Manufacturer’s Instructions</td>
<td>01 33 00, 1.11</td>
<td>2</td>
<td>As necessary</td>
</tr>
<tr>
<td>S26</td>
<td>Materials Testing Plan</td>
<td>01 40 00, 1.4</td>
<td>1</td>
<td>5 days prior to start of related work</td>
</tr>
<tr>
<td>S27</td>
<td>Materials Test Results</td>
<td>01 40 00, 1.4</td>
<td>1</td>
<td>Daily</td>
</tr>
<tr>
<td>S28</td>
<td>Summary Materials Test Results</td>
<td>01 40 00, 1.4</td>
<td>1</td>
<td>Weekly</td>
</tr>
<tr>
<td>S29</td>
<td>Surveyor Resume and Qualifications</td>
<td>01 40 00 1.3</td>
<td>1</td>
<td>5 days prior to start of related work</td>
</tr>
<tr>
<td>S30</td>
<td>Surveyor Submittals</td>
<td>01 45 00, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S31</td>
<td>Request for Substitution</td>
<td>01 60 00, 1.6</td>
<td>3</td>
<td>Pre-construction meeting or as needed</td>
</tr>
<tr>
<td>S32</td>
<td>Closeout Certification</td>
<td>01 70 00, 1.2</td>
<td>1</td>
<td>Upon project completion when ready for Engineer’s final review</td>
</tr>
<tr>
<td>S33</td>
<td>Final Application for Payment</td>
<td>01 70 00, 1.2</td>
<td>1</td>
<td>After Engineer's final review</td>
</tr>
<tr>
<td>S34</td>
<td>Project Record Documents</td>
<td>01 70 00, 1.5</td>
<td>3</td>
<td>With Final Application for Payment</td>
</tr>
<tr>
<td>S35</td>
<td>Operation and Maintenance Data</td>
<td>01 70 00, 1.6</td>
<td>3</td>
<td>At Final Inspection</td>
</tr>
<tr>
<td>S36</td>
<td>Manual for Equipment and Systems</td>
<td>01 70 00, 1.7</td>
<td>2</td>
<td>As described in 01 70 00, 1.7</td>
</tr>
<tr>
<td>S37</td>
<td>Product Warrants and Bonds</td>
<td>01 70 00, 1.8</td>
<td>2</td>
<td>As described in 01 70 00, 1.8</td>
</tr>
<tr>
<td>S38</td>
<td>Formwork, Shoring, and Reshoring Shop Drawings</td>
<td>03 10 00, 1.4</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S39</td>
<td>Concrete Reinforcing Bar Shop Drawings</td>
<td>03 20 00, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S40</td>
<td>Concrete Mix Design</td>
<td>03 30 00, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S41</td>
<td>Manufacturer’s Installation Instructions</td>
<td>03 30 00, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S42</td>
<td>Project Record Documents</td>
<td>03 30 00, 1.4</td>
<td>1</td>
<td>At closeout</td>
</tr>
<tr>
<td>Submittal Number</td>
<td>Item</td>
<td>Reference Section &amp; Paragraph</td>
<td>Number of Copies</td>
<td>Due Date or Delivery Time</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------</td>
<td>-------------------------------</td>
<td>------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>S43</td>
<td>Plan for Clearing, Grubbing, and Stripping</td>
<td>31 10 00, 1.2</td>
<td>1</td>
<td>No later than 5 days before beginning the work</td>
</tr>
<tr>
<td>S44</td>
<td>Excavation Plan</td>
<td>31 23 16, 1.3</td>
<td>1</td>
<td>No later than 5 days before beginning the work</td>
</tr>
<tr>
<td>S45</td>
<td>Project Record Documents</td>
<td>31 23 19, 1.6</td>
<td>1</td>
<td>At closeout</td>
</tr>
<tr>
<td>S46</td>
<td>Borrow Area Development Plan</td>
<td>31 24 00, 1.3</td>
<td>1</td>
<td>5 days before starting to work in the borrow area</td>
</tr>
<tr>
<td>S47</td>
<td>Detailed Embankment Work Plan</td>
<td>31 25 00, 1.3</td>
<td>1</td>
<td>5 days before starting work on the embankment</td>
</tr>
<tr>
<td>S48</td>
<td>Proposed Plan for Temporary Construction Slopes</td>
<td>31 25 00 3.1.A</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S49</td>
<td>Reseeding Product Data</td>
<td>31 39 00, 1.3</td>
<td>1</td>
<td>15 days before seeding</td>
</tr>
<tr>
<td>S50</td>
<td>Manhole Shop Drawings</td>
<td>33 05 13, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S51</td>
<td>Manhole product data</td>
<td>33 05 13, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S52</td>
<td>Welding Inspector’s Qualifications and Certifications</td>
<td>33 05 20, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S53</td>
<td>Field Weld Inspection Reports</td>
<td>33 05 20, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S54</td>
<td>Product Data for Gates and Valves</td>
<td>33 05 20, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S55</td>
<td>Shop Drawings for Gates and Valves</td>
<td>33 05 20, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S56</td>
<td>Manufacturer’s Certificate</td>
<td>33 05 20, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S57</td>
<td>Product Data for Oil Used to Fill Pipe Encasing Gate Stem</td>
<td>33 05 20, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S58</td>
<td>Engineering Data Covering Design and Installation</td>
<td>33 05 23, 1.4</td>
<td>1</td>
<td>15 days before related work begins</td>
</tr>
<tr>
<td>S59</td>
<td>Product Data on HDPE Pipes and Fittings</td>
<td>33 11 18, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S60</td>
<td>Manufacturer’s Certificate</td>
<td>33 11 18, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S61</td>
<td>Project Record Documents</td>
<td>33 11 18, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S62</td>
<td>Unexpected Variations to Subsoil Conditions or Discovery of Uncharted Utilities</td>
<td>33 11 18, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S63</td>
<td>Product Data on PVC Pipes and Fittings</td>
<td>33 11 19, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>Submittal Number</td>
<td>Item</td>
<td>Reference Section &amp; Paragraph</td>
<td>Number of Copies</td>
<td>Due Date or Delivery Time</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------</td>
<td>------------------------------</td>
<td>-----------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>S64</td>
<td>Manufacturer’s Certificate</td>
<td>33 11 19, 1.3</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S65</td>
<td>Outlet Pipe Restraining Plan</td>
<td>33 11 19, 1.3</td>
<td>1</td>
<td>15 days prior to placement of concrete encasement around the outlet pipe</td>
</tr>
<tr>
<td>S66</td>
<td>Project Record Documents</td>
<td>33 11 19, 1.3</td>
<td>1</td>
<td>15 days prior to placement of concrete encasement around the outlet pipe</td>
</tr>
<tr>
<td>S67</td>
<td>Unexpected Variations</td>
<td>33 11 19, 1.3</td>
<td>1</td>
<td>15 days prior to placement of concrete encasement around the outlet pipe</td>
</tr>
<tr>
<td>S68</td>
<td>List of All Instruments</td>
<td>33 55 00, 1.2</td>
<td>1</td>
<td>As necessary</td>
</tr>
<tr>
<td>S69</td>
<td>Initial Reading of Instruments</td>
<td>33 55 00, 1.2</td>
<td>1</td>
<td>One week after installation</td>
</tr>
<tr>
<td>S70</td>
<td>Final Instrumentation Drawings</td>
<td>33 55 00, 1.2</td>
<td>1</td>
<td>At closeout</td>
</tr>
</tbody>
</table>

**PART 2 PRODUCTS**

Not used.

**PART 3 EXECUTION**

Not used.

END OF SECTION
SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality control and control of installation.
B. Quality assurance.
C. Tolerances.
D. References.
E. Testing and inspection services.

1.2 QUALITY CONTROL AND 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. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
D. 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.
E. Perform Work by persons qualified to produce required and specified quality.
F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
H. Contractor shall provide material property test results for all embankment materials to Engineer before placing materials in the embankment, or adding additional lifts. Tests shall include, as a minimum:
   1. Grain size distribution.
   3. Atterberg limits (ASTM D4318) for clay materials.
I. Contractor shall provide material property test results for concrete, cement, and aggregates to Engineer.

J. Testing by Engineer does not relieve Contractor of any responsibility for quality control of earthwork and concrete.

1.3 QUALITY ASSURANCE

A. Owner may provide, or request Engineer to provide, independent materials testing or measurement to verify that Work performed by Contractor meets specified requirements of Contract Documents.

B. Contractor shall not rely upon quality assurance testing or measurement provided by Owner as evidence of compliance with required Work, but shall provide quality control as described in Section 01 40 00, Part 1.2.

C. Contractor shall cooperate with the Engineer to furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested for quality assurance testing.

D. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

1.4 MATERIALS TESTING SERVICES

A. Within five days of beginning any work that requires materials testing, submit a materials testing plan that describes:

1. Who will perform materials testing.

2. What materials testing will be performed.

3. At what intervals testing will occur.

4. Proposed plans to bring work into compliance when testing indicates non-compliance.

5. Any other pertinent information regarding materials testing services.

B. Perform, or cause to be performed, materials testing to assure that Work meets specified requirements of Contract Documents.

C. Submit a daily report that includes a copy of all materials testing results for that day.

D. Testing and source quality control may occur on or off the Project site.

E. Notify Engineer 24 hours prior to expected time for operations requiring testing services.

F. Testing results that indicate non-compliance with Contract Documents.
1. Contractor shall immediately notify Engineer of any testing results that indicate non-compliance with Contract Documents.

2. Engineer shall immediately notify Contractor of any independent testing results that indicate non-compliance with Contract Documents.

3. Contractor and Engineer shall meet to discuss what measures will be taken to bring construction in compliance with Contract Documents and make payment adjustments as described in Section 01 22 50, Part 1.6.

4. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instruction by the Engineer.

5. Payment for re-testing performed by the Engineer’s independent testing firm will be charged to the Contractor by deducting testing charges from the Contract Price.

G. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.5 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.6 REFERENCES

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

B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.7 MANUFACTURERS’ FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions,
conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Engineer 10 days in advance of required observations. Observer shall be approved by Engineer.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Summary.
B. Submittals.
C. Primary control.
D. Secondary control.
E. Accuracy of surveys.
F. Protection of control points, monuments, stakes and marks.
G. Work limits and borrow areas.
H. Quantity surveys.

1.2 SUMMARY

A. Contractor shall provide all materials, items, operations or methods specified, listed or scheduled in Specifications and Drawings, including all materials, labor, equipment and incidentals necessary and required to conduct proper surveys required to stake and layout the Work.

B. Engineer will identify initial site reference control points as shown on the Drawings.

C. Contractor shall perform all surveys for the Work including establishing and reestablishing construction control, resetting of stakes and monuments, measurement for payment of completed work, and performing surveys needed for restoration of public and private improvements that have been damaged, destroyed, or relocated by Contractor.

D. All surveys and staking shall be performed under the direction of a land surveyor licensed in the State of Utah.

1.3 SUBMITTALS

A. Surveyor:

1. The surveyor performing the on-site construction staking shall have a minimum of five years of construction staking experience.

2. Submit a resume detailing the experience level of the licensed land surveyor to Engineer at least five days prior to the start of Work requiring surveying.
B. Survey Records:

1. Contractor shall use the control points established and shown on the Drawings. As the Work progresses, all subsequent changes to the control plan shall be submitted.

2. Submit documentation of Survey Work, including:
   a. Original field books
   b. Copies of field books
   c. Field notebooks
   d. Data from electronic data recorders

3. Documentation shall be submitted to Engineer at the conclusion of the Work or upon request of Engineer.

C. Submit a certificate with final Application for Payment signed by the professional land surveyor, stating that the elevations and locations of the Work are in conformance with Contract Documents.

1.4 PRIMARY CONTROL

A. Contractor shall be responsible for checking the position of existing control points prior to starting site work and notify Engineer of discrepancies found between actual and recorded measurements.

B. Permanent control points shall not be relocated without prior written approval from Engineer.

1.5 SECONDARY CONTROL

A. From the primary control points provided by Engineer, Contractor shall establish secondary control points necessary for the construction of the Work. Secondary control shall consist of sufficient permanent points to establish the lines and grades for the various Work either directly or by offset. Layout lines for use in constructing the Work shall be taken directly from either the primary or secondary control.

B. Secondary control shall be tied to and closed upon the primary control. Secondary control networks shall be adjusted prior to use in developing subsequent control or in laying out the Work.

C. Any points on the Drawings that are not specifically labeled control points shall be considered secondary control points, which shall be established by Contractor.

1.6 ACCURACY OF SURVEYS

A. Locate points for cross sections to the nearest 0.1 foot horizontally and vertically.

B. Close vertical elevation surveys within 0.05 foot times the square root of the length of the circuit in miles.

C. Set all grade stakes within 0.1 foot.
D. Set alignment of tangents and curves within 0.05 foot.

E. Set points for structures to the nearest 0.01 foot vertical and 0.05 foot horizontal, except where operational functions of special features require closer tolerances.

F. Set survey monuments within an accuracy of 0.01 foot vertical and 0.05 foot horizontal.

G. Tolerances for all other Work shall be as shown or specified in the Contract Documents.

H. Instruments shall be accurate and shall be subject to inspection by Engineer for proper operation.

1. Contractor shall check calibration of electronic distance measuring (EDM) instruments used on the Site a minimum of once per month on an established base line approved by Engineer.

2. Keep all calibration results in a log book, available for Engineer’s review, showing the date and distances measured on the base line. An EDM shall not be used if it does not meet the minimum advertised accuracy published by the manufacturer.

3. Promptly replace, repair or adjust defective instruments to operate within the tolerances of the instrument manufacturer.

I. All work not performed with the methods and equipment as submitted by Contractor and accepted by Engineer shall be removed and replaced by Contractor at no additional cost to the Owner, unless otherwise instructed by Engineer.

1.7 PROTECTION OF CONTROL POINTS, MONUMENTS, STAKES AND MARKS

A. Contractor shall preserve and protect all control points, survey monuments, stakes, and related marks.

B. When removal is necessary, Contractor will accurately reference the original location, subject to approval of Engineer.

1. Except for boundary monuments, all other survey stakes, control points, monuments, benchmarks, or reference stakes disturbed or destroyed during the Work shall be replaced and reset to the satisfaction of Engineer at Contractor’s expense.

2. Contractor shall reset primary or secondary control monuments as soon as the Work requiring removal is complete. Alternatively, other control points may be set so as to reestablish the control network.

3. Verify the position of control points, monuments, or other marks that are subject to movement or settlement due to passage of equipment or other forces at regular intervals, but not less than monthly.
1.8 Work Limits and Borrow Areas

A. The Drawings indicate the project work limits and borrow areas. Any work outside these limits must be approved by the Engineer and Owner.

B. Contractor shall use flagging, fencing, or other measures to clearly mark work limits

C. Contractor shall prevent any work from occurring outside the work limits.

1.9 Quantity Surveys

A. Prior to stripping and before removing any existing embankment, mitigation area or borrow area materials, prepare a baseline survey of the existing embankment or borrow areas consisting of, at a minimum, cross-sections at 50-foot intervals. Survey point density shall be sufficient to accurately define the surface within 6 inches in all areas.

B. Following the completion of all the clearing, grubbing, and stripping operations in an area, and before commencing excavation, prepare a baseline survey consisting of, at a minimum, cross-sections surveyed at the same location as surveyed during the initial site survey. Survey point density shall be sufficient to accurately define the surface within 6 inches in all areas.

C. Complete surveys of surfaces prior to removal of any underlying material, such as borrow materials, foundation bedrock, etc. Surveyed surface shall be used to provide initial surface conditions for calculating quantities of subsequent excavated material. Verify with Engineer that area to be surveyed has been adequately cleared of overlying materials.

D. Use the same cross-sections for all subsequent measurement of quantities. Excavation and fill quantities shall be calculated by either the average end area method or by using digital terrain models.

E. Each month, coordinate with Engineer to estimate and agree on the volume of earthwork accomplished and the amount of payment due for that month.

F. At the point where the Work performed under each bid item is completed, perform a final survey using the same cross-sections established during the baseline survey to determine the in-place quantities. Use this survey to calculate in-place quantities, as described above, which will be used as the final basis of payment for the completed item, and the initial basis of payment for the subsequent related item of Work. Payment will not be made for products placed beyond the lines and levels of the required Work.

G. Submit a copy of cross-section survey data and quantity calculation to Engineer. The difference in calculated quantities between the initial and final cross-sections or digital terrain models for each item will be the basis for the total payment to Contractor for that item, unless otherwise defined in the Specifications. Payment will not be made for products placed beyond the lines and levels of the required Work.
1.10 As-Built Surveys

A. Upon completion of the Work and approval by the Engineer, as-built surveys of all areas impacted by construction shall be prepared by the Contractor. The as-built survey shall include but not be limited to: mitigation area surfaces, borrow area surfaces, staging, storage and stockpile area surfaces, embankment surface, reservoir basin surface, structures, roads, fences, and utilities. Survey point density shall be sufficient to accurately define all surfaces within 6 inches in all areas.

B. The Contractor shall provide AutoCad files to the Engineer including all surfaces and items mentioned in Item A above.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.
This page is intentionally left blank.
SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

   A. Temporary utilities.
   B. Construction facilities.
   C. Temporary controls.
   D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY UTILITIES

   A. Temporary Electricity
      1. Contractor shall provide own source of power or arrange for power to be used at
         the construction site.
   
   B. Temporary Lighting for Construction Purposes
      1. Contractor shall provide any temporary lighting needed for construction
         purposes.
   
   C. Temporary Heating and Cooling
      1. Provide and pay for heating and cooling devices and heat or cool as needed to
         maintain specified conditions for construction operations. This may include, but
         is not limited to, heating required for placement and curing of concrete.
   
   D. Temporary Water Service
      1. Contractor shall provide temporary water needed during construction. Arrangements may be made with Owner to connect to existing water source. Any costs shall be borne by Contractor.
   
   E. Temporary Sanitary Facilities
      1. Provide and maintain required facilities and enclosures. Provide facilities at time
         of project mobilization.

1.3 CONSTRUCTION FACILITIES

   A. Field Offices and Sheds
1. In the event that Contractor shall need an on-site field office or shed, it shall be provided by Contractor.

2. Do not use permanent facilities for field offices or for storage.

3. Storage Areas and Sheds: Size to storage requirements for products of individual sections, allowing for access and orderly provision for maintenance and for inspection of products to the requirements of Section 01 60 00.

4. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings.

5. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas to pre-construction conditions, or to satisfaction of Owner if different than pre-construction conditions.

B. Vehicular access

1. Use designated existing on-site roads for construction traffic.

2. Maintain existing site access and on-site roads in sound condition.

3. Promptly repair breaks, potholes, low areas, standing water, washboarding, and other deficiencies, to maintain paving and drainage in original condition.

4. Roads shall be protected against road damage resulting from Contractor’s use of these roads, and any damage so caused shall be promptly repaired by Contractor at Contractor’s expense.

5. Hauling of materials or equipment over public highways, roads, or bridges shall be in accordance with Federal, State, and applicable local regulations and shall be performed in a manner to minimize interference with public traffic.

6. Where haul routes cross public highways or roads, Contractor shall provide barricades, flag personnel, and other necessary precautions for safety purposes.

7. Provide traffic control in accordance with local requirements.

C. Parking

1. Coordinate with Owner parking areas to accommodate construction personnel.

2. Locate as approved by Owner.

3. When site space is not adequate, provide additional off-site parking.

D. Progress Cleaning and Waste Removal

1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
2. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.4 TEMPORARY CONTROLS

A. Security

1. Security Program:
   a. Protect existing Work premises from theft, vandalism, and unauthorized entry.
   b. Initiate program at project mobilization.
   c. Maintain program throughout construction period until directed by Engineer.

2. Entry Control:
   a. Maintain log of workers and visitors, make available to Owner on request.

B. Dust Control

1. Execute Work by methods to minimize raising dust from construction operations.

2. Provide dust control on access and haul roads.

3. Use method or combination of methods listed below to prevent particulate matter from becoming airborne and being transported off-site:
   a. Schedule: Delay earthwork and other activities generating particulate matter until wind velocity is 30 MPH or less.
   b. Restricting vehicles: Use signs and other traffic controls to limit speed and access of job site vehicles. Limit speed to 10 MPH maximum. Restrict vehicle traffic in dust stabilized areas.
   c. Watering: Use sprinkler system or water truck with spray boom to water disturbed area daily and at intervals required to adequately control dust.
   d. Palliatives: Apply dust palliative to stabilize soils after earthwork is completed and to sandy soils where watering is ineffective. Do not use palliative detrimental to vegetation.
   e. Other methods that substantially and effectively reduce transported material or emission of particulate matter into atmosphere.

C. Erosion and Sediment Control

1. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

2. Minimize surface area of bare soil exposed at one time.

3. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.
4. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

5. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures, as necessary.

D. Noise Control

1. Provide methods, means, and facilities to minimize noise produced by construction operations.

E. Pollution Control

1. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

2. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.5 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to minimum depth of 2 feet. Grade site as indicated on Drawings.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION
SECTION 01 59 00
FIELD OFFICES, EQUIPMENT, AND SERVICES

PART 1 GENERAL

1.1 GENERAL

A. Provide at the Contractor’s expense all temporary facilities and utilities required for prosecution of the work, protection of employees and the public, protection of the work from damage by fire, weather or vandalism, and such other facilities as may be specified or required by any legally applicable law, ordinance, rule, or regulation.

B. The Contractor's project office, shop, yard, and storage areas shall be located in the area acceptable to the Engineer and the Owner, and arranged in a manner to preserve trees and vegetation to the maximum practicable extent.

1.2 Submittals

A. Submit a detailed layout of the field offices. The offices shall not be shipped to the site until the layout is approved.

1.3 Security and Protection of Project Facilities.

A. Throughout the entire period of construction, provide protection and security of project facilities including offices, vehicles, equipment, materials, other project work and associated facilities which are within the project construction limits including the main staging area, other staging areas, pipeline and reservoir rights of way and access roads.

1.4 CONTRACTOR’S field office

A. Maintain within the project site a suitable office or other protected area in which shall be kept project copies of the Contract Documents, project progress records, etc. which shall be accessible to the Owner or Engineer during normal working hours.

1.5 Field Office for Engineer

A. Provide and maintain for the Engineer and his staff a field office building or trailer made specifically for use as an office. Locate the field office within the main staging area or close to the Contractor's field office, and convenient to the construction operations.

B. The office building or trailer shall be approximately 10' x 30' or 8' x 40' in size with an 8' minimum ceiling height and shall be of weathertight construction. The walls and ceiling shall be lined inside with insulating fiberboard. The ceiling shall be insulated with 3 inches of rock wool. The office building shall have at least six windows and two entrance doors, each complete with cylinder lock and four keys. The field office shall include three or four rooms which are well lighted, air conditioned, and electrically heated. Rooms shall include a lavatory, one or two separate offices, and a conference room. The water closet may be of the chemical type; provided, that it is a flush type with an approved holding tank. The toilet room door shall be provided with a latch set. A
toilet shall not be required for the Engineer’s trailer if a portable toilet is accessible within 200 feet of the trailer.

C. Provide all necessary electrical wiring, plumbing, toilet and lavatory fixtures, air conditioning and heating equipment, shelving, and insurance on full value of contents; and furnish all necessary light, heat, water, and weekly janitorial services in connection with all field offices specified herein, for the duration of the Work; and shall remove said offices and appurtenant facilities within 14 days after the execution or recordation of the Certificate of Notice of Completion.

D. If satellite conditions provide accessibility at the site, the Contractor shall provide satellite service for telephone and internet throughout the duration of the Work.

E. No initial payments for mobilization will be allowed until all field office facilities have been provided. Unless released earlier by the Engineer in writing, said field office(s) shall be maintained in full operation with all utilities connected and operable from the commencement date stated in the Notice to Proceed until the Notice of Completion is recorded.

F. Upon execution of the Notice of Completion, or upon early release of the field office(s) by the Engineer, remove the field office(s) within 14 days, restore and revegetate the site to the pre-construction conditions satisfactory to the Engineer.

1.6 FIELD OFFICE FURNISHINGS

A. Furnish the following listed items in good condition for the Engineer’s field office:

   2 Standard 30 x 60-inch office desks with 3+ drawers, locks and chairs
   2 Office chairs, std. arm rest type, adjustable, swivel, tilt-back w/ casters
   1 Plan table not less than 3’ x 5’
   1 Conference table, not less than 2.5’ x 6’
   6 Straight side chairs, no arms
   3 Wastebaskets
   1 White board 3’ x 3.5’ or larger
   1 Bottled water dispenser unit (supplying both hot and cold water) and bottled water service and continuous supply of paper cups.
   Other items as described below:

1.7 FIRE EXTINGUISHER

A. Provide at least one fire extinguisher, rated at least 2A, in or readily accessible to, each temporary office or storage structure on the jobsite.
SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 2 GENERAL

2.1 SECTION INCLUDES

A. Products.
B. Product delivery requirements.
C. Product storage and handling requirements.
D. Product options.
E. Product substitution procedures.

2.2 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
C. Furnish interchangeable components from same manufacturer for components being replaced.

2.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.
B. Promptly inspect shipments to ensure Products comply with requirements, quantities are correct, and products are undamaged.
C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

2.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.
B. Store with seals and labels intact and legible.
C. Store sensitive products in weather tight, climate controlled enclosures in an environment favorable to Product.
D. For exterior storage of fabricated products, place on sloped supports above ground.
E. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

F. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

H. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

2.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

2.6 PRODUCT SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during bidding period to requirements specified in this section.

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

D. A request constitutes a representation that Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.

2. Will provide same warranty for substitution as for specified product.

3. Will coordinate installation and make changes to other work which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
F. Substitution Submittal Procedure:

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.

2. Submit Shop Drawings, product data, and certified test results attesting to proposed product equivalence. Burden of proof is on Contractor.

3. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 3 PRODUCTS

Not used.

PART 4 EXECUTION

Not used.

END OF SECTION
This page is intentionally left blank.
SECTION 01 70 00
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES
   A. Closeout procedures.
   B. Final cleaning.
   C. Starting of systems.
   D. Protecting installed construction.
   E. Project record documents.
   F. Operation and maintenance data.
   G. Manual for equipment and systems.
   H. Product warranties and product bonds.

1.2 CLOSEOUT PROCEDURES
   A. Submit written certification that Contract Documents have been reviewed, Work has been
      inspected, and that Work is complete in accordance with Contract Documents and ready
      for Owner/Engineer's review.
   B. Provide submittals to Engineer required by authorities having jurisdiction.
   C. Submit final Application for Payment identifying total adjusted Contract Sum, previous
      payments, and sum remaining due.

1.3 FINAL CLEANING
   A. Execute final cleaning prior to final Project assessment.
   B. Clean surfaces exposed to view; remove temporary labels, stains, and foreign substances.
   C. Clean debris from structures and drainage systems.
   D. Ensure the maintenance roads are free of obstructions and can be traveled by a pickup
      truck.
   E. Remove waste and surplus materials, rubbish, and construction facilities from site.
   F. Ensure all areas disturbed by excavation or regrading are covered with topsoil and
      prepared to allow for natural revegetation to occur.
1.4 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

1.5 PROJECT RECORD DOCUMENTS

A. Maintain onsite one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, product data, and Samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract Drawings.

G. Submit documents to Engineer with claim for final Application for Payment.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch text pages, D-size three ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
   a. Significant design criteria.
   b. List of equipment.
   c. Parts list for each component.
   d. Operating instructions.
   e. Maintenance instructions for equipment and systems.
   f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
   a. Shop Drawings and product data.
   b. Air and water balance reports.
   c. Certificates.
   d. Originals of warranties and bonds.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy will be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes in final form within 10 days after final inspection.

E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

F. Include color coded wiring diagrams as installed.

G. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.

H. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

I. Include servicing and lubrication schedule, and list of lubricants required.

J. Include manufacturer's printed operation and maintenance instructions.

K. Include sequence of operation by controls manufacturer.

L. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

M. Include control diagrams by controls manufacturer as installed.

N. Include Contractor's coordination drawings, with color coded piping diagrams as installed.

O. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

P. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

Q. Include test and balancing reports as specified in Section 01 40 00.

R. Additional Requirements: As specified in individual product specification sections.

S. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
1.8 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include Table of Contents and assemble in D-size three ring binders with durable plastic covers.

F. Submit prior to final Application for Payment.

G. Time of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION
This page is intentionally left blank.
SECTION 01 80 00

PROTECTING EXISTING UNDERGROUND UTILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Materials and procedures for protecting existing underground utilities.

PART 2 PRODUCTS

2.1 REPLACEMENT IN KIND

A. Except as indicated below or as specifically authorized by the Engineer, reconstruct utilities with new material of the same size, type, and quality as that removed.

PART 3 EXECUTION

3.1 GENERAL

A. Replace in kind fences, signs, etc. that are cut, removed, damaged, or otherwise disturbed by the construction.

B. Where utilities are parallel to or cross the construction but do not conflict with the permanent work to be constructed, follow the procedures given below and as indicated in the Drawings. Notify the utility owner 48 hours in advance of the crossing construction and coordinate the construction schedule with the utility owner’s requirements. For utility crossings not shown in the Drawings, refer to the General Conditions and the instruction of the Engineer for guidance.

C. Determine the true location and depth of utilities and service connections which may be effected by or effect the Work. Determine the type, material, and condition of these utilities. In order to provide sufficient lead-time to resolve unforeseen conflicts, order materials, and take appropriate measures to ensure that there is no delay in work.

3.2 PROCEDURES

A. Protect in Place: Protect utilities in place, unless abandoned. Maintain the utility in service, unless otherwise specified in the drawings or in the specifications.

B. Remove and Reconstruct: Where so indicated in the Drawings or as required by the Engineer, remove the utility and, after passage, reconstruct it with new materials. Provide temporary service for the disconnected utility.
3.3 COMPACTION

A. Utilities Protected in Place: Backfill and compact under and around the utility so that no voids are left.

B. Utilities Reconstructed: Prior to replacement of the utility, backfill the excavation and compact to an elevation one foot above the top of the ends of the utility. Excavate a cross trench of the proper width for the utility and lay, backfill, and compact.

C. Alternative Construction: Sand slurry consisting of one sack (94 pounds) of Portland cement per cubic yard of sand and sufficient moisture for workability may be substituted for other backfill materials to aid in reducing compaction difficulties. Submit specific methods and procedures for Engineer’s review prior to construction.

END OF SECTION
SECTION 03 10 00

CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete.
2. Shoring, bracing, and anchorage.
3. Form accessories.
4. Form stripping.

1.2 REFERENCES

A. American Concrete Institute:

2. ACI 301 - Specifications for Structural Concrete.
3. ACI 318 - Building Code Requirements for Structural Concrete.
4. ACI 347 - Guide to Formwork for Concrete.

B. American Forest and Paper Association:

1. AF&PA - National Design Specifications for Wood Construction.

C. The Engineered Wood Association:


D. ASTM International:

1.3 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to applicable code requirements to achieve concrete shape, line, and dimension as indicated on Drawings.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
   1. Submit formwork, shoring, and reshoring shop drawings.
   2. Indicate the following:
      a. Pertinent dimensions, openings, methods of construction, types of connections, materials, joint arrangement and details, ties and shores, location of framing, studing and bracing, and temporary supports.
      b. Means of leakage prevention for concrete exposed to view in finished construction.
      c. Sequence and timing of erection and stripping assumed compressive strength at time of stripping, height of lift and height of drop during placement.
      d. Vertical, horizontal, and special loads in accordance with ACI 347, Section 2.2 and camber diagrams, when applicable.
      e. Notes to formwork erector showing size and location of conduits and piping embedded in concrete in accordance with ACI 318, Section 6.3.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347 and ACI 301.

B. For wood products furnished for work of this Section, comply with AF&PA.

C. Perform Work in accordance with Utah Dam Safety standard.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Products storage and handling requirements.

B. Deliver void forms and installation instructions in manufacturer's packaging.

C. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.
PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood Forms:


2. Forms: Conform to PS 1; full size 4 x 8 feet panels; each panel labeled with grade trademark of APA/EWA.


4. Plywood where “Smooth Finish” is required, as indicated on Drawings: APA/EWA “HD Overlay Plyform Structural I Exterior” grade, minimum of 3/4 inch thick.

2.2 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Framing, Studding and Bracing: Stud or No. 3 structural light framing grade.

2.3 FORMWORK ACCESSORIES

A. Form Ties: Removable snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects capable of leaving holes larger than one inch in concrete surface.

B. Form Release Agent: Colorless mineral oil that will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.


D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

E. Water Stops: Rubber, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, minimum six inch wide, maximum possible lengths, ribbed profile, preformed corner sections, heat welded jointing.

F. Corners: Chamfered, ¾" x ¾"; maximum possible lengths. Chamfer all exposed corners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Engineer.

3.2 INSTALLATION

A. Earth Forms:

1. Trench earth forms neatly, accurately, and at least 2 inches wider than footing widths indicated on Drawings.

2. Trim sides and bottom of earth forms.

3. Construct wood edge strips at top of each side of trench to secure reinforcing and prevent trench from sloughing.

4. Form sides of footings where earth sloughs.

5. Tamp earth forms firm and clean forms of debris and loose material before depositing concrete.

B. Formwork - General:

1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.

2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.

3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.

4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.

5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:

1. Use steel, plywood or lined board forms.

2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.

3. Install form lining with close-fitting square joints between separate sheets without springing into place.

4. Use full size sheets of form lines and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.
6. Use care in forming and stripping wood forms to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

D. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.

E. Framing, Studding and Bracing:
1. Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.
2. Size framing, bracing, centering, and supporting members with sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Construct beam soffits of material minimum of 2 inches thick.
4. Distribute bracing loads over base area on which bracing is erected.
5. When placed on ground, protect against undermining, settlement, or accidental impact.

F. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.

G. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

H. Obtain Engineer’s approval before framing openings in structural members not indicated on Drawings.

I. Install void forms in accordance with manufacturer's recommendations.

J. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer’s specifications. Do not coat forms for concrete indicated to receive “scored finish”. Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings for items to be embedded in or passing through concrete work.

B. Locate and set in place items required to be cast directly into concrete.

C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Install water stops continuous without displacing reinforcement. Heat seal joints watertight.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

H. Form Ties:

1. Use sufficient strength and sufficient quantity to prevent spreading of forms.

2. Place ties at least one inch away from finished surface of concrete.

3. Leave inner rods in concrete when forms are stripped.

4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.

I. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

J. Construction Joints:

1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.

2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.

3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.

4. Arrange joints in continuous line straight, true and sharp.
K. Embedded Items:
   1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
   2. Do not embed wood or uncoated aluminum in concrete.
   3. Obtain installation and setting information for embedded items furnished under other Specification sections.
   4. Securely anchor embedded items in correct location and alignment prior to placing concrete.
   5. Verify conduits and pipes, including those made of coated aluminum, meet requirements of ACI 318 for size and location limitations.

L. Openings for Items Passing Through Concrete:
   1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
   2. Coordinate work to avoid cutting and patching of concrete after placement.
   3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

M. Screeds:
   1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
   2. Slope slabs to drain where required or as shown on Drawings.
   3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

N. Screed Supports:
   1. For concrete over waterproof membranes and vapor barrier membranes, use cradle, pad or base type screed supports which will not puncture membrane.
   2. Staking through membrane is not to be permitted.

O. Cleanouts and Access Panels:
   1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris, and waste material.
   2. Clean forms and surfaces against which concrete is to be placed. Remove chips, sawdust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.
3.5 FORM CLEANING
   A. Clean forms as erection proceeds, to remove foreign matter within forms.
   B. Clean formed cavities of debris prior to placing concrete.
   C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
   D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.6 FORM REMOVAL
   A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by Engineer.
   B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
   C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.
   D. Leave forms in place for minimum number of days as specified in ACI 347.

3.7 FIELD QUALITY CONTROL
   A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
   B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
   C. Notify Engineer after placement of reinforcing steel in forms, but prior to placing concrete.
   D. Schedule concrete placement to permit formwork inspection before placing concrete.

   END OF SECTION
SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Reinforcing bars.
3. Reinforcement accessories.

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
3. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
7. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
8. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

9. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.


13. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.


C. American Welding Society:

1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:


2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel, bending and cutting schedules, and supporting and spacing devices.

C. Certificates: Submit AWS qualification certificate for welders employed on the Work.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE


B. Prepare shop drawings in accordance with ACI SP-66.

C. Perform Work in accordance with Utah Dam Safety standard.
1.5 QUALIFICATIONS
   A. Welders: AWS qualified within previous 12 months.

1.6 COORDINATION
   A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
   B. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.1 REINFORCEMENT
   A. Reinforcement: ASTM A615/A615M; 60 ksi yield strength, steel bars.

2.2 ACCESSORY MATERIALS
   A. Tie Wire: Minimum 16 gage annealed type.
   B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

2.3 FABRICATION
   A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice.
   B. Form standard hooks for 90 degree bend, stirrup and tie hooks as indicated on Drawings.
   C. Form reinforcement bends with minimum diameters in accordance with ACI 318.
   D. Fabricate column reinforcement with offset bends at reinforcement splices.
   E. Form ties and stirrups from the following:
      1. For bars No. 10 and Smaller: No. 3 deformed bars.
      2. For bars No. 11 and Larger: No. 4 deformed bars.
   F. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Review location of splices with Engineer.

PART 3 EXECUTION

3.1 PLACEMENT
   A. Place, support and secure reinforcement against displacement. Do not deviate from required position beyond specified tolerance.
      1. Do not weld crossing reinforcement bars for assembly.
B. Accommodate placement of formed openings.

C. Space reinforcement bars with minimum clear spacing in accordance with ACI 318.
   1. Where bars are indicated in multiple layers, place upper bars directly above lower bars.

D. Maintain concrete cover around reinforcement in accordance with ACI 318.
   1. Concrete cover for reinforcement to be 3 inches where concrete contacts soil.
   2. Concrete cover for reinforcement to be 2 inches everywhere else.

3.2 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Install reinforcement within the following tolerances for flexural members, walls, and compression members:

<table>
<thead>
<tr>
<th>Reinforcement Depth</th>
<th>Depth Tolerance</th>
<th>Concrete Cover Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 8 inches</td>
<td>plus or minus 3/8 inch</td>
<td>minus 3/8 inch</td>
</tr>
<tr>
<td>Less than 8 inches</td>
<td>plus or minus 1/2 inch</td>
<td>minus 1/2 inch</td>
</tr>
</tbody>
</table>

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services.

B. Reinforcement Inspection:
   1. Placement Acceptance: Specified material requirements and specified placement tolerances.
   3. Periodic Placement Inspection: Inspect for correct materials, fabrication, sizes, locations, spacing, concrete cover, and splicing.
SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1  GENERAL

1.1  SUMMARY

A. Section includes cast-in-place concrete for the following:

1. Valve Vaults.
2. Anchor Blocks.
3. Slabs on Grade.
4. Spillway Floors.
5. Spillway Walls.
6. Wing Walls.
7. Outlet Encasement.
8. Placement on Bedrock.

B. Related Sections:

1. Section 03 10 00 - Concrete Forming and Accessories.
2. Section 03 20 00 - Concrete Reinforcing.

1.2  REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 305 - Hot Weather Concreting.
5. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:

1. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
4. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
8. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
15. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.


30. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

31. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on joint devices, attachment accessories and admixtures.

C. Design Data:

1. Submit concrete mix design for each concrete strength a minimum of 14 days prior to use in the Work. Submit separate mix designs when admixtures are required for the following:
   a. Hot and cold weather concrete work.
   b. Air entrained concrete work.

2. Identify mix ingredients and proportions, including admixtures.

D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution Requirements: Closeout procedures.
B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with ACI 318.
B. Conform to ACI 305 when concreting during hot weather.
C. Conform to ACI 306.1 when concreting during cold weather.
D. Acquire cement and aggregate from one source for Work.
E. Perform Work in accordance Utah Dam Safety standard.

1.6 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum 7 days.

1.7 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS
A. Cement: ASTM C150, Type I – Normal, may be used if approved by Engineer or Type IIA – Moderate or Type VA Sulfate Resistant/Air Entraining, Portland Type.
B. Normal Weight Aggregates: ASTM C33.
C. Water: ACI 318; potable.

2.2 ADMIXTURES
A. Furnish materials in accordance with Utah Dam Safety standard.
B. Air Entrainment: ASTM C260.
C. Fly Ash: ASTM C618.
D. Silica Fume: ASTM C1240.

2.3 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion or Engineer approved equal.

B. Non-Shrink Grout: ASTM C1107, Grade A; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

C. Epoxy for embedments and drilled dowels: Hilti HY150.

2.4 CONCRETE MIX

A. Select proportions for concrete in accordance with ACI 318 trial mixtures.

B. Provide concrete to the following criteria:

<table>
<thead>
<tr>
<th>Material and Property</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength (7 day)</td>
<td>2850 psi</td>
</tr>
<tr>
<td>Compressive Strength (28 day)</td>
<td>5000 psi</td>
</tr>
<tr>
<td>Cement Type</td>
<td>Type IIA or VA</td>
</tr>
<tr>
<td>Aggregate Type</td>
<td>Normal weight</td>
</tr>
<tr>
<td>Water-Cement Ratio (maximum)</td>
<td>0.45 by weight</td>
</tr>
<tr>
<td>Coarse Aggregate Size (maximum)</td>
<td>3/4 inch</td>
</tr>
<tr>
<td>Coarse Aggregate Size (minimum)</td>
<td>#4 Sieve</td>
</tr>
<tr>
<td>Air Content</td>
<td>5 percent plus or minus 1 percent</td>
</tr>
<tr>
<td>Slump for Floors</td>
<td>3 inches plus or minus 1 inch</td>
</tr>
<tr>
<td>Slump for Walls</td>
<td>5 inches plus or minus 1 inch</td>
</tr>
</tbody>
</table>

C. Admixtures: Include admixture types and quantities indicated in concrete mix designs only when approved by Engineer.

1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.

2. Do not use calcium chloride nor admixtures containing calcium chloride.

3. Use set retarding admixtures during hot weather.

4. Add air entrainment admixture to concrete mix for all work.

5. For concrete exposed to deicing chemicals, limit fly ash pozzolans, silica fume, and slag content as required by applicable code.

D. Average Compressive Strength Reduction: Not permitted.
E. Ready Mixed Concrete: Mix and deliver concrete in accordance with ASTM C94/C94M.
F. Site Mixed Concrete: Mix concrete in accordance with ACI 318.

PART 3 EXECUTION

3.1 EXAMINATION
A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
B. Verify requirements for concrete cover over reinforcement.
C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION
A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.
B. Where watertight seal is required between floors and walls, embed waterstop. Sand blast concrete surface before placing concrete for walls.
C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, apply epoxy and insert steel dowels.
D. Remove debris and ice from formwork, reinforcement, and concrete substrates.
E. Wet the surface without ponding any water.
F. Remove standing water from areas receiving concrete before concrete is placed.
G. Clean soil and bedrock surfaces of any loose soil, debris, or rock.

3.3 PLACING CONCRETE
A. Place concrete in accordance with ACI 301 and ACI 318. In addition, place concrete in accordance with ACI 305 during hot weather and ACI 306.1 during cold weather.
B. Notify testing laboratory Engineer minimum 24 hours prior to commencement of operations.
C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, are not disturbed during concrete placement.
D. Deposit concrete at final position. Prevent segregation of mix.
E. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
F. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor and wall finish.

G. Install joint covers in one piece length, when adjacent construction activity is complete.

H. Deposit concrete at final position. Prevent segregation of mix. Do not allow concrete to free fall more than 3 feet when placing in forms.

I. Place concrete in continuous operation for each panel or section determined by predetermined joints.

J. Consolidate concrete using stinger every 2 feet along walls. Ensure that stinger penetrates previous lift by 1 foot.

K. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

L. Place concrete continuously between predetermined expansion, control, and construction joints.

M. Do not interrupt successive placement; do not permit cold joints to occur.

N. Screed floors and slabs on grade level, maintaining surface flatness of ¼ inch in 10 feet.

3.4 CONCRETE FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 318.

B. Steel trowel surfaces which are indicated to be exposed.

C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on Drawings.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure concrete in accordance with ACI 308.1.

D. Allow concrete to cure for 24 hours prior to removing forms.

E. Allow concrete to cure for 14 days prior to backfilling structures or walls.

F. Allow concrete to cure for 28 days prior to structural loading.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services.
B. Perform field inspection and testing in accordance with ACI 318.
C. Provide free access to Work and cooperate with appointed firm.
D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
E. Concrete Inspections:
   1. Continuous Placement Inspection: Inspect for proper installation procedures.
   2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.
F. Strength Test Samples:
   3. Sample concrete and make one set of four cylinders for every 50 cubic yards or less of each class of concrete placed each day.
   4. When volume of concrete for any class of concrete would provide less than 5 sets of cylinders, take samples from five randomly selected batches, or from every batch when less than 5 batches are used.
   5. Make one additional cylinder during cold weather concreting, and field cure.
G. Field Testing:
   1. Slump Test Method: ASTM C143/C143M.
   2. Air Content Test Method: ASTM C173/C173M.
   3. Temperature Test Method: ASTM C1064/C1064M.
   4. Measure slump and temperature for each compressive strength concrete sample.
   5. Measure air content in air entrained concrete for each compressive strength concrete sample.
H. Cylinder Compressive Strength Testing:
   2. Test Acceptance: In accordance with ACI 318.
   3. Test one cylinder at 7 days.
   4. Test two cylinders at 28 days.
5. Test field cured cold weather cylinder at 28 days.
6. Test final cylinder at 45 days, if 28 day tests fail Specifications.
7. Dispose remaining cylinders when testing is not required.

I. Core Compressive Strength Testing:
   1. Sampling and Testing Procedures: ASTM C42/C42M.
   2. Test Acceptance: In accordance with ACI 318.
   3. Drill three cores for each failed strength test from concrete represented by failed strength test.

J. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.7 PATCHING
   A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
   B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.
   C. Patch imperfections as directed by Engineer in accordance with ACI 318.

3.8 DEFECTIVE CONCRETE
   A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
   B. Repair or replacement of defective concrete will be determined by Engineer.
   C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION
This page intentionally left blank.
PART I GENERAL

1.1 SUMMARY

A. Section includes shop fabricated metal items.
   1. Bolts, nuts, and washers.
   2. Steel stairs and railings.
   3. Steel floor gratings.

1.2 REFERENCES

A. Aluminum Association:
   1. AA DAF-45 - Designation System for Aluminum Finishes.

B. American Architectural Manufacturers Association:
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

C. American National Standards Institute:
   1. ANSI A14.3 - Ladders - Fixed - Safety Requirements.

D. ASTM International:


14. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

15. ASTM A510/A510M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.


20. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

22. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.


25. ASTM B177 - Standard Guide for Chromium Electroplating on Steel for Engineering Use.


32. ASTM F844 - Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

33. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

E. American Welding Society:

1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

2. AWS D1.1 - Structural Welding Code - Steel.

3. AWS D1.6 - Structural Welding Code - Stainless Steel.

1.3 SUBMITTALS

A. Product Data: Submit data for bolts, stairs, railings, and gratings. Include span and deflection tables for gratings.

B. Shop Drawings: Submit shop drawings for stairs, railings, and gratings.
1. Where applicable indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, accessories, component supports, openings, and tolerances.

2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer’s Certificate: Certify that products meet specified requirements.

D. Welders’ Certificate: Certify welders and welding procedures employed on the Work, verifying AWS qualification within previous 12 months.

1.4 DELIVERY, STORAGE, AND HANDLING

A. As specified in Section 01 60 00 - Product Requirements.

B. Accept metal fabrications on-site in labeled shipments. Inspect for damage.

1.5 FIELD MEASUREMENTS

A. Verify all field measurements are as indicated on Drawings.

PART 2 PRODUCTS

2.1 BOLTS, NUTS, and WASHERS.


B. Nuts: ASTM A563, heavy-hex type.


D. Finish for Bolts, Nuts, and Washers: Galvanized or Stainless Steel.

2.2 STEEL STAIRS AND RAILINGS

A. Fabricate stair assembly to support uniform live load of 200 lb./sq. ft. with deflection of stringer or landing framing not to exceed 1/240 of span.

B. Railing assembly, walls, rails and attachments to resist lateral force of 100 lb. at any point without damage or permanent set. Test according to ASTM E935.

C. Finish for Stairs and Railings: Galvanized.

D. Touchup Primer for Galvanized Surfaces: ASTM A780.

2.3 STEEL FLOOR GRATINGS

A. Design Live (Pedestrian) Load: Uniform load of 200 lb./sq. ft. minimum; concentrated load of force 400 lb.
B. Maximum Allowable Deflection under Live Load: 1/240 of span.
C. Maximum Spacing between Bars: To restrict pedestrian shoe heels.
D. Finish: Galvanized.

2.4 FABRICATION
A. Fit and shop assemble items in largest practical sections, for delivery to Site.
B. Fabricate items with joints tightly fitted and secured.
C. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.5 FACTORY APPLIED FINISHES - STEEL
A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
B. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.
D. Galvanizing for Fasteners, Connectors, and Anchors:
   1. Hot-Dipped Galvanizing: ASTM A153/A153M.
   2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

PART 3 EXECUTION
3.1 EXAMINATION
A. Refer to Section 01 30 00 - Administrative Requirements.
B. Verify field conditions are acceptable and are ready to receive Work.

3.2 INSTALLATION
A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
C. Field weld components indicated on Drawings.
D. Perform field welding in accordance with AWS D1.1.
E. Obtain approval of Engineer prior to Site cutting or making adjustments not scheduled.
F. After erection, touch up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

3.3 ERECTION TOLERANCES

A. As specified in Section 01 40 00 under Part 1.3 - Tolerances.

3.4 FIELD QUALITY CONTROL

A. Welding: Inspect welds in accordance with AWS D1.1.

END OF SECTION
SECTION 05 53 00
PREFABRICATED TRUSS BRIDGE

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
1. Prefabricated Truss Bridge.

B. Related Requirements:
1. Section 03 10 00 - Concrete Forms and Accessories.
2. Section 03 20 00 - Concrete Reinforcement.
3. Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCE STANDARDS
A. ASTM International:
2. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.


C. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. American Institute of Timber Construction.

E. American Wood Protection Association.

1.3 COORDINATION
A. Section 01 30 00 - Administrative Requirements.
B. Coordinate Work of this Section with placement of abutments, frames, tolerances for placed frames and openings.

1.4 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
B. Product Data: Submit data for anchor bolts, fasteners, railings, and wood decking. Submit span and deflection tables.
C. Shop Drawings: Manufacturer shop drawings indicating but not limited to details, top chords, bottom chords, verticals, diagonals, component supports, and tolerances. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
E. Welders' Certificates: Certify welders and welding procedures employed on the Work, verifying AWS qualification within previous 12 months.

1.5 QUALIFICATIONS
A. Welders and Welding Procedures: AWS D.1 qualified within previous 12 months for employed weld types.

1.6 EXISTING CONDITIONS
A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Contech.
B. Excel Bridge.
C. Pioneer Bridges.
D. Big R Bridge.
E. Approved Equivalent.

2.2 PERFORMANCE AND DESIGN CRITERIA
A. Dead Load: Final Weight of Bridge.
B. Uniform Live Load: 85 psf.
C. Vehicular Live Load: 10,000 lbs.
D. Vertical Deflection:
   1. The vertical deflection of the main trusses due to service pedestrian live load shall not exceed 1/400 of the span.

E. Horizontal Deflection:
   1. The horizontal deflection of the structure due to lateral wind loads shall not exceed 1/500 of the span under an 85 MPH (25 PSF) wind load.

2.3 STEEL MEMBERS

A. Unpainted Weathering Steel:
   1. Bridges shall be fabricated from high strength, low alloy, atmospheric corrosion resistant ASTM A847 cold-formed welded square and rectangular tubing and/or ASTM A588, or ASTM A242, ASTM A606 plate and structural steel shapes (\(F_y = 50,000\) psi). The minimum corrosion index of atmospheric corrosion resistant steel, as determined in accordance with ASTM G101, shall be 6.0.

2.4 DECKING

A. Coastal Douglas Fir:
   1. Structural grade, surfaced 4 sides, minimum 70% free of heart center, light to no wane, precision end trimmed, incised and pressured treated to 0.40/refusal ACQ (Osmose Naturewood), stickered for air dry after treating. \(F_b = 1,400\) psi (minimum).

B. Southern Yellow Pine:
   1. Southern Yellow Pine Lumber #1 common, surfaced four sides (s4s), trimmed to length, treated with CCA .60 retention, bending strength of 1600. Product to be graded for low to no wane. \(F_b = 1,300\) psi (minimum).

2.5 FASTENERS

A. Anchor Bolts, Washers, and Nuts:
   1. Meet or exceed manufacturer specification.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements.

B. Verify that opening sizes and dimensional tolerances are acceptable.

C. Verify that supports and anchors are correctly positioned.
3.2 INSTALLATION

A. Form and install concrete abutments in correct position, plumb and level. Backfill and compact around abutments.

B. Follow manufacturer detailed written instructions in the proper lifting and splicing (if required) procedures of the bridge.

C. Place bridge in correct position, plumb and level on the formed abutments per manufacturers detailed written instructions. Do not place bridge on the abutments until adequate strength has been achieved.

D. Anchor bolts are not to be cast in place with the abutment concrete. They are to be drilled and installed after the bridge is set in position, so as to place the bolts in the correct location, using the bridge bearing plate as the template.

E. Secure to prevent movement per manufacturers detailed written instructions.

3.3 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

END OF SECTION
SECTION 31 10 00
CLEARING, GRUBBING, AND STRIPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for clearing, grubbing, and stripping designated areas of work. This includes, but is not limited to:
   1. Borrow areas.
   2. Staging areas.
   3. Stockpile areas.
   4. Disposal areas.

1.2 SUBMITTALS

A. Contractor shall submit a plan that indicates the location, limits, and methods to be used for clearing, grubbing, and stripping.

B. Plan shall be submitted to Engineer for review no later than five days before beginning the Work.

1.3 REQUIREMENTS

A. This work shall also include the preservation from injury or defacement of all trees, shrubs, vegetation, and existing features designated to remain.

B. Areas, facilities, equipment, and vegetation outside of Contractor work areas affected by the Contractor work shall be restored to a condition as good as existed before the work began.

1.4 DEFINITIONS

A. Whenever the following terms are used in this section, the intent and meaning shall be interpreted as stated below:

   1. Clearing: Clearing shall consist of cutting, removing, and disposing of all objectionable material from the ground surface, such as trash, trees, brush, logs, stumps, weeds, grasses, and obstructions of any kind, natural or artificial. Trees, shrubs, and vegetation designated to remain shall not be removed or disturbed. Work shall be performed in such a manner as to remove all evidence of the objects’ presence from the surface. Clearing shall also include the removal and disposal of trash piles and rubbish from the work site created prior to and during the duration of the work.
2. **Grubbing:** Grubbing shall consist of cutting, removing, and disposing of all objectionable material found below the ground surface, such as trash, trees, brush, logs, stumps, roots, weeds, grasses, and obstructions of any kind, natural or artificial. Trees and stumps requiring removal shall be removed completely from the ground.

3. **Stripping:** Stripping shall consist of removing the top layer of soil after clearing and grubbing have been completed.

### 1.1 QUALITY ASSURANCE

A. Conform to applicable code for environmental requirements and disposal of debris.

B. Perform Work in accordance with Emery County standards.

C. Conform to applicable codes and County requirements for debris disposal, burning debris onsite, and use of herbicides.

### PART 2 PRODUCTS

Not used.

### PART 3 EXECUTION

#### 3.1 GENERAL

A. Verify existing plant life designated to remain is tagged or identified.

B. Clearing, grubbing, and stripping operations shall be conducted with minimum interference with roads and adjacent facilities. Roads and facilities shall not be constructed without approval from the Engineer and other authorities having jurisdiction.

C. Contractor shall establish all stockpile areas within the work limits. Contractor shall be responsible for the accuracy, maintenance, and observation of all lines and elevations during work within the work limits.

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

#### 3.2 CLEARING, GRUBBING, AND STRIPPING

A. Clearing, grubbing, and stripping shall be completed prior to the start of earthwork.

B. All borrow areas, stockpile areas, staging areas, and other earthwork areas shall be cleared and grubbed except as otherwise specified herein. All areas will require the Engineer’s approval prior to the start of work.

C. Remove trees and shrubs within designated areas. Remove stumps and root system so that no woody vegetation remains in the soils, to a minimum depth of 24 inches.
D. After clearing and grubbing is completed, stripping shall be performed in a manner to prevent intermingling stripped materials with underlying soils.

E. Strip all designated staging and stockpile areas to a minimum depth of 4 inches.

F. Final stripping depths shall be determined in the field to verify that organics have been sufficiently removed from materials that will be stockpiled for re-use in embankment materials.

G. Stripped materials shall be stockpiled for later re-use during reclamation of borrow areas.

H. Stripped materials shall be stockpiled within the defined borrow, staging, stockpile, and disposal area perimeters indicated on the Drawings.

I. Stripping stockpiles shall be constructed to allow for free drainage of surface water in a manner that minimizes erosion.

3.3 DISPOSAL OF CLEARING AND GRUBBING DEBRIS

A. Dispose of clearing and grubbing debris in accordance with local regulations.

END OF SECTION
This page is intentionally left blank.
SECTION 31 23 16
EXCAVATION AND TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Materials and procedures for specified excavation and trenching work for the Project. It is anticipated that most materials excavated during work covered by this section will be reused in construction of the berms for the embankment. Contractor should exercise care to assure that materials identified for reuse are not mixed with other materials during excavation, stockpiling, and moisture conditioning processes.

1. Excavation of existing dam materials.
2. Excavation of dam foundation materials.
3. Excavation of trenches for utilities.

1.2 REFERENCES

A. 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. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of the Invitation to Bid shall be used.

B. American Society for Testing and Materials (ASTM):

1. ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
8. ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).


1.3 SUBMITTALS

A. Contractor shall submit an excavation plan for the removal, stockpiling and processing of materials comprising the existing dam and reconstructed dam foundation area, as shown on Construction Drawings. The plan shall address the following issues:

1. Method of excavation, material mixing and material handling, including proposed equipment and excavation rates.

2. Sequence of excavation.

3. Proposed haul roads and traffic safety plan.

4. Proposed stockpile areas and area designated to receive, store and process material prior to reuse in the reconstruction process.

5. Method and rate of moisture conditioning, including both drying and wetting.

6. Drainage and erosion control.

7. Proposed foundation treatment and preparation procedures and plans.

1.4 DEFINITIONS

A. Soil Excavation: Excavation and stockpiling of materials from the existing embankment or borrow area, including soils and riprap.

B. Utility: Any buried pipe, manhole, vault, or conduit.

PART 2 PRODUCTS

2.1 EXCAVATED MATERIALS TO BE REUSED FOR DAM RECONSTRUCTION

A. Existing Embankment Materials

1. Existing embankment and foundation materials shall be excavated as generally shown on the Drawings, and transported to the Contractor selected stockpile area. Materials shall consist of materials to be screened or processed for reuse to meet material specifications as described in Section 31 25 00. Any processing/mixing required to meet Section 31 25 00 requirements shall be performed in the stockpile area prior to being transported to the construction site for use in reconstructing portions of the dam.

2. Additional materials may be obtained from materials in the borrow area that meet specification requirements.
B. Existing Riprap Materials

1. Existing riprap materials shall be excavated from the downstream face of the existing dam and transported to the Contractor selected stockpile area. Materials shall consist of cobble and boulders that meet the grain-size distribution outlined in Section 31 25 00 for riprap materials. Any processing/mixing required to meet Section 31 25 00 requirements shall be performed in the stockpile area prior to being transported to the construction site for use in reconstructing portions of the dam.

PART 3 EXECUTION

3.1 GENERAL

A. This section covers materials excavation, stockpiling and moisture processing excavated materials for subsequent dam reconstruction and foundation treatment.

B. Existing riprap on the existing dam face shall be excavated and stockpiled for reconstruction of the upstream and downstream riprap surfaces. Stockpiled riprap be free of existing embankment soils. Contractor should exercise care to ensure that riprap materials are not mixed with other materials during the excavation process.

C. Existing embankment materials, and foundation area materials shall be excavated, stockpiled, and moisture conditioned for reuse during reconstruction of the embankment and foundation.

D. Contractor shall conduct its operations so as to facilitate drying wet materials intended for reuse in the dam embankment. Additional pre-reuse mechanical treatment (i.e. disk, harrow, plow, etc.) may be necessary to bring each class of material into moisture content compliance as outlined in Section 31 25 00.

E. As part of the work for performing required excavations, Contractor shall remove any loose materials that may endanger workers or structures.

F. All excavation shall be performed without damage to the foundation outside the limits of excavation shown on the drawings, or as otherwise directed by Engineer. All material outside the limits of excavation which is over-excavated due to damage from excavation shall be removed and replaced with backfill concrete or appropriate embankment material, as directed by Engineer, at no cost to Owner.

G. Grading tolerance of embankment excavation shall be plus or minus 1-foot with respect to the finished grade elevations indicated on the Drawings.

H. If groundwater begins flowing into any excavation or trench areas, take the following steps:

1. Stop excavation immediately.

2. Backfill area with native soils to stop flowing groundwater.
3. Inform Engineer of flowing water in excavation.
4. Install shallow piezometers to monitor groundwater levels.
5. Recomence excavation after groundwater level has dropped below final excavation depth.

3.2 METHOD OF EXCAVATION

A. Contractor shall determine equipment to be utilized for excavating, loading, hauling, and moisture conditioning materials so that no loose materials remain on the excavated slope.

B. Excavation methods shall minimize disturbance of foundation surfaces.

C. For soil excavation, the method of excavation shall maximize the mixing of various layers comprising the same class of materials. Oversized materials shall be removed from excavated material to meet the zone requirements of reused materials.

D. Any foundation materials removal by the Contractor beyond lines and grades shown on the Drawings shall be replaced, as approved by the Engineer, and at no cost to the Owner.

3.3 EXCAVATION LIMITS

A. Excavation lines shown on the Drawings are based on geotechnical conditions estimated from test holes, test pits, photographic records, and written and verbal histories regarding original embankment construction. Engineer may require more or less excavation, depending upon conditions actually observed in the field. Engineer will conduct field tests to evaluate when foundation excavation shall be terminated. Contractor shall provide equipment and personnel to assist with field testing of foundation materials.

B. Excavation slopes shall be finished to the lines and grades shown on the Drawings.

C. All debris, overhanging material and loose material shall be removed. When completed, the average plane shall be in accordance with the slopes shown on Drawings and at no point shall vary more than one foot measured normal to the slope.

D. Engineer will observe all cut slopes during construction.

E. The cut slope shall, at no time, be over-excavated beyond the lines and grades shown on the Drawings and allowable tolerances, unless otherwise required by Engineer.

F. The surface of exposed cut slopes shall be maintained in a stable condition.

3.4 TRENCHING

A. Cut trenches to width indicated on Drawings. Remove water or materials that interfere with Work.

B. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.
C. When subsurface materials at bottom of trench are loose or soft, notify Engineer, and request instructions.

D. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type S1 or S2, and compact to density equal to or greater than requirements for subsequent backfill material.

E. Trim excavation. Remove loose matter.

F. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

G. Stockpile excavated material in areas designated on Drawings.

3.5 STOCKPILING

A. Contractor shall establish all stockpile areas within the work limits. Contractor shall be responsible for the accuracy, maintenance, and observation of all lines and elevations during work within the work limits.

B. Excess materials from stockpiles shall be evenly spread so that the stockpile areas have a similar appearance to pre-construction site conditions. Final slopes of excess materials shall have a slope of 5:1 or flatter.

3.6 TOE DRAIN TRENCH PREPARATION

A. All areas excavated for the purpose of providing a foundation for placement and compaction of new toe drain materials shall be cleaned of loose materials and then compacted to verify that there are not any loose or soft materials in the bottom of the toe drain trench.

END OF SECTION
This page is intentionally left blank.
SECTION 31 23 19
DEWATERING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Dewatering system.
   2. Surface water control system.
   3. Monitoring wells.
   4. System operation and maintenance.
   5. Water disposal.

1.2 REFERENCES

A. ASTM International:

1.3 DEFINITIONS

A. Dewatering includes the following:
   1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations, and trenches.
   2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations and trenches.
   3. Disposing of removed water.

B. Surface Water Control: Removal of surface water within open excavations and the prevention of surface water, such as, but not limited to storm drainage, from entering excavations and trenches.

1.4 SYSTEM DESCRIPTION

A. Provide dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.

B. Use existing piezometers or provide piezometers and monitoring equipment to obtain meaningful observations of conditions affecting excavation.
1. Install piezometers to observe ground water conditions below excavation limits.

2. Excavation is to occur only when the ground water surface is demonstrated to be more than 3 feet below prevailing excavation surface in soil materials.

1.5 PERFORMANCE REQUIREMENTS
A. Contractor shall design surface water control systems to:
   1. Collect and remove surface water and seepage entering excavation.
   2. Prevent storm water from entering excavations.

1.6 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
B. Section 01 70 00 - Execution Requirements: Requirements for submittals.
C. Project Record Documents: Record actual locations and depths of capped wells and piping abandoned in place where approved by Engineer.

1.7 QUALITY ASSURANCE
A. Obtain permit from the state of Utah under National Pollutant Discharge Elimination System (UPDES), for storm water discharge from construction sites.
B. Perform Work in accordance with Utah State and Emery County standards.

1.8 COORDINATION
A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
B. Coordinate work to permit construction operations to be completed on dry stable substrate.

PART 2 PRODUCTS

2.1 DEWATERING EQUIPMENT
A. Select dewatering equipment to meet specified performance requirements.

2.2 MONITORING EQUIPMENT
A. Piezometers: To monitor ground water elevation.

2.3 ACCESSORIES
A. Valves and Fittings: Furnish valves and fittings to isolate each well from header pipe and to prevent loss of pump prime.
B. Filter Sand: ASTM C33; Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; graded to suit well screen.

C. Grout: Mixture of portland cement and bentonite clay or sand suitable for sealing abandoned wells and piping.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Call Local Utility Line Information service not less than three working days before performing Work.

   1. Request underground utilities to be located and marked within and surrounding construction areas.

3.2 PREPARATION

A. Protect existing adjacent buildings, structures, and improvements from damage caused by dewatering operations.

3.3 DEWATERING SYSTEM

A. Install dewatering system as necessary to remove groundwater from work areas.

3.4 SURFACE WATER CONTROL SYSTEM

A. Provide ditches, berms, and other devices to divert and drain surface water from excavation.

B. Divert surface water and seepage water within excavation areas into sumps and discharge water in accordance with requirements of agencies having jurisdiction.

C. Control and remove unanticipated water seepage into excavation.

3.5 SYSTEM OPERATION AND MAINTENANCE

A. Conduct daily observation of dewatering system and monitoring system. Make required repairs and perform scheduled maintenance.

B. Modify dewatering and surface water control systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.

3.6 WATER DISPOSAL

A. Discharge water in accordance with approved UPDES discharge permit.
3.7 SYSTEM REMOVAL

A. Fill abandoned wells and piezometers not included in the permanent monitoring system with grout.

B. Fill abandoned piping with grout.

C. Repair damage caused by dewatering and surface water control systems or resulting from failure of systems to protect property.

3.8 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

END OF SECTION
SECTION 31 24 00
BORROW AREAS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for excavation and operation of borrow areas.

B. Procedures for hauling and delivery of off-site borrow materials.

1.2 REFERENCES

A. 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. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of the Invitation to Bid shall be used.

B. American Society for Testing and Materials (ASTM):

1. ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.


8. ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.3 SUBMITTALS

A. Contractor shall submit a borrow area development plan for borrow areas. The plan shall address the following issues:

1. Proposed stockpile areas.
2. Proposed disposal areas.
3. Method and rate of moisture conditioning, including drying and wetting.
4. Method of excavation and material handling, including proposed equipment and excavation rates of excavation.
5. Method of processing and preparing materials, including proposed equipment and processing rates.
6. Sequence of excavation.
7. Proposed haul roads and traffic safety plan.
8. Drainage, dewatering, and erosion control.
9. Proposed final layouts showing the general shapes and configuration after excavation. The final layouts shall include slope inclinations.

1.4 DEFINITIONS

A. Borrow Areas: The areas designated on the Drawings that are to be used as borrow sources for embankment materials to supplement the excavated materials that will be reused.

PART 2 PRODUCTS

2.1 MATERIAL SOURCES

A. Zone 1 (Core) and Zone 2 (Shell) Materials

1. Materials shall be obtained from the borrow area as shown on the Drawings and shall consist of gravel, sand, and silt/clay that meet the grain-size distribution characteristics outlined in Section 31 25 00. Any processing/mixing required to meet Section 31 25 00 requirements shall be performed in the borrow area or stockpile area prior to being transported to the construction site for use in reconstructing portions of the dam.

B. Zone 3 (Upstream Riprap) and Zone 4 (Downstream Riprap) Materials

1. A large portion of the riprap materials is expected to come from processing the downstream slope, excavation of the foundation, and processing additional Zone 1 and Zone 2 materials. Supplemental riprap materials shall be obtained from the borrow area as shown on the Drawings and shall consist of cobble and boulders.
that meet the grain-size distribution outlined in Section 31 25 00. Any processing/mixing required to meet Section 31 25 00 requirements shall be performed in the borrow area or stockpile area prior to being transported to the construction site for use in reconstructing portions of the dam.

C. Zone 3 (Filter Sand), Zone 4 (Drain Gravel), and Zone 5 (Transition Gravel)
   1. These materials were not identified in the borrow areas. Materials will need to be identified, supplied, and delivered by the Contractor from off-site locations.

PART 3 EXECUTION

3.1 GENERAL

A. Contractor shall remove debris of all types within the borrow areas.

B. Borrow areas shall be stripped and prepared as specified in Section 31 10 00.

C. All excavation work shall be done in the dry. Contractor shall, if necessary, dewater borrow excavations in order to obtain borrow materials. Such work shall be considered incidental to borrow operations.

D. Testing
   1. Engineer will observe, sample, and perform field and laboratory tests on materials from the borrow areas for quality assurance (QA).
   2. Contractor shall provide access for Engineer to areas where observation, sampling, and testing are to be performed and shall schedule construction operations to avoid interference with the sampling and testing operations.
   3. Contractor shall perform quality control testing as described in Section 01 40 00. Quality assurance testing by Engineer shall not relieve Contractor of its sole responsibility to perform the work in conformance with the provisions of this section.

E. Borrow Area Demobilization and Clean Up:
   1. When borrow area operations are completed, Contractor shall remove all equipment, lighting, temporary fencing, and water removal and drainage systems.
   2. All excavation slopes shall be stabilized.
   3. Stripped materials shall be used to reclaim the borrow area.

F. Disposal of Excess and Unsuitable Materials:
   1. Excess or unsuitable borrow materials from borrow and processing operations shall be disposed at locations within borrow area limits of work as defined on the Drawings, in the staging storage and stockpile areas as defined on the Drawings or as approved by Engineer. All biodegradable waste shall be buried with soil at...
a minimum depth of 5 feet. All other debris shall be hauled to off-site disposal areas and disposed of by Contractor, at Contractor’s expense. Contractor shall locate, make arrangements for, and obtain necessary permits for any off-site disposal of these materials.

2. No material shall be disposed of, either temporarily or permanently on privately or publicly owned property, unless Contractor has obtained permission from the owner or agency concerned and has approval by Engineer. Contractor shall furnish written evidence to Engineer that such consent has been obtained.

3. Any excess soil materials may be disposed of at approved locations within the project limits. Materials shall be placed in a manner such that they will not interfere with work or haul roads. Materials shall be graded to maintain the original drainage patterns and so that they have a maximum slope of 5:1 (H:V). Contractor shall coordinate proposed disposal locations with Engineer.

G. Materials from off-site borrow areas shall be hauled to the point of use, or designated staging area, using approved existing roads and haul routes.

3.2 EMBANKMENT BORROW MATERIALS

A. Adjustments in water content of embankment materials shall be made in stockpiles and borrow areas to bring the material to within one percentage point of the range of compaction water content as set forth for that class of material in Section 31 25 00.

B. Excavation of Borrow Materials:
   1. Contractor shall utilize such means and methods as will effect excavation of materials from the borrow areas with minimum waste.
   2. Materials shall be processed, if required, to meet gradation requirements of each class of materials.
   3. Contractor shall excavate materials in the borrow areas within the perimeter lines shown on the drawings.

C. Temporary and Permanent Slopes:
   1. Contractor shall, within the borrow areas, construct permanent cut slopes no steeper than 3:1 (H:V). Contractor shall maintain slopes during the duration of the Contract.
   2. Contractor shall conduct operations to prevent rock or soil from falling into any work areas.
   3. Configuration of the borrow areas shown on the Drawings is the maximum extent to which the borrow area may be developed. Borrow areas of lesser size and extent may be developed by the Contractor to satisfy Contractor’s material requirements.
4. Contractor shall excavate borrow areas in a manner that will result in an arrangement at the completion of the borrow operation that is acceptable to Engineer.

5. Contractor shall use the borrow areas in a uniform fashion, both horizontally and vertically, so that the final excavated slopes are uniform and sloped to promote drainage without curves, potholes, low areas, or pits where water could collect.

6. Transitions within excavated areas and between excavated and unexcavated areas shall be gradual and unobtrusive.

END OF SECTION
This page is intentionally left blank.
PART 1 GENERAL

1.1 SECTION INCLUDES

A. The work necessary for the earthwork including, but not limited to the excavation, fill and backfill, and foundation and subgrade preparation for embankments, trenches and structures. Provide all labor, tools, material, and equipment required to accomplish the work shown on the construction drawings.

B. Materials and procedures for embankment construction work for the project. Work includes:

1. Zone 1 (Core)
2. Zone 2 (Shell)
3. Zone 3 (Upstream Riprap)
4. Zone 4 (Downstream Riprap)
5. Zone 5 (Filter Sand)
6. Zone 6 (Drain Gravel)
7. Zone 7 (Transition Gravel)
8. Zone 8 (Berm)

1.2 REFERENCES

A. 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. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition available on the date of the Invitation to Bid shall be used.

B. American Society for Testing and Materials (ASTM):

1. ASTM C33, Standard Specification for Concrete Aggregates.
2. ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.


9. ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).

10. ASTM D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.


14. ASTM D4253, Standard Test Methods for Maximum Index Density and Unity Weight of Soils Using a Vibratory Table.


18. ASTM D4718, Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.


1.3 SUBMITTALS

A. Contractor shall submit a detailed work plan describing the proposed methods and sequencing of dam embankment construction. After acceptance of the work plan, changes shall not be made to the work plan without prior written acceptance of the Engineer.

B. Contractor shall include in the work plan a list of equipment proposed for use in all operations of construction of each embankment zone, including, but not limited to, equipment for loading, hauling, spreading, moisture conditioning, diskng, scarifying, and compacting. For the compaction equipment proposed, sufficient data shall be furnished for verification of the requirements specified in this section.

C. The work plan shall include a detailed description of interrelationships between work operations, such as moisture conditioning, placement of embankment materials, preparation for and work on internal drain systems, development of borrow areas, etc.

D. The work plan shall include, but not be limited to, the equipment types and number of pieces of each type, number and length of shifts, and production rates and progress.

E. The work plan shall include a diagram showing all proposed haul routes and access ramps from borrow areas and stockpile areas to, from, and across the dam embankment.

1.4 DEFINITIONS

A. Embankment: Includes all parts of the dam both above and below foundation levels.

B. Lift: An individual layer of embankment materials placed on the prepared embankment surface (or prepared foundation surface in the case of the first lift) at the specified thickness and compacted in the specified manner or to the specified end product before placing the next lift.

C. Lift Thickness: The thickness that embankment materials are placed before being compacted with the specified compaction effort.

D. Maximum Dry Unit Weight: The maximum dry unit weight in pounds per cubic foot, to be obtained in accordance with ASTM D698.

E. Optimum Water/Moisture Content: The water content of material corresponding to its maximum dry unit weight when compacted in accordance with ASTM D698.

F. Compaction Water Content: The water content of a given material at the time it is compacted.

G. Relative Compaction (or Percent Compaction): The ratio, expressed as a percentage, of the dry unit weight obtained in the fill after the specified compaction has been performed to the maximum dry unit weight.
H. Maximum Index Density: Maximum density in pounds per cubic foot obtained using procedures outlined in ASTM D 4253.

I. Minimum Index Density: Minimum density in pounds per cubic foot obtained using procedures outlined in ASTM D 4254.

J. Relative Density: Expresses the degree of compactness of a cohesionless soil with respect to the loosest (minimum index density) and densest (maximum index density) condition as defined by standard laboratory procedures.

K. Fines Content: The percent by dry weight of particles that pass the No. 200 U.S. Standard Sieve.

L. Coverage: The process of operating compaction equipment over the fill surface such that the primary compaction element(s) comes in contact with the entire lift surface. When using a single-drum roller (towed or self-propelled), one pass of the equipment is considered to be one coverage of the area contacted. For equipment utilizing tandem drums and which cover the same path in a single pass of equipment, such pass will be considered to be two coverages of the area contacted.

1.5 FIELD TESTING

A. Engineer will observe, sample, and perform quality assurance field and laboratory tests on placed materials on a regular basis.

B. Contractor shall provide access for Engineer to areas where observation, sampling, and testing are to be performed and shall schedule construction operations to avoid interference with the sampling and testing operations.

C. Contractor shall perform quality control testing as described in Section 01 40 00 and as described in the specifications below. Quality assurance testing by Engineer shall not relieve Contractor of responsibilities to perform the work in conformance with the provisions of this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. General:

1. Gradations specified herein and in the drawings apply to the material after placing, spreading, moisture conditioning, and compacting. Contractor shall determine the gradation that the material must have before transportation to the embankment to ensure that the specified gradation is obtained in place in the embankment after placing, spreading, moisture conditioning and compacting. Materials represented by samples that do not meet the specified requirements will be rejected. Contractor shall remove all rejected materials that have been placed in stockpiles or in the embankment, and replace them with material meeting the specified requirements for the zone, at no cost to Owner.
2. Contractor shall transport, handle, and stockpile materials to avoid segregation and contamination. Materials that are segregated or contaminated, either in stockpile or in-place in the embankment, will be rejected by Engineer.

3. Adjustments in water content of embankment materials shall be made in the borrow areas and stockpiles, as specified in Sections 31 23 16 and 31 24 00.

4. All embankment materials shall be free of wood, trash, debris, snow, ice, organic, contaminated, or deleterious material.

5. Materials placed within 24 inches of concrete structures or bedrock surfaces shall meet the following specifications or the specifications for the corresponding zone materials, whichever is more stringent:
   a. Maximum size of three (3) inches.
   b. Moisture content limits shall increase by one (1) percent.

B. Zone 1 (Core) and Zone 2 (Shell)

1. Materials shall consist of gravel, sand, and clay/silt from excavations of the existing dam and borrow areas that meet the gradations as specified in the G Set of the Drawings.

2. Compliance with gradation requirements shall be determined from samples of the material taken from the embankment after placing, spreading, moisture conditioning, and compacting.

3. Engineer will make measurements of the gradation in accordance with the provisions of ASTM C117 and ASTM C136.

C. Zone 3 (Upstream Riprap) and Zone 4 (Downstream Riprap)

1. Materials shall consist of riprap excavated from the downstream slope of the existing embankment or foundation, riprap processed from screening efforts to produce Zone 1 and Zone 2 materials, or from the borrow area that meet the following requirements:

2. Materials shall be well graded, meaning they shall have a uniform distribution of particle sizes, with no gap-grading or skip-grading.

3. Materials shall meet the gradations as specified in the G Set of the Drawings:
   Note: Size is measured at the rock’s narrowest section.

4. Neither the breadth nor thickness of any piece of rock shall be less than one-third its largest length.

5. Rounded boulders and cobbles shall not be used.

D. Zone 5 (Filter Sand), Zone 6 (Drain Gravel), and Zone 7 (Transition Gravel)

1. Materials shall meet the following requirements.
a. Consist of well-graded (uniform distribution of particle sizes, with no gap-grading or skip-grading) sand and gravel-sized materials, with an even distribution of particle sizes that meet the gradations as specified in the G Set of the Drawings.

b. Specific Gravity: as specified in the G Set of the Drawings.


d. Soundness: as specified in the G Set of the Drawings.

e. Contractor shall submit documented laboratory test results to verify that proposed materials meet all specifications.

f. Contractor must receive, in writing, approval of the proposed filter and drain sources from Engineer, prior to placing any materials.

2. Compliance with gradation requirements shall be determined from samples of the material taken from the embankment after placing, spreading, moisture conditioning, and compacting.

3. Engineer will make measurements of the gradation in accordance with the provisions of ASTM C117 and ASTM C136.

E. Zone 8 (Berm)

1. Materials shall consist of general backfill materials from stockpiles or borrow areas that meet the gradations as specified in the G Set of the Drawings.

2. Compliance with gradation requirements shall be determined from samples of the material taken from the embankment after placing, spreading, moisture conditioning, and compacting.

3. Engineer will make measurements of the gradation of materials in accordance with the provisions of ASTM C117 and ASTM C136.

2.2 COMPACTION, DISKING, AND TILLING EQUIPMENT

A. Compaction, disking, and tilling equipment shall be maintained in good working condition at all times.

B. Compaction Equipment:

1. Compaction equipment for coarse-grained materials shall meet the following requirements:
   a. Equipment shall be a Caterpillar CS64 vibratory soil compactor, or equivalent.
   b. Equipment shall be operated at manufacturer’s recommended speeds.

2. Compaction equipment for fine-grained materials shall meet the following requirements:
   a. Equipment shall be Caterpillar CP64 vibratory soil compactor with pads, or equivalent.
   b. Segmented pads on rollers shall have minimum depth of 5 inches.
   c. Equipment shall be operated at manufacturer’s recommended speeds.
3. In restricted spaces where other compactors specified in this section do not operate effectively, hand-held power tampers, power tampers on wheels, walk-behind rollers, vibrating plates, or other compaction equipment must be submitted for acceptance by Engineer.

C. Disking Equipment:

1. Disking equipment shall be used to break up, blend, or moisture condition materials on the embankment fill.

2. Disking equipment shall have a minimum of two gangs hooked together in tandem and shall be sized to penetrate a minimum fill depth of eight inches.

3. Disk blades shall be notched, spaced at approximately 16 inches, and have a minimum diameter of 36 inches.

4. Disking equipment shall have self-cleaning scrapers to prevent the accumulation of materials between and on the disks.

5. Disk serrations shall break up and blend the materials.

6. In no case shall the depth of the disk serrations be allowed to wear down to less than 50 percent of their depth when new.

7. Disking equipment shall be such that adjustments can be made in the depth of penetration and the angle of cut from within the towing vehicle without the operator dismounting from the vehicle.

D. Tilling Equipment:

1. Tilling equipment shall be used to break up, blend, or moisture condition materials on the embankment fill.

2. Tilling equipment shall be sized to penetrate a minimum fill depth of eight inches.

3. Tiller tines shall be evenly spaced and set to provide overlapping coverage of the area tilled.

4. In no case shall tines be allowed to wear down to less than 50 percent of their thickness/width when new.

5. Tilling equipment shall be such that adjustments can be made in the depth of penetration from within the vehicle without the operator dismounting the vehicle.
PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Fill Elevations: New embankment fill zones shall be maintained at approximately the same level, both parallel and perpendicular to the dam embankment axis, except as indicated below:

1. Temporary construction slopes required by normal sequences of construction activities may be permitted. In each case, Contractor shall submit a proposed plan for the temporary slope, which shall include the following:
   a. Proposed location and configuration.
   b. Maximum height.
   c. Contractor’s schedule for placing adjacent embankment.
   d. Proposed procedures for bonding new embankment to old embankment.

2. Contractor’s proposed plan shall incorporate the following requirements:
   a. Temporary slopes shall be oriented either substantially transverse to the dam axis (within 30 degrees of being perpendicular to the dam axis) or substantially longitudinal (within ten degrees of being parallel to the dam axis).
   b. Temporary slopes, when allowed, shall not be steeper than 4H:1V for joints that run parallel to the dam axis and 10H:1V for joints that run perpendicular to the dam axis.

3. Engineer will accept, reject, or modify the plan for resubmittal, and, in the case it is rejected, Contractor shall have no further recourse regarding this proposal.

4. Any additional work required to construct temporary slopes or to bond new embankment to old embankment shall be performed at no cost to Owner.

B. Tolerance: The embankment fill shall be placed and compacted in horizontal lifts to the lines and grades shown on the Drawings within the tolerances specified below:

1. The following horizontal tolerances shall apply to the dimensions shown on the drawings:

<table>
<thead>
<tr>
<th>Toward Baseline</th>
<th>Away from Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Slopes</td>
<td>1.0 foot</td>
</tr>
</tbody>
</table>

   For the purposes of determining compliance with the above tolerances, measurements shall be made over a maximum length of 25 feet along the baseline.

2. The minimum widths or thicknesses of the following zones shall not be less than the dimensions indicated on the Drawings:
   a. Zone 3 (Upstream Riprap)
   b. Zone 4 (Downstream Riprap)
   c. Zone 5 (Filter Sand)
   d. Zone 6 (Drain Gravel)
   e. Zone 7 (Transition Gravel)
3. The elevation of the dam embankment crest shall be within ±0.1 feet of the elevations indicated on the Drawings.

C. Drainage: Water will not be allowed to pond on the top of embankment lifts.

D. Upstream and Downstream Faces: Upstream and downstream dam embankment faces, when completed, shall present an appearance of uniform shape and texture, shall be planar, and shall be free of excess and loose materials on the slope.

E. Haul Roads: Except where otherwise specified, hauling routes shall be dispersed across the embankment to avoid heavy concentrations of loads in any one area. Any material whose gradation is altered from that specified herein because of routing of traffic over the zone, or is contaminated, shall be removed and replaced with material conforming to the specified requirements for the zone, at no cost to Owner.

F. Testing by Engineer:

1. Engineer will routinely take samples of materials and perform quality assurance testing in the borrow areas, stockpile areas, and the dam embankment, as described in Paragraph 1.5 of this section, to monitor compliance of all embankment materials with the material and compaction requirements contained in this section.

2. Contractor shall provide access for Engineer to areas where observations, sampling, and testing are to be performed and schedule construction operations to avoid interference with the sampling and testing operations.

3. Contractor shall assist Engineer as required in such testing. Assistance shall include, but not be limited to, cutting horizontal pads or trenches with a bulldozer or backhoe at locations on the fill selected by Engineer for compaction testing, observation testing, and sampling.

4. At the completion of the test, the test pad shall be filled in lifts with the material of the zone in which the test was conducted and compacted as specified for that zone.

5. Results of field and laboratory tests will be made available to Contractor.

6. Testing by Engineer will not relieve Contractor of ensuring compliance with the Specifications.

G. Direction of Placement and Compaction: Dumping, spreading, and compaction for embankment zones shall be done parallel to the embankment axis, unless otherwise specified. Materials shall be dumped and spread over the surface of the underlying compacted lift.

H. Coverage of Compaction Equipment: Coverages of the compaction equipment shall be carried out so that compactive effort is uniformly distributed in a systematic manner over the entire lift. Compaction of individual lanes of a lift shall be completed before
beginning compaction of an adjacent lane. Individual lanes shall be overlapped by at least 12 inches.

I. Control and Conduct of Operations:

1. Embankment materials shall not be placed when the air temperature drops below 32 degrees Fahrenheit nor on frozen ground. Contractor shall not place frozen materials and shall remove all snow, ice, and frozen materials from the embankment fill. Contractor shall be aware of the potential weather conditions at the construction site when planning construction schedules.

2. If placement and compaction is shut down for an extended period due to cold weather conditions, the following procedures shall be completed:
   a. The top layer of all materials shall be covered with a minimum 12-inch thick layer of loose, non-compacted material.
   b. Frost tubes shall be installed at a maximum spacing interval of 300 feet to verify depth of frost in embankment materials.
   c. All frozen materials, based on frost tube measurements, shall be removed prior to commencing placement and compaction of any materials.

3. Contractor shall control and conduct all operations, including, but not limited to, loading, transporting, dumping, spreading, moisture conditioning, and compacting materials to prevent contamination and segregation of embankment zones. All contaminated or segregated materials shall be removed and replaced to the satisfaction of Engineer at no cost to Owner. The distribution of materials throughout an embankment zone shall be such that each lift is free from lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material.

J. Equipment Crossings:

1. Equipment crossings shall be limited to no more than two at any given level of the embankment to reduce the number of areas effected by particle breakdown and contamination.

2. Materials contaminated from equipment crossings shall be removed from the crossing areas and be replaced with acceptable materials at no cost to Owner.

3. All removed materials shall be hauled to and placed in designated disposal areas.

4. Equipment crossings shall be staggered or distributed to avoid being aligned vertically.

K. Re-working to Attain Specified Limits:

1. Contractor shall inform Engineer when Contractor’s quality control test results indicate that compaction water content or relative compaction is not in conformance with the specified limits.
2. Engineer will inform Contractor when Engineer’s quality assurance test results indicate that compaction water content or relative compaction is not in conformance with the specified limits.

3. Contractor shall make immediate adjustments in procedures as necessary to conform to the specified limits.

4. Re-working to attain the specified limits may include removal, rehandling, reconditioning, recompacting, or combinations of these procedures.

5. Contractor shall perform all re-work required to achieve the specified compaction water content and relative compaction at no cost to Owner.

L. Joining New Embankment Materials to Natural Soils, Rock Foundations, or Existing Dam:

1. Placing embankment materials against the existing slope:
   a. Prior to placing any new embankment materials against the existing slope, all contaminated and loose materials shall be removed.
   b. Existing natural soils or embankment materials shall be benched in the transverse direction to the existing dam axis; the minimum bench height into undisturbed materials shall be one foot and the maximum bench height shall be two feet.
   c. Benching into the slope will not be required where Soil Type S2 (Sand Filter) or Soil Type S4 (Riprap Bedding) materials are placed against cleaned slopes.

2. Placing embankment material on excavation bottoms:
   a. Prior to placing any new embankment materials on excavation bottoms, all contaminated and loose materials shall be removed.
   b. Compact cleaned surface with at least four passes of the specified compactor described in Paragraph 2.2.B of this section.

M. Sediment Control:

1. Sediment will not be permitted to accumulate on new embankment fill construction.

2. Contractor shall take measures to prevent sediment from accumulating on new fills, such as by constructing geotextile sediment control fences at toes of slopes or by other approved means.

3. All contaminated materials shall be removed from the embankment at no cost to Owner.

N. Sealing Working Surfaces

1. Immediately prior to periods of shutdown of all material placement operations, including periods when rain is forecast, the exposed surfaces shall be compacted with two coverages of compaction equipment.
2. Prior to recommencing placement, the compacted surfaces shall be scarified to a depth of at least three inches and no more than nine inches, moisture conditioned, and compacted to meet the requirements of this section.

3.2 ZONE 1 (CORE) AND ZONE 2 (SHELL)

A. Placement:

1. Materials shall be placed on accepted foundation surfaces and joined into existing dam embankment materials as discussed in Paragraph 3.1.L.1

2. Materials shall be dumped and spread in level, continuous, approximately horizontal lifts that do not exceed the maximum lift thicknesses as specified in the G Set of the Drawings.

3. All materials placed on the fill having a maximum dimension greater than the maximum allowable size shall be removed, broken down, or bladed towards the downstream exterior limit of the fill.

4. Contractor shall moisten or dry the material in stockpile areas, making allowance for moisture change during excavation, transportation, and placing operations. Supplementary water, if required, shall be added to the material on the embankment by the use of water trucks with power spray bars or other approved method and then the water shall be worked into the material for the full lift thickness by a minimum of four coverages of a disk or tiller, and until the specified compaction water content is obtained in the lift.

5. If the surface of the previous lift is drier than the specified compaction water content, the surface shall be disked and the material moisture conditioned to the specified compaction water content and then this material shall be recompacted to meet specifications before succeeding material is placed. No separate payment will be made for this work.

6. If the surface of the previous lift is wetter than the specified compaction water content, Contractor shall remove, allow to dry, or disk and aerate the surface to reduce the water content to the specified amount, and then recompact this material to meet specifications before succeeding materials are placed. No separate payment will be made for this work.

7. Lift surfaces that have been sealed in accordance with Paragraph 3.1.N of this section, used as haul routes, rutted, or are determined by Engineer to be too smooth to properly bond with the succeeding layer, shall be reworked before the succeeding lift is placed thereon. Such rework shall consist of roughening the surface by scarifying, plowing, diskng, or tilling to a minimum depth of three inches, moisture conditioning and recompacting this material to meet specifications before succeeding material is placed. No separate payment will be made for this work.

8. Materials shall be sufficiently overbuilt and trimmed to match the lines and grades on the drawings. All final placed materials shall meet compaction
requirements. No loose materials shall remain on the downstream exterior limit of any materials.

B. Water Content and Relative Compaction:

1. Engineer will make field and laboratory quality assurance tests of the compacted materials at intervals and embankment locations selected by Engineer in accordance with Paragraph 3.1.F of this section, to evaluate whether the specified compaction water content requirement is being met. Tests for water content will be made in accordance with ASTM D2216. Field tests for compacted unit weight will be made in accordance with ASTM D1556, D5030, or D6938, depending on the gradation of the materials. Relative compaction and water content variation from optimum water content will be determined in accordance with ASTM D5080 using the compactive effort of ASTM D698. A correction will be used in accordance with ASTM D4718. If materials contain more than 30 percent by weight retained on the 3/4-inch sieve, Engineer may waive the 30 percent limitation at his discretion.

2. Compaction water content for the minus 3/4-inch portion of a test sample shall be within the acceptable range as specified in the G Set of the Drawings.

3. Materials shall be compacted to at least 95 percent of the maximum dry unit weight as determined by laboratory compaction standard ASTM D698. The 95 percent relative compaction requirement will be considered to be met when the results of at least nine of every sequence of ten consecutive tests are equal to or greater than 95 percent and no result is less than 93 percent. Any material for which results less than 93 percent are obtained will be rejected and the corresponding fill shall be reworked to meet specified compaction requirements or be removed and replaced at no cost to Owner.

C. Compaction:

1. When each lift of material has been placed and spread and is at the specified compaction water content, and all oversize materials have been removed, the lift shall be compacted to meet the relative compaction requirements using the specified compactor in Paragraph 2.2.B of this section. The number of coverages shall be determined by Contractor to achieve the specified relative compaction requirements. This number of coverages shall not be changed without approval from Engineer.

2. Compaction with hand-held power tampers specified in Paragraph 2.2.B of this section shall be used in areas that are inaccessible to larger compactors.

3. All final in-place materials shall meet compaction specifications.
3.3 ZONE 5 (FILTER SAND), ZONE 6 (GRAVEL DRAIN), AND ZONE 7 (TRANSITION GRAVEL)

A. Placement:

1. Materials shall be placed on the accepted downstream slope, on accepted foundation materials, and in accepted toe drain trenches.

2. Materials shall be dumped and spread in level, continuous, approximately horizontal lifts that do not exceed the maximum allowable lift thickness as specified in the G Set of the Drawings.

3. Contractor may use a spreader-box or other method accepted by Engineer.

4. Care shall be taken to prevent segregation during dumping, spreading, and compaction. Contractor shall rework any segregated materials back into the uncompacted lift in a uniform manner. Segregated materials that cannot be reworked shall be removed and replaced at no cost to the Owner.

5. Care shall be taken to prevent contamination during dumping, spreading, and compaction. Zones 5, 6, and 7 materials shall be maintained a minimum of three inches and a maximum of 18 inches above materials being placed and compacted adjacent to these materials. Contaminated materials shall be removed and replaced at no cost to the Owner.

B. Water Content and Relative Compaction:

1. Filter and drain material shall be compacted to a relative density of at least 70 percent as determined by ASTM D4253 and ASTM D4254.

2. Clean the surface of the previously placed drain material before placing next layer.

3. Test Fills:
   a. The Contractor shall perform test fills to develop the number of passes necessary to obtain the specified density for the drain.
   b. Test fills shall be observed by the Engineer and repeated as necessary to verify the number of passes required.
   c. Test fills are incidental to the work and are at the Contractor’s expense.
   d. Test fill results are only to provide an anticipated level of compaction needed to meet specification requirements. Actual in-place density results will be based on nuclear gauge results and frequencies as described in Paragraph 3.5 which will account for variations in compaction if gradations or supplied materials change.
   e. If filter and drain zones are too thin for reliable nuclear gauge tests, or if adjacent pipes appear to be impacting nuclear gauge test results, results of test fills may be used at the Engineer’s discretion as the method specifications to accept compaction efforts for filter and drain zones

4. Relative Density Field Correlation and Verification:
a. After relative density values have been established, a correlation test may be completed for the same materials with a “One-Point Proctor” test to assist with quality control testing and verifying consistency of materials.

b. A “One-Point Proctor” test is completed by testing the soil sample using methods described in ASTM D698 for a single oven-dried sample.

c. One-Point Proctor tests may then be run using on-site materials to compare against the laboratory One-Point Proctor results to verify consistency of on-site materials versus materials tested in the laboratory.

C. Compaction:

1. When each lift has been placed and spread, the lift shall be compacted to meet the relative density requirements.

2. Tamping foot or pad foot compactors shall not be used to compact filter and drain materials.

3. The number of coverages shall be determined by Contractor to achieve the specified compaction requirements. This number of coverages shall not be changed without approval from Engineer.

3.4 ZONE 3 (UPSTREAM RIPRAP) AND ZONE 4 (DOWNSTREAM RIPRAP)

A. General: The intent of this specification paragraph is to produce a stable layer of riprap on the upstream and downstream dam faces with a uniform surface conforming to the lines and grades shown on the drawings.

B. Placement:

1. Materials shall be placed to full lift thickness in such a manner to minimize segregation and avoid displacement of underlying materials.

2. Oversize rock shall be placed to minimize voids in riprap zones. Smaller rock shall be uniformly distributed throughout the mass.

3. Contractor shall adjust rock and fill voids with smaller rock to provide a dense cover with a finished surface corresponding to the lines and grades shown on the drawings.

C. Compaction: Compaction of Soil Type S5 will not be required.

3.5 LABORATORY AND SITE TESTING FOR QUALITY CONTROL

A. All Quality Control testing results shall be submitted to the Engineer the same day of receipt/testing by the Contractor’s testing entity.

B. The Contractor shall make the necessary tests to control his work to meet these specifications. As a minimum, Contractor shall test materials at the frequency listed in the G Set of the Drawings or more often as determined by the Engineer, if variation in materials is occurring, or if the material appears to depart from the Specifications. If test results indicate material does not meet Specification requirements, terminate material
placement until corrective measures are taken by the Contractor to meet specified requirements.

C. In regards to each soil source, a material is considered a new source if materials appear different from previously placed materials, they are supplied from a different location, laboratory test results vary beyond accepted ASTM tolerances, or compaction is not able to be met using methods that had previously been meeting specifications.

END OF SECTION
SECTION 31 39 00
REVEGETATION

PART 1  GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Preparation of subsoil.
   2. Placing topsoil.
   3. Hydroseeding.
   4. Mulching.
   5. Maintenance.

1.2 DEFINITIONS
A. Noxious Weeds: Vegetative species other than specified species to be established in given area.

1.3 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Requirements for Submittals.
B. Product Data: Submit data for seed mix, mulch, and other accessories.
C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS
A. Section 01 70 00 - Execution Requirements: Requirements for Submittals.

1.5 QUALITY ASSURANCE
A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

1.6 QUALIFICATIONS
A. Seed Supplier: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
B. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.
1.7 DELIVERY, STORAGE, AND HANDLING
   A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
   B. Deliver seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

1.8 COORDINATION
   A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

1.9 MAINTENANCE SERVICE
   A. Section 01 70 00 - Execution Requirements: Requirements for maintenance service.
   B. Maintain seeded areas immediately after placement until areas have 70 percent vegetative cover density.
   C. Provide noxious weed control of revegetated areas until areas have 70 percent vegetative cover density.

PART 2 PRODUCTS

2.1 SEED MIXTURE
   A. Furnish seed mix to match existing site vegetation. Submit proposed seed mix for acceptance by Engineer.
   B. Seed mixture shall contain only contain native grasses and forbs. No woody or deep-rooted species shall be planted.
   C. Prior to opening seed bags at the project site, seed must be certified weed free and test results must be in hand before mixing the seed.
   D. Bags must be certified and tagged prior to delivery. No seed will be accepted that is not tagged.

2.2 ACCESSORIES
   A. Mulching Material: Wood cellulose fiber, chip form, free of growth or germination inhibiting ingredients.
   B. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.
   C. Herbicide: As necessary to control noxious weeds.
   D. Stakes: Softwood lumber, chisel pointed.
   E. String: Organic fiber.
2.3 SOURCE QUALITY CONTROL
   A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
   B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION OF SUBSOIL
   A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
   B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.
   C. Scarify subsoil to depth of 3 inches where topsoil is to be replaced. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL
   A. Replace topsoil during dry weather and on dry unfrozen subgrade.
   B. Remove foreign non-organic material from topsoil while spreading.
   C. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

3.4 SEEDING
   A. Apply seed at rate of 25 lbs per acre pure live seed evenly in two intersecting directions on all areas to be seeded.
   B. Do not seed areas in excess of that which can be mulched on same day.
   C. Planting Season: Fall.
   D. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

3.5 HYDROSEEDING
   A. Apply mulch with hydraulic mulcher at rate of 35 lbs per 1000 sq ft of mulch evenly in one pass.
3.6 SEED PROTECTION
   A. Include tackifier in mulch slurry to keep seeds and mulch in place. Apply tackifier at rates suggested by the manufacturer according to site conditions

3.7 MAINTENANCE
   A. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides. Control noxious weeds until seeded areas have 70 percent vegetative cover density.
   B. Immediately reseed areas showing bare spots.
   C. Repair washouts or gullies.
   D. Protect seeded areas during maintenance period.

3.8 SCHEDULE
   A. Downstream embankment face shall be seeded with native grass and forb seeds. No woody or deep-rooted species shall be planted on the downstream embankment.

END OF SECTION
SECTION 32 31 13
CHAIN LINK FENCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fence fabric, framework, and accessories.
   2. Excavation for post bases.
   3. Concrete foundation for posts

B. Related Sections:
   1. Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

A. ASTM International:
13. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.

B. Chain Link Fence Manufacturers Institute:

1. CLFMI - Product Manual.

1.3 COORDINATION
A. Section 01 30 00 – Administrative Requirements.
B. Coordinate work of this section with placement of spillway walls.

1.4 SYSTEM DESCRIPTION
A. Fence Height: 6 feet nominal.
B. Line Post Spacing: At intervals not exceeding 10 feet.
C. Fence Post and Rail Strength: Conform to ASTM F1043 Light Industrial Fence quality.

1.5 SUBMITTALS
A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.

D. Installation Plan and Manufacturer Instructions: Submit installation requirements for placement in spillway walls and dam embankment.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of fence line and posts.

C. Operation and Maintenance Data: Procedures for submittals.

1.7 QUALITY ASSURANCE

A. Supply material according to CLFMI - Product Manual.

B. Perform installation according to ASTM F567.

C. Perform Work according to Utah Dam Safety standards.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.9 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

C. Identify each package with manufacturer's name.

D. Store fence fabric and accessories in secure and dry place.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Authorized Manufacturer.
2.2 MATERIALS AND COMPONENTS

A. Materials and Components: Conform to CLFMI Product Manual.


D. Terminal, Corner, Rail, Brace, and Gate Posts: ASTM F1083 Schedule 40, hot-dip galvanized coated pipe.

E. Tie Wire: Aluminum alloy steel wire.

2.3 ACCESSORIES

A. Caps: Galvanized steel or malleable iron weather-resistant, sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings: Malleable cast iron or pressed steel coated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories according to ASTM F567.

B. Set posts plumb. Slope top of concrete for water runoff.

C. For fences on spillway walls, set posts or post sockets in center of concrete walls at a straight line. Use 0.048 inch thick galvanized metal pipe sleeve socket with an inside diameter that allows post to fit loosely. Coat the inside of the socket and the outside of the posts with bituminous paint. Use sulfur caulk or other expansive grout to fasten the post in the socket.

D. For fences on dam embankment, set posts in concrete bases at a straight line for end posts, pull posts, corner posts, gate posts, and pine posts.

E. Place fabric on pedestrian side of post.

F. Do not stretch fabric until concrete foundation has developed sufficient strength.

G. Position bottom of fabric 1 inch above finished grade.

H. Fasten fabric line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

I. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

J. Install bottom tension strap stretched taut between terminal posts.
END OF SECTION
PART I GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Monolithic concrete manholes and structures with transition to cover frame, covers, anchorage, and accessories.
   3. Bedding and cover materials.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 318 - Building Code Requirements for Structural Concrete.
   2. ACI 530/530.1 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.

B. ASTM International:
   4. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.

1.3 DESIGN REQUIREMENTS

A. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318.
B. Design of Lifting Devices for Precast Components: In accordance with ASTM C913.

C. Design of Joints for Precast Components: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate manhole and structure locations, elevations, piping, conduit, sizes and elevations of penetrations.

C. Product Data: Submit cover and frame construction, features, configuration, and dimensions.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Natural Resource Conservation Service (NRCS) standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

1.7 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Comply with precast concrete manufacturer’s instructions for unloading, storing and moving precast manholes and structures.

C. Store precast concrete manholes and structures to prevent damage to Owner’s property or other public or private property. Repair property damaged from materials storage.

D. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

PART 2 PRODUCTS

2.1 MANHOLES AND STRUCTURES

A. Manufacturers:

1. Armorcast Products Company.

2. Hanson Pipe & Precast.

3. Oldcastle Precast, Inc.

5. Substitutions: Section 01 60 00 - Product Requirements.

B. Manhole and Structure Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923.

2.2 FRAMES AND COVERS

A. Manufacturers:

1. Barry Pattern & Foundry Co., Inc.

2. East Jordan Iron Works, Inc.

3. McKinley Iron Works, Inc.


5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: ASTM A48, Class 30B Cast iron construction, machined flat bearing surface, removable lid, closed cover design; sealing gasket; cover molded with the word: “DRAIN.”

2.3 COMPONENTS

A. Manhole and Structure Steps: Formed polyethylene rungs. Formed integral with manhole and structure sections.

2.4 CONFIGURATION

A. Shaft Construction: Concentric with concentric cone top section; lipped male/female dry joints; sleeved to receive pipe sections.

B. Shape: Cylindrical or Rectangular as shown on Drawings.

C. Clear Inside Dimensions: As indicated on Drawings.

D. Design Depth: As indicated on Drawings.

E. Clear Cover Opening: As indicated on Drawings.

F. Pipe and Conduit Entry: Furnish openings as indicated on Drawings.

G. Steps: 12 inches wide, 12 inches on center vertically, set into manhole and structure wall.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: As indicated on Drawings.

B. Cover: As indicated on Drawings.
C. Soil Backfill From 12 Inches Above Pipe To Finish Grade: As indicated on Drawings.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify items provided by other sections of Work are properly sized and located.

C. Verify built-in items are in proper location, and ready for roughing into Work.

D. Verify correct size of manhole and structure excavation.

**3.2 PREPARATION**

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

**3.3 INSTALLATION**

A. Excavation and Backfill:

1. Excavate for manholes and structures in location and to depth as shown on Drawings. Provide clearance around sidewalls of structure for construction operations.

2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes and structures in dry trench.

3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

B. Install manholes and structures supported at proper grade and alignment as shown on Drawings.

C. Backfill excavations for manholes and structures as shown on Drawings.

D. Form and place manhole and structures cylinder plumb and level, to correct dimensions and elevations.

E. Cut and fit for pipe and conduit.

F. Set cover frames and covers level without tipping, to correct elevations.
G. Coordinate with other sections of Work to provide correct size, shape, and location.

3.4 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

A. Lift precast components at lifting points designated by manufacturer.

B. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

C. Set precast structures bearing firmly and fully on material shown on Drawings.

D. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.

E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

F. Joint sealing materials may be installed on site or at manufacturer’s plant.

G. Verify manholes and structures installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

3.5 FRAME AND COVER INSTALLATION

A. Set frame and cover as shown on Drawings.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements.

B. Test concrete manhole and structure sections in accordance with ASTM C497.

C. Test cast-in-place concrete in accordance with Section 03 30 00.
This page is intentionally left blank.
SECTION 33 11 16
SITE WATER UTILITY DISTRIBUTION PIPING

PART I GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings for pressurized pipe conveying non-potable water.

2. Valves.

3. Air-Vacuum Valves.


5. Underground pipe markers.

B. Related Requirements:

1. Section 03 30 00 - Cast-In-Place Concrete: Concrete for thrust restraints.

2. Section 31 23 17 - Trenching: Execution requirements for trenching required by this section.

3. Section 33 11 17 - Steel Pipe.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:


B. ASTM International:


2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).


C. American Water Works Association:

1. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.

2. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.

3. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.


1.3 SUBMITTALS

A. As specified in Section 01 33 00 under Part 1.2 - Submittal Procedures.

B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.
B. Perform Work in accordance with Natural Resources Conservation Service (NRCS) standards.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 WATER PIPING

A. Steel Pipe: Steel Pipe shall conform to AWWA C200.
   1. Minimum wall thickness: 5/16 inches.
   2. Coating & Lining: Fusion bonded epoxy.
   4. Fittings: Molded/Welded.
   5. Refer to Section 33 11 17 for pipe product specifications.

B. PVC Pipe: AWWA C905.
   1. Pressure Rating: As indicated on Drawings.

2.2 GATE VALVES

A. 2-1/2 inches and Smaller: Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression IPS ends, with control rod, extension box and valve key.

B. 3 inches and Larger: AWWA C509, Iron body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, flanged or mechanical joint ends, control rod, and hand wheel.

C. Valves shall open counterclockwise.
2.3 BALL VALVES
   A. 4 inches and Smaller: Brass body, teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA IPS compression inlet end, compression IPS outlet, with control rod, extension box and key if applicable.

2.4 BUTTERFLY VALVES
   A. AWWA C504, iron body, bronze disc, resilient replaceable seat, water or lug ends, flanged or mechanical joint ends, and hand wheel.

2.5 DISCHARGE VALVES
   A. VAG RIKO Plunger Valve
      1. Discharge Cylinder: Seat Ring Type E.
   B. Size: 10-inch and 36-inch.
   C. Actuation: electric actuator for 10-inch valve and manual actuator for 36-inch valve.
   D. Worm gear box orientation as shown on Drawings.

2.1 METERS
   A. Electromagnetic Flow Meter as shown on Drawings.
   B. Substitutions: As specified in Section 01 60 00 under Part 1.6 - Product Substitution Procedures.

2.2 AIR VACUUM VALVES
   A. Air and Vacuum Valve: AWWA C512 Standard.
      1. Waterman type CR101 continuous acting air vent and vacuum relief valve, size as indicated on Drawings.
   B. Substitutions: As specified in Section 01 60 00 under Part 1.6 - Product Substitution Procedures.

2.3 PIPE SUPPORTS
   A. Pipe supports shall be reinforced concrete as indicated on the Drawings.

2.4 UNDERGROUND PIPE MARKERS
   A. Metallic Warning Tape: This tape shall be prepared with white or black printing on purple field, installed 12 inches below the ground surface, continuously printed, at least 3 inches in width and 4.0 mil thick, manufactured for direct burial service having the following words:
“CAUTION BURIED NON-POTABLE WATER LINE BELOW”

B. Trace Wire: Electronic detection materials for non-conductive piping products.
   1. Unshielded 14 AWG THWN insulated copper wire.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: As indicated in Drawings.
B. Cover: As indicated in Drawings.
C. Soil Backfill from Above Pipe to Finish Grade: As indicated in Drawings.

2.6 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 03 30 00.
B. Manhole and Cover: Refer to Section 33 05 13.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
B. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
C. Remove scale and dirt on inside and outside before assembly.
D. Prepare pipe connections to equipment with flanges or unions.

3.3 BEDDING

A. Form and place concrete for pipe thrust restraints at change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Do not cover fittings with concrete.
B. Place bedding material at trench bottom, level fill materials in one continuous layer; compact to required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe to allow for expansion and contraction without stressing pipe or joints.
B. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

C. Establish elevations of buried piping with not less than 30 inches of cover.

D. Install plastic ribbon tape continuous buried 12 inches below finish grade.

E. Install trace wire continuous over top of pipe. Use duct tape to hold trace wire in place.

3.5 INSTALLATION - VALVES

A. Set valves as indicated on Drawings.

3.6 INSTALLATION - METERS

A. Install water meters in accordance with AWWA M6.

3.7 FIELD QUALITY CONTROL

A. As specified in Section 01 40 00 - Quality Requirements.

B. Pressure test system in accordance with AWWA C600 and the following:

1. Test Pressure: Pressure rating of pipe.

2. Conduct hydrostatic test for at least two-hour duration. Notify Engineer at start and end of test.

3. Fill section to be tested with water slowly, expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.

4. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.

5. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.

6. Compute maximum allowable leakage by the following formula:

\[
L = \frac{(SD\sqrt{P})}{C}
\]

- \(L\) = testing allowance, in gallons per hour
- \(S\) = length of pipe tested, in feet
- \(D\) = nominal diameter of pipe, in inches
- \(P\) = average test pressure during hydrostatic test, in psig
- \(C = 148,000\)

When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.
7. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.


D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Laboratory Material Test: Required if native material changes.

F. Frequency of Density Compaction Tests: See Trenching Section 31 23 17, Paragraph 3.7E.

END OF SECTION
This page is intentionally left blank.
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Installation of steel pipe of the sizes and in the locations shown on the Drawings and as specified herein.

1.2 REFERENCES

A. Unless otherwise stated, the latest edition for any commercial standards and all manufacturing tolerances referenced therein shall apply.

1. ANSI/AWS D1.1 Structural Welding Code-Steel.


3. ANSI/AWWA C200 Steel Water Pipe - 6 In. (150 mm) and Larger.

4. ANSI/AWWA C205 Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. (100 mm) and Larger- Shop Applied.

5. ANSI/AWWA C206 Field Welding of Steel Water Pipe.

6. ANSI/AWWA C207 Steel Pipe Flanges for Waterworks Service – Sizes 4 In. Through 144 In. (100 mm through 3,600 mm).

7. ANSI/AWWA C208 Dimensions for Fabricated Steel Water Pipe Fittings.

8. ANSI/AWWA C209 Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipe.


12. ANSI/AWWA C600 Standard for Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances.


1.3 QUALIFICATIONS

A. Manufacturers who are fully experienced, reputable, and qualified in the manufacture of the products to be furnished shall furnish all steel pipe and fittings. The pipe and fittings shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

B. Pipe cylinders, coating, lining, and fabrication of specials shall be the product of one manufacturer that has not less than 5 years successful experience manufacturing pipe of the particular type and size indicated. The pipe manufacturer must have a certified quality assurance program. This certified program shall be ISO 9001:2000 or other equivalent nationally recognized program as approved by the Engineer.

1.4 SUBMITTALS

A. As specified in Section 01 33 00 under Part 1.2 - Submittal Procedures.

B. Product Data: Submit data on pipe materials.

C. Shop Drawings: Submit shop drawings for pipe fittings and spools.

D. Manufacturer’s Certificate: Certify Products meet or exceed specified requirements.

1.5 VERIFICATION

A. Inspections

1. All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of AWWA C200 and AWWA C210 standard.

B. Welding Requirements

1. All welding procedures used to fabricate pipe shall be qualified under the provision of AWS B2.1 or ASME Section IX.

C. Welder Qualifications

1. Skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used shall do all welding. Welders shall maintain current qualifications under the provisions of AWS B2.1 or ASME Section IX. Machines and electrodes similar to those in the work shall be used in qualification tests. The Contractor shall furnish all material and bear the expense of qualifying welders.
PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe

1. Steel pipe shall conform to AWWA C200. Steel plate used in the manufacture and fabrication of steel pipe shall meet the requirements of AWWA C200. All longitudinal and girth seams, whether straight or spiral, shall be butt-welded using an approved electric-fusion-weld process.

2. Pipe shall be designed with a minimum wall thickness of 5/16 inches. Pipe design shall be in accordance with AWWA M11.

3. Pipe shall be bedded and backfilled per the Plan details or manufacturer’s recommendations utilizing an E’ value for design check per AWWA M11 Chapter 6.

B. Fittings

1. Unless otherwise shown on the Plans, all specials and fittings shall conform to the dimensions of AWWA C208. Pipe material used in fittings shall be of the same material and pressure class as the adjoining pipe. The minimum radius of elbows shall be 2 1⁄2 times the pipe diameter and the maximum miter angle on each section of the elbow shall not exceed 11 1⁄4 degrees (one cut elbow up to 22 1⁄2 degrees). If elbow radius is less than 2 1⁄2 times the pipe diameter, stresses shall be checked per AWWA M11 and the pressure class increased if necessary.

2. Fittings shall be equal in pressure class design as the adjoining pipe. Specials and fittings, unless otherwise shown on the Plans, shall be made of segmentally welded sections from hydrostatically tested pipe, with ends compatible with the type of joint or coupling specified for the pipe. All welds made after hydrostatic testing of the straight sections of pipe shall be tested per the requirements of AWWA C200 Section 5.2.2.1.

C. Joints

1. Welded
   a. All steel pipes shall be butt-welded using an approved electric-fusion weld process. Pipe ends should be prepared in accordance with the requirements in AWWA C200 and C206.

2. Flanges
   a. Flanges shall be in accordance with AWWA C207 Class D for operating pressures to 150 psi on diameters over 12 inches. Shop lining and coating shall be continuous to the end of the pipe or back of the flange. Flange faces shall be shop coated with a soluble rust preventive compound.
   b. Gaskets shall be full face, 1/8-inch thick, cloth-inserted rubber, Garlock 3000, John Crane Co. Style 777 or equal.
   c. Flange connections should allow for connection to PVC pipe, when required on the Drawings.
3. Bolts and Nuts for Flanges
   a. Bolts for flanges shall be carbon steel, ASTM A 307, Grade B for Class B and D flanges and nuts shall be ASTM A 563, Grade A heavy hex.
   b. All bolts and nuts shall be galvanized or stainless steel.

2.2 LININGS
   A. Epoxy
      1. Unless otherwise specified, the pipe and fittings shall be lined with a liquid epoxy as specified in AWWA C210. The lining shall be shop applied to a minimum thickness of 16 mils in not less than two coats.

2.3 COATING
   A. Epoxy Coating System
      1. Polyamide Epoxy
         a. Prepare surface and apply coating in accordance with AWWA C210 and coating manufacturer’s guidelines.
         b. Apply minimum of two coats at a total minimum dry film thickness of 16 mils.

PART 3 EXECUTION

3.1 INSTALLATION
   A. The Contractor shall provide and install all required piping and accessories in accordance with the contract documents and manufacturer’s recommendations. Pipe installation as specified in this section supplements AWWA M11.
   B. Installing Buried Piping
      1. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or roll pipe into trenches under any circumstances.
      2. Inspect each pipe and fitting before lowering into the trench. Inspect the interior and exterior protective coatings. Repair damaged areas in the field in accordance with Section 2.2. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
      3. Grade the bottom of the trench and place a 4-inch minimum layer of select or scarified material under the pipe. Before laying each section of pipe, check the grade and correct any irregularities found. The trench bottom shall form a uniform bearing and support for the pipe.
      4. Keep the trench in a dewatered condition during pipe laying.
5. When the pipe laying is not in progress, including the noon hours, close the open ends of the pipe. Do not permit trench water or foreign objects to enter the pipe.

C. Installing Exposed Piping

1. Install exposed piping after installing equipment and after piping and fitting locations have been determined.

2. Support piping as shown in the Plans.
   a. Do not transfer pipe loads and strain to equipment.

3. In addition to the joints indicated on the Plans, provide unions, flexible couplings, flanged joints, and other types of joints or means which are compatible with and suitable for the piping system, and necessary to allow ready assembly and disassembly of the piping.

4. Assemble piping without distortion or stresses caused by misalignment.
   a. Match and properly orient joints, and other connections.
   b. Do not subject piping to bending or other undue stresses when fitting piping. Do not correct defective orientation or alignment by distorting flanged joints or subjecting flange bolts to bending or other undue stresses.
   c. Flange bolts, union halves, flexible connectors, and other connection elements shall slip freely into place.
   d. Alter piping assembly to fit when proper fit is not obtained.

3.2 FIELD QUALITY CONTROL

A. Perform hydrostatic pressure test in the presence of the Engineer in accordance with Section 33 11 16.

END OF SECTION
This page is intentionally left blank.
PART 1 GENERAL

1.1 SUMMARY

A. The work in this section includes furnishing all labor, equipment, and materials required to supply, install, and test all High Density Polyethylene (HDPE) pipe fittings and accessories, as shown on the plans and/or specified herein.

1.2 REFERENCES

A. ASTM D-1248: Material Classification of HDPE Pipe.
C. CSA B137.1: Polyethylene Pipe, Tubing, and Fittings for Cold Water Pressure Services.
E. AWWA C901: Polyethylene (PE) Pressure Pipe and Tubing, ½ in. Through 3 in. for Water Service.
J. PPI: Inspections, Test, and Safety Considerations.
K. PPI: TR-3 – Policies and Procedures for Developing Hydrostatic Design Bases (HDB), Pressure Design Bases (PDB), and Minimum Required Strengths (MRS) for Thermoplastic Piping Materials or Pipe.

1.3 SUBMITTALS

A. Product Data: Submit data on pipe and fittings.
B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Project Record Documents: Record actual locations of pipes, valves, connections, thrust restraints, and invert elevations.

D. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.4 QUALITY ASSURANCE

A. Fittings shall be verified by Engineer or Owner and certification made that the fittings have been delivered and that they meet the standards described in these specifications.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pipe on clean, level ground to prevent undue scratching or gouging of the pipe. If pipe must be stacked for storage, stack it in accordance with pipe manufacturer's recommendations.

B. Handle pipe in such a manner that it is not damaged by dragging over sharp objects or cut by chokers or lifting equipment.

C. Cut out and remove sections of pipe with cuts or gouges in excess of 10 percent of the wall thickness of the pipe.

D. Follow all manufacturer recommendations for delivery, storage, and handling of pipe.

PART 2 PRODUCTS

2.1 PIPE

A. Manufacturer:
   1. WL Plastics.
   2. ISCO Industries.
   3. Or Approved Equal.

B. Material:
   1. The pipe shall be newly manufactured with no previous use.
   2. The pipe shall be made from polyethylene resin compound with a minimum cell classification of PE 445474C for PE 4710 materials in accordance with ASTM D3350. This material shall have a Long Term Hydrostatic Strength of 1600 psi when tested and analyzed by ASTM D2837, and shall be a Plastic Pipe Institute (PPI) listed compound.
3. The raw material shall contain a minimum of 2%, well dispersed, carbon black. Additives that can be conclusively proven not to be detrimental to the pipe may also be used, provided the pipe produced meets the requirements of this standard.

4. The pipe shall contain no recycled compound except that generated in the manufacturer’s own plant from resin of the same specification and from the same raw material supplier.

5. Compliance with the requirements of this paragraph shall be certified in writing by the pipe supplier, upon request.

6. Manufacturer’s Quality System shall be certified by an appropriate independent body to meet the requirements of the ISO 9000 or ISO 9002 Quality Management Program.

C. Pipe Design:

1. The pipe shall be designed in accordance with the relationships of the ISO-modified formula (see ASTM F 714).

   \[ P = \frac{2S}{[(Do/t)-1]} \]

   where,
   
   \begin{align*}
   S & = \text{Hydrostatic Design Stress (psi)} \\
   P & = \text{Design Pressure Rating (psi)} \\
   Do & = \text{ODavg for IPS pipe} \\
   & \quad \text{ODmin for ISO pipe} \\
   t & = \text{Minimum Wall Thickness} \\
   Do/t & = \text{Dimension Ratio}
   \end{align*}

2. The design pressure rating \( P \) shall be derived using the ISO modified formula above, and shall be its normal working pressure in pounds per square inch at temperatures up to 73 degrees F.

3. The Hydrostatic Design Stress shall be 800 psi for PE4710 materials.

4. The pipe dimensions shall be as specified in manufacturer’s literature.

D. Marking:

1. The following shall be continuously indent printed on the pipe or spaced at intervals not exceeding 5 feet:
   a. Name and/or trademark of the pipe manufacturer.
   b. Nominal pipe size.
   c. Dimension ratio.
   d. The letters PE followed by the polyethylene grade per ASTM D3350, followed by the Hydrostatic Design basis in 100’s of psi e.g. PE 4710.
   e. Manufacturing Standard Reference e.g. ASTM F714.
f. A production code from which the date and place of manufacture can be determined.

E. General Requirements:
1. The pipe manufacturer shall provide, upon request, an outline of quality control procedures performed on polyethylene system components.
2. The pipe manufacturer shall provide recommendations for butt fusion joining procedures.

F. Toe Drain Pipe:
1. Toe Drain Pipe shall be 12-inch diameter HDPE DR 32.5 pressure class pipe.
2. Slotted Perforations for Pipe Sections Embedded in Drain Materials:

G. Spillway Drain Pipe:
1. Spillway Drain Pipe shall be 8-inch diameter HDPE, PE 4710 resin, DR 32.5 pressure class pipe or Schedule 80 PVC pipe.
   a. Spillway drain collection

H. Other Utility Pipes:
1. All utilities pipes being replaced or modified as part of the outlet works rehabilitation shall be of the same type as the existing pipes.

I. Slotted Perforations for Pipes:
1. Collection pipes in the toe drain and spillway drain that require slots are indicated in Drawings.
2. All slotted perforations shall be pre-cut in the pipe prior to arrival at the site.
3. Slots shall have a width of 0.13 inches ±0.05 inches.
4. For pipes with a diameter less than or equal to 9 inches, slots shall have a length of 1.0 inches ±0.2 inches.
5. For pipes with a diameter greater than 9 inches, slots shall have a length of 2.0 inches ±0.4 inches
6. Slotted perforations shall be placed in rows along the entire length of perforated pipe sections.
7. A row consists of slots normally spaced at 6-inch intervals longitudinally along the pipe.
8. Three rows of slots shall be evenly cut at 120 degree intervals around the pipe perimeter.
2.2 FITTINGS:

A. Fittings shall be manufactured from materials meeting the requirements of Section 2.1. The manufacturer shall certify that samples of the manufacturer’s production product have been tested in-house in accordance with ASTM D2387, and validated in accordance with the latest revision of PPI TR-3.

B. Manufacturer shall comply with AWWA Standard C906. The material shall be listed by the Plastics Pipe Institute (PPI) a division of The Society of the Plastics Industry in PPI TR-4. The pipe material shall have a hydrostatic design basis of 1600 psi at 73.4 degrees Fahrenheit and 800 psi at 140 degrees Fahrenheit. The PPI listing shall be in the name of the Pipe Manufacturer and testing and validation of samples of the pipe manufacturers’ product shall be based upon ASTM D2837 and PPI TR-3.

C. Both pipe and fittings shall carry the same pressure rating. All fittings shall be pressure rated to match the system piping to which they are joined. At the point of fusion, the outside diameter and minimum wall thickness of the fitting shall meet the outside diameter and minimum wall thickness specifications of ASTM F714 for the same size of pipe. All fittings shall be properly derated according to manufacturer’s written recommendations, and clearly labeled on the fitting as such. Manufacturer shall have a written specification for all standard fittings, which establishes Quality Control criteria and tolerances. The manufacturer for the pipe shall be the same manufacturer of the fabricated fittings and other fabrications. The manufacturer shall certify that the materials used to manufacture pipe and fittings meet the requirements of this specification.

D. Pipe and fittings shall be butt fusible according to the manufacturer recommended procedures. The socket or sidewall fittings shall also be to manufacturers recommended procedures. Pipe and fittings may also be joined with flanged adapters and convoluted ductile iron rings.

PART 3 EXECUTION

3.1 POLYETHYLENE JOINING PROCEDURES

A. Wherever possible, the polyethylene pipe should be joined by the method of thermal butt fusion, as outlined in ASTM D 2657, Heat Joining Polyolefin Pipe and Fittings. Butt fusion joining of pipe and fittings shall be performed in accordance with the procedures recommended by the manufacturer. The temperature of the heater plate should not exceed 425 degrees F +/- 25 degrees F. The joining interfacial pressure should not exceed 25 pounds per square inch of projected end area for European design fusion machines or 75 pounds per square inch of projected end area for American design fusion machines.

B. The polyethylene pipe may be adapted to fittings or to other systems by means of an assembly consisting of a polyethylene stub-end, butt fused to the pipe, a back-up flange of ductile iron, made to Class 150, ANSI B16.1/B16.5 dimensional standards with exceptions, bolts of compatible material and a gasket of suitable neoprene, red rubber of asbestos-rubber compound cut to fit the joint. In all cases, the bolts shall be drawn up evenly and in line.

C. Pipe and fittings must both be manufactured by the same manufacturer.
D. The pipe supplier shall be consulted to obtain machinery and expertise for the joining by butt fashion of polyethylene pipe and fittings. No pipe or fittings shall be joined by any Contractor unless he is adequately trained and qualified in the techniques involved. Butt fusion must be performed by qualified technicians with at least 5 years experience in large diameter butt fusion or must be factory/manufacturer trained.

E. Pipe/fittings supplier/distributor preferred to have large diameter shop/field fabrication capabilities for additional support during and after the project.

F. Butt Fusion: Butt fusion shall be accomplished in accordance with the following steps:

1. Securing Components: Each component that is to be fused must be held in position so that it will not move unless it is moved by the clamping device.

2. Facing Pipe Ends: Pipe ends must be faced to establish clean, parallel mating surfaces. Equipment shall incorporate rotating planer block designs in their facers to accomplish this. Facing should be continued until a minimal distance exists between the fixed and movable jays of the machine and the facer is located firmly and squarely between the jaws.

3. Alignment: Pipe profiles must be rounded and aligned with each other to minimize mismatch (high-low) of the pipe walls. This will be accomplished by adjusting the clamping jaws until the outside diameters of the pipe ends match. Jaws shall not be loosened until fusion processes are complete. The distance between fixed- and moveable-jaws should be minimized to allow pipe ends to be rounded as close as possible to the joint area.

4. Melting Pipe Ends: Pipe ends shall be heated to the pipe manufacturer’s recommended temperature, interface pressure, and time duration so that heat will penetrate into pipe ends, and a molten “bead” of material forms at each end. Heating tools should be furnished with thermometers to measure internal heater temperature so the operator can monitor the temperature before each joint is made. A pyrometer or other surface temperature-measuring device should be used periodically to insure proper temperature of the heating tool. Heating tools should also be equipped with suspension and alignment guides to center them on the pipe ends. Heater faces contacting pipe ends should be coated by the manufacturer to prevent molten plastic from sticking to the heater faces.

5. Joining Pipe Ends: After pipe ends have been heated for the proper time and to the proper temperature, the heater tool shall be removed and the molten pipe ends brought together with sufficient pressure to properly mix the pipe materials and form a homogeneous joint.

6. Holding Joints Under Pressure: The molten joint shall be held immobile under pressure until cooled adequately to develop strength. Joints shall be cooled in accordance with the manufacturer’s recommendations. Do not increase pressure or heating plate surface temperature for cold pipe conditions.

7. Obtain saddle fusion, socket fusion, and electrofusion joining procedures and instructions from the fitting manufacture. Persons making electrofusion joints
should be trained and qualified in the electrofusion fitting manufacture’s joining procedure.

3.2 INSTALLATION

A. Trench bottoms found to be unsuitable for foundations after pipe-laying operations have started shall be corrected and brought to grade with approved compacted materials.

B. Pipe trenches shall be kept free from water during pipe laying, joining or before sufficient backfill has been placed to prevent flotation of the pipe. Contractor shall use sump pumps, well points, or any other devices to remove water from the trench bottom. Contractor shall provide ample means and devices to promptly remove and dispose of all water from any source entering the trench.

C. No connection shall be made where joint surfaces and joint materials have been soiled by earth or embedment in handling until such surfaces are thoroughly cleaned.

D. As the Work progresses, the interior of all pipe shall be kept clean. After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.

E. Backfilling of trenches shall be started immediately after the pipe is placed in the trench in accordance specifications.

F. Backfill material placed under the haunches shall be shovel sliced or compacted depending on class of embedment.

G. Under no circumstances shall the pipe or accessories be dropped into the trench.

H. The open ends of all pipelines under construction shall be covered and effectively sealed at the end of the day’s work.

3.3 VIDEO CAMERA INSPECTIONS

A. Contractor shall provide video camera inspections as described below.

B. All elbows, tees, and other fittings shall be of sufficient radius and clearance to allow for a thorough internal inspection by allowing passage of a video inspection device, unless access is provided to the fitting from the opposite end of the pipe.

C. All pipes shall be inspected internally by video camera at the following time periods:
   1. After a minimum of four feet and a maximum of eight feet of fill materials have been placed and compacted above the pipe.
   2. Following completion of all embankment work.

D. Any damaged pipe sections must be repaired to meet specification requirements at no additional cost to the Owner.

E. Any debris in the internal drain system pipes must be flushed clean and the pipe must be re-inspected one week following the cleaning.
F. All cross drains in the spillway drain system shall be inspected by camera after the concrete floor is poured and before the side walls to the spillway chute are constructed.

3.4 FIELD QUALITY CONTROL

A. As specified in Section 01 40 00 - Quality Requirements.

END OF SECTION
SECTION 33 55 00
INSTRUMENTATION

PART 1 GENERAL

1.1 SECTION INCLUDES
   A. This section covers the work necessary for furnishing and installing new piezometers.

1.2 SUBMITTALS
   A. Contractor shall submit for approval a list of all instruments with the full required cable lengths and the proposed method for marking cables for piezometers.
   B. Contractor shall submit the initial readings of the instruments within one week after installation.
   C. Contractor shall submit final drawings showing the exact installed location, the instrument identification number, the instrument type, and the installation date and time. The drawings shall include details of installed instruments, accessories and protective measures including all dimensions and materials used. Contractor shall also submit any operation and maintenance manuals as supplied by the instrument manufacturer for the installed instruments.

1.3 QUALIFICATIONS
   A. Manufacturer shall be a company specializing in the manufacturing of geotechnical and other instruments specified in this section with a minimum of ten years experience.
   B. Drilling and logging of borings and installation of piezometers shall be under the full-time supervision of a geotechnical engineer or geologist with at least 3 years previous experience in drilling and installing monitoring wells. The firm and the individuals who actually supervise the work shall be subject to the Engineer's review and acceptance. All drilling shall be performed by driller licensed by the Utah Office of the State Engineer with a minimum of 5 years experience in drilling, sampling, and piezometer/monitoring well installation, including experience drilling in embankment dams.

1.4 REQUIREMENTS
   A. Contractor shall furnish and install vibrating wire piezometers in the foundation and embankment, the terminal apparatus and portable readout devices required for manual operation of the foregoing instruments, and the connections and/or terminations of the instrumentation to the appropriate readout panels.

1.5 SUBMITTALS
   A. Administrative Submittal: State Agency Permit Submittals.
   B. Qualifications of firm and personnel installing piezometer monitoring wells.
C. A Geotechnical Instrumentation Installation Plan shall be submitted with the following minimum information:

1. A drilling and installation process describing the proposed equipment, methods, materials, and schedule in sufficient detail to evaluate if the proposed drilling, installation methods, and materials are in conformance with the specifications.

2. Piezometer development concepts describing the development of the piezometer intercept interval to effect accurate readings and response.

3. Work procedures and precautions to avoid hydrofracturing of the embankment and collapse or bridging of bore hole during piezometer installation.

4. The submitted schedule shall include estimated dates for drilling on the dam. The Contractor shall notify the Engineer five days before any site drilling begins for piezometers. Any changes to the drilling schedule shall be promptly communicated to the Engineer so that the Engineer can arrange for drill hole logging and QA review of the drilling as it occurs.

D. Submit within 14 days after installation of each instrument:

1. Boring logs for each monitoring well borehole.

2. Construction diagrams for each monitoring well.

3. Initial survey results including horizontal and vertical control data.

1.6 PERMIT REQUIREMENTS

A. Monitoring wells shall be installed, constructed, and operated in compliance with current Rules and Regulations of the Utah Administrative Code and especially Section R655-4, Water Well Drillers.

B. Contractor shall be fully responsible for obtaining applicable permits, providing notification of intent to construct monitoring wells, and satisfying reporting requirements of State Engineer's Office.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. GENERAL:

1. Deliver products and materials in original, unopened containers.

2. Handle products in manner that maintains undamaged conditions.

3. Do not store products directly on ground.
PART 2 PRODUCTS

2.1 GENERAL

A. Provide all materials and trained personnel necessary to accomplish the work specified in this Section. All equipment and materials shall be in good operating condition at all times and operated and maintained in strict conformance with manufacturer's recommendations.

2.2 PROTECTIVE CASING

A. Galvanized steel pipe of standard wall thickness (ANSI Schedule 40) or as approved by Engineer. All piezometer well covers will be Boart Longyear (TC-200).

B. Commercially available flush mount protective casing and piezometer surface completions for piezometers located in access road, as approved by Engineer.

2.3 PIEZOMETER/WELL RISER AND SCREEN

A. Provide all riser and screen of the types, thicknesses and diameters specified or shown. All riser and screen shall be of new, first quality material, and free of defects in workmanship and handling.

B. RISER PIPE:

1. Schedule 40 PVC plastic. Lengths of riser shall be capable of being joined watertight, and the resulting joint shall have the same structural integrity as the riser itself.

2. All Piezometers: 1-inch ID.

C. The well screen shall be Schedule 40 PVC in 2-foot lengths. All well screen shall be factory slotted with 0.010-inch slots. Slot rows shall be spaced parallel, having a slot-to-slot distance of 0.125 inches, and with approximately 86 slots per row per foot, or as approved by Engineer.

D. All risers shall be supplied in 5-, 10-, and 20-foot lengths. Have on hand at all times sufficient quantities of each length of pipe to make up any length required.

E. Fittings shall be compatible material with riser material.

F. Provide all parts of each piezometer riser/screen assembly from a single manufacturer.

2.4 CENTRALIZERS

A. Centering guides shall be fabricated of high-grade, spring stainless steel with ribs on 120-degree centers and adjustable up to 8-inch diameter holes.
2.5 MISCELLANEOUS FITTINGS
   A. All miscellaneous fittings for piezometer construction shall consist of new, first-quality material, free of defects, and meeting the approval of the Engineer. Provide fittings as specified or shown.
   B. Locks shall be commercially available padlocks being keyed alike with the existing piezometer locks.

2.6 FILTER SAND
   A. The filter sand shall be thoroughly washed, sound, durable, well rounded, siliceous material containing, when delivered, no organic material, soluble materials, calcareous materials, and mica. The filter sand shall be of 16 to 40-mesh sand. The specific gravity of the material shall be not less than 2.5.

2.7 BENTONITE PELLETS
   A. Commercial grade sodium bentonite pellets, as approved by the Engineer.

2.8 CEMENT-BENTONITE GROUT MIX
   A. Grout shall consist of a cement/sand/bentonite slurry. Proportion one bag of cement to not more than 15 gallons of water. Provide 10 to 12 pounds of powdered bentonite per bag of cement to reduce shrinkage. Mix cement with water first and let hydrate for a minimum of 10 minutes, then mix in bentonite. Add sand as appropriate. Consistency and method of mixing shall be approved by the Engineer. The use of special cements or other admixtures (ASTM C494) to reduce permeability, increase fluidity, and/or control set time, and the composition of the resultant slurry shall be approved by the Engineer. The density of the slurry mixture for tremie grouting shall be monitored prior to placement (using a standard mud balance).
   B. Cement: Conform to ASTM Designation C150 Type I or II Portland cement.
   C. Bentonite: High swelling, finely ground, reduced pH, sodium bentonite/montmorillonite.
   D. Water: Potable water.
   E. Concrete Sand: Commercially available, washed, silica sand.

2.9 LEAN GROUT
   A. Lean grout shall be a 1:5 ratio cement-sand mixture by volume. Cement and sand shall be as described in Article CEMENT-BENTONITE GROUT MIX.

2.10 CONCRETE
   A. Conform to Section 03300, CAST-IN-PLACE CONCRETE.
2.11 REINFORCING STEEL

A. Provide rebar conforming to Section 03210, REINFORCING STEEL.

PART 3 EXECUTION

3.1 GENERAL

A. Furnish all labor, materials, and equipment necessary to install the geotechnical instrumentation as shown.

B. Location of Instrumentation: Install one double piezometer and one single piezometer at the locations shown and as established by the Engineer. During the initial installation of each instrument and during the construction of each instrument, the Contractor shall perform all surveys to define the initial, intermediate, and final location and elevation of the instruments, and all intermediate surveys to maintain the verticality of the instrument.

C. Exercise care during construction so as to avoid damage to instrumentation. All locations shall be flagged and protected during and after construction. Geotechnical instrumentation that is damaged as a result of the Contractor's operations shall be repaired or replaced by the Contractor at his own expense. The Engineer will determine whether repair or replacement is required.

D. All installed instruments shall be clearly labeled for easy identification as shown on the Drawings and approved by the Engineer, and shall be clearly visible.

3.2 DRILLING AND SAMPLING FOR PIEZOMETERS

A. Drill borings as necessary for installation of piezometers after completion of embankment construction.

B. Drilling of the borings shall be performed under the direct supervision of the Contractor's geotechnical engineer or geologist, who shall also be responsible for completing a geotechnical log of each borehole.

C. Each boring shall be sampled on regular 5-foot intervals, or as determined by the Engineer, using a split-barrel sampler and Standard Penetration Test procedure (ASTM D1586).

D. DRILLING EQUIPMENT:

1. All equipment necessary to perform the drilling for this project shall be provided by the Contractor. The drilling equipment shall produce cased holes through the embankment and open holes in bedrock. Casing may be extended into broken and otherwise unstable rock, at the direction of the Engineer.

2. The Contractor shall furnish all temporary casing required to advance the hole. All temporary casing shall be removed by the Contractor at the completion of the boring.
E. DRILLING IN EMBANKMENT:

1. General:
   a. Contractor shall drill piezometer holes using dry augering methods, such as hollow-stem auger or sonic drilling. Fluids shall not be used for drilling of piezometer holes.
   b. Drill rigs shall be capable of drilling to a minimum depth of 150 feet.
   c. The inside diameter of the casing shall be of a size to allow minimum HW (4-inch-inside diameter) drill rod to be installed through the casing. Drilling will be accomplished in a smooth and continuous manner to avoid hydrofracturing.
   d. The hole shall be drilled within one degree of vertical.
   e. Contractor shall not permit oil or grease waste on the fill. Contractor shall dispose of drilling fluids, oil and grease waste, and all other waste in accordance with applicable regulatory requirements.
   f. Contractor shall verify that all piezometers are completed in accordance with current State of Utah Well Drilling Rules.

2. Casing:
   a. Temporary casing shall be installed through the embankment to prevent caving.
   b. The temporary casing installed shall be of minimum HW size (4 inches inside diameter).
   c. The Contractor shall furnish all temporary casing required.
   d. The Contractor shall anticipate possible difficult drilling in embankment foundation materials due, firm to hard conditions, and the presence of gravel and cobbles.
   e. All temporary casing shall be removed by the CONTRACTOR from the drill holes at the completion of the boring.

F. DRILLING SURFICIAL MATERIALS:

1. General:
   a. Surficial material is defined as nonembankment layers of soil materials beneath the embankment, regardless of nature and depth.
b. The Contractor shall drill through surficial materials by use of equipment capable of producing a drill hole suitable for the installation of temporary casing.

2. Casing:
   a. A temporary casing shall be installed through the embankment and surficial materials.
   b. The temporary casing installed shall be of minimum HW (4 inches inside diameter).
   c. The Contractor shall furnish all temporary casing required.
   d. The Contractor should anticipate possible difficult drilling in surficial materials due to caving conditions and the presence of gravel, cobbles, and boulders.
   e. All temporary casing shall be removed by the CONTRACTOR at the completion of the drill holes.

G. Occurrences such as sudden changes in consistency, voids, dropping of drill rods, unusual water conditions, and other unanticipated conditions shall immediately be brought to the attention of the CONSTRUCTION MANAGER and drilling shall be stopped immediately, unless it is determined that stopping would be more detrimental than continuing.

1. Observations by QC or QA personnel shall be used in determining when to stop drilling for any of the occurrences described above.

2. Drilling shall be stopped until a determination of the cause and/or effect of such conditions has been assessed by the CONSTRUCTION MANAGER in coordination with the Engineer.

3.3 PIEZOMETER INSTALLATION

A. Install riser, well screen, centralizers, filter sand, bentonite pellets, and cement-bentonite grout as shown on the Drawings and as otherwise directed by Engineer. While withdrawing temporary casing during instrument installation, care shall be taken to minimize the increments of temporary casing withdrawal so that collapse of the borehole does not occur. Sand and bentonite pellets shall be placed slowly by tremie so that bridging does not occur in the boring, and so as to prevent the instrument from being lifted as the temporary casing is withdrawn. Hydrate bentonite pellets with clear water before grouting. Grout above the bentonite pellets shall be a cement-bentonite grout mix, pumped or tremied through a pipe placed at the top of the bentonite seal.

B. Install filter sand to completely and uniformly envelope the well screen, and extend beyond the well screen to the limits shown in the drawings. Use centralizers to position
the piezometer riser and screen in the borehole. Centralizers shall have a maximum interval spacing of 20 feet.

C. Instrument installation and backfilling of each piezometer shall, to the extent practical, commence and continue to completion without interruption as soon as possible following drill-hole completion and cleanout. The Contractor shall use precautions as necessary during all backfill placement operations to prevent bridging of the backfill material and to ensure compliance with backfill depth requirements by measurement probe checks and placement volume calculations. The Contractor shall be prepared to dislodge all bridged material by vibration of the casing, tamping, or other method acceptable to the Engineer. If clear water has to be introduced into the cased hole during the backfilling operation, any free-water accumulation above the base level of the bentonite seal zone shall be removed by bailing or blowing out with compressed air prior to the placement of bentonite pellet backfill material. Care shall be taken to prevent disruption of sand during water removal.

D. The top and exposed portion of the piezometers will be covered and protected with a well cover (Boart Longyear, TC-200) as shown on the Drawings.

E. Install concrete around protective casing as shown and in accordance with Section 03300, CAST-IN-PLACE CONCRETE.

F. Each piezometer shall be developed upon completion of the installation. The method of development that the Contractor proposes shall be approved by the Engineer. The approved method of development shall be continued until the purge water becomes clear and, in the opinion of the Engineer, the piezometer has been developed. Development of dry piezometers will not be required.

3.4 PIEZOMETER ABANDONMENT

A. Piezometers may require abandonment due to discontinued use, incorrect installation, or other reasons.

B. Any existing or new piezometer that requires abandonment shall be abandoned as described below.

C. Open well portion of the piezometer shall be filled with a lean grout mix.

D. The grout shall be tremied into the piezometer starting from the bottom of the pipe.

E. After the grout has settled from curing, the top portion of the pipe shall be filled with grout again to the top of the piezometer pipe.

3.5 SURVEY MONUMENTS

A. Survey monuments shall be constructed as shown in the Drawings.

END OF SECTION