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State of Utah – Department of Environmental Quality
Division of Water Quality
288 North 1466 West
P.O. Box 144870
Salt Lake City, Utah 84111-4870

April 14, 2014

Attention: Mr. Woodrow W. Campbell, P.E.

Subject: CS Mining, LLC
Concrete Specifications
Acid Leach SX/EW Proposed Plant
West of Milford, Utah

Dear Mr. Campbell:

The attached concrete construction specifications are submitted for your review and approval. The concrete foundations are intended to provide secondary containment for process liquids contained in tanks within the foundations at the CS Mine near Milford, Utah. All foundations surrounding tanks holding process chemicals will have the capacity to contain 110 percent of the volume of the largest tank within the containment. All joints in the secondary containment facilities will be of water tight construction conforming to the requirements of the attached specifications.

Attached to this letter is the above-referenced concrete specifications with QA/QC plans and example vendors' information for waterstop and joint seal products proposed. The drawings listed below have been previously submitted to the Division as part of the Ground Water Discharge Permit and provide the design information for the concrete foundations:

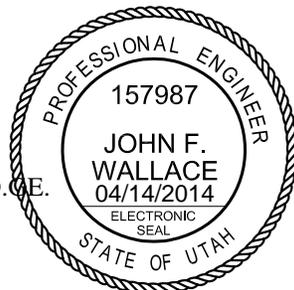
- 63-GA-01 - Mill Thickener Layout
- 60-GA-01 - Leach Circuit Tanks Layout
- 61-GA-01 - CCD Thickeners Circuit Layout
- 61-GA-01 - CCD Thickeners Circuit Section
- 62-GA-01 - Acid Storage Unit Layout
- 30-GA-01 - Solvent Extraction Unit Layout
- 30-GA-02 - Solvent Extraction Unit Concrete Plan
- 50-GA-01 - Tank Farm Unit Layout
- 40-GA-01 - Electrowinning Unit Layout
- 40-CN-02 - Electrowinning Polymer Concrete - Cell Details

The final As-Built Drawings will be provided to you with appropriate engineer's stamp and quality control documentation following construction, as required by the permit stipulations.

Should you have any questions, please do not hesitate to call me at (801)-270-9400 or my cell (801)-243-9603.

Respectfully submitted on behalf of CS Mining, LLC,
IGES, Inc.

John F. Wallace, P.E., D. & E.
Principal

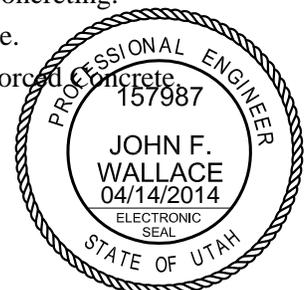


PART 1 **GENERAL****1.1** **DESCRIPTION**

This specification was developed for the CS Mining LLC Agitation Leach project in Milford Utah U.S.A. The document is meant to supplement notes contained in the engineering drawings referenced for the project for cast in place concrete structures as designed by WSE. In case of conflict, the specifications will take precedence over the notes.

1.2 **REFERENCES**

- .1 Western States Engineering Drawings for the CS Mining Project, Milford UT.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .5 ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .6 ASTM D1751, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
 - .7 ASTM C33-81, Concrete Aggregate.
 - .8 ASTM A36-81, Standard Specification for Structural Steel.
- .3 American Concrete Institute (ACI)
 - .1 ACI 117-90, Standard Specifications for Tolerances for Concrete Construction Materials.
 - .2 ACI 211, Standard Practice for selecting Proportions for Normal, Heavyweight, and Mass Concrete.
 - .3 ACI 212, Chemical Admixtures for Concrete.
 - .4 ACI 301, Specifications for Structural Concrete.
 - .5 ACI 306, Standard Specification for Cold Weather Concreting.
 - .6 ACI 308, Standard Specification for Curing Concrete.
 - .7 ACI 318-83, Building Code Requirements for Reinforced Concrete.
 - .8 ACI 360, Design of Slabs on grade.



1.3 QUALITY ASSURANCE CERTIFICATIONS

- .1 At least 4 weeks prior to commencing work, Concrete Supplier shall provide Owner's Representative with the proposed source of aggregates and provide samples for testing and/ or certification letters indicating the results of ASTM C1260 testing for alkali silica reaction which demonstrate compliance with the acceptable standard..
- .2 Concrete Supplier / Contractor shall submit testing results on the concrete mix for review by Owner's Representative and will not proceed without written approval when deviations from mix design or parameters are found.
- .3 Other Certificates:
 - .1 Prior to starting concrete work where applicable and otherwise following delivery of material to site, Contractor shall submit to Owner's Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - Portland cement.
 - Supplementary cementing materials, if any.
 - Grout.
 - Admixtures.
 - Aggregates.
 - Water.
 - Waterstops.
 - Waterstop joints.
 - Joint filler.
 - .2 Provide certification that mix proportions delivered will produce concrete of quality, yield and strength as specified in concrete mixes. Certified delivery tickets will include:
 - Name and location of batch plant with name of plant inspector.
 - Ticket Number.
 - Load number.
 - Date and truck number.
 - Concrete type, strength, and mix designation.
 - Actual quantities of all materials, including admixtures and amount of concrete in cubic yards.
 - Time of arrival and placement.

1.4 SOURCE QUALITY CONTROL

- .1 Ready-mixed concrete shall be batched, mixed and transported in accordance with ACI 301, 7.1.
- .2 Site mixed concrete shall be batched and mixed in accordance with ACI 301, 7.2.

1.5 QUALITY ASSURANCE

- .1 Minimum 4 weeks prior to starting concrete work contractor shall submit proposed quality control procedures for Owner's Representative approval for following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
 - .1 Any modifications to maximum time limit must be agreed to by Owner's Representative and concrete producer prior to placement of batch.
 - .2 Deviations to be submitted for review by Owner's Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant at temperatures to be determined in relation to expected ambient air temperatures per ACI 306.
- .3 Waste Management and Disposal:
 - .1 Owner shall provide an appropriate area on the job site where concrete trucks can be safely washed out or overtime batches properly disposed.
 - .2 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
 - .3 Prevent admixtures and additive materials from entering water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local and National regulations.

PART 2 DESIGN MATERIALS**2.1 MATERIALS**

- .1 Portland cement: ASTM C150 type II or type V only.
- .2 Aggregates shall conform to ASTM C33.
- .3 Maximum aggregate size: 1 ½ inch for piers, grade beams, general foundations. ¾ inch for floor slabs and columns. ¾ inches for underground duct banks.

- .4 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixtures: to ASTM C494, Owner's Representative to approve accelerating or set retarding admixtures during cold and hot weather placing. No calcium chloride additives allowed.
- .5 Non-premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 6 ksi at 28 days.
- .6 Waterstops: Material to be resistant to degradation from intermittent exposure to weak sulfuric acid solution and kerosene type liquid hydrocarbons. Thermoplastic Elastomeric Rubber or HDPE non-metallic types only are allowed for this chemical resistant application . All concrete foundations potentially exposed to chemical attack shall use resistant waterstops as described in the preceding.
 - .1 For expansion joints, unless otherwise shown on drawings: Nine inches wide and minimum 3/8 inch thick, dumbbell type with center bulb of minimum 3/4 inch inside diameter.
 - .2 For construction or control joints, unless otherwise shown on drawings: Six inch wide and 3/8 inch thick, dumbbell type without center bulb.
 - .3 Manufactured accessories at waterstop intersections: Form field splices with butt joints only following manufacturer's recommendations.
 - .4 Heat sealed field splices: Capable of developing water tightness equal to that of un-spliced material and with tensile strength of not less than 50% of un-spliced material.
- .7 Pre-moulded joint fillers:
 - .1 Chemical resistant, pre-compressed, polysulfide impregnated foam such as Chemseal +5 from Emseal Joint Systems or equivalent is to be used to ensure a water tight seal.
- .8 Polyethylene film: minimum 5 mils, thickness to ASTM C171.
- .9 Bonding adhesive: as approved by Owner's Representative.
- .10 Reinforcing steel:
 - .1 Material, fabrication and placing of reinforcement shall conform to ACI 301, chapter 5 and ACI 315. Reinforcing steel shall be deformed in conformance with ASTM A615 (grade 60) or A617 or approved equal.
 - .2 Tie wire shall be soft galvanized wire, 16 gage or heavier.
 - .3 Reinforcing shall be free of loose rust, scale, mud, oil or other coatings that will prevent or reduce the bond.
 - .4 Welded wire fabric shall be electrically welded wire fabric of cold drawn wire, 70,000 psi yield stress, in conformance with ASTM A185 or approved equal.

2.2 DESIGN MIXES

- .1 Mix Proportioning:
 - .1 Cement: Type II or V sulfate resistant.
 - .2 Minimum cement content: to be determined by design compressive strength.
 - .3 Water/Cement Ratio: 0.45 maximum.
 - .4 Nominal size of coarse aggregate: $\frac{3}{4}$ inch. See 2.1.3.
 - .5 Slump at time and point of discharge: 1 inch to 3 inch maximum excepting flowable mix.
 - .6 Air content: 4 to 6 %.
 - .7 Chemical admixtures: Water reducing acceptable, in accordance with ASTM C494. Calcium chloride shall not be allowed.
- .2 Design Strength of 28 Day Concrete by Application:
 - .1 Minimum of 4,000 psi concrete for structurally reinforced concrete work.
 - .2 Minimum of 4000 psi concrete for vehicle entry secondary containment slabs.
 - .3 Minimum of 3,000 Psi concrete for slabs on grade.
 - .4 Minimum of 3,000 psi concrete for pipe cradles, thrust blocks, masonry cell fill or under foundations where excavated to excessive depth.
 - .5 Minimum of 1500 psi for flowable fill for filling voids between pipes, casing, or liners and limited site voids as may be necessary.

PART 3 EXECUTION**3.1 PREPARATION**

- .1 Obtain Owner's Representative approval before placing concrete. Provide 24 h notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Concrete Reinforcing Standards following ACI 301 with concrete cover following in ACI 318..
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Owner's Representative approval of proposed method for protection of concrete during placing and curing in adverse weather.

- .7 Protect previous Work from damage.
- .8 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .9 Do not place load upon new concrete until authorized by Owner's Representative.

3.2 CONSTRUCTION

- .1 Cast-in-place concrete work will be in accordance to ACI 301
- .2 Formwork
 - 1. The design and construction of formwork shall be in accordance with ACI 347.
 - 2. Forms for columns, wall, sides of beams and other vertical forms not supporting concrete weight may be removed 24 hours after placing, if the concrete has hardened sufficiently.
 - 3. Forms for beam soffits, slabs, and other parts requiring support, shall remain in place for seven days or until the concrete has attained 60% of its specified 28 day strength.
- .3 Sleeves and inserts.
 - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Owner's Representative.
 - .2 Where approved by Owner's Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 4 inches x 4 inches not indicated, must be approved by Owner's Representative.
 - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Owner's Representative before placing of concrete.
 - .4 Check locations and sizes of sleeves and openings shown on drawings.
 - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .4 Anchor bolts.
 - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
 - .2 With approval of Owner's Representative, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 4 inches diameter. Drilled holes to be per manufacturer's recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with shrinkage compensating grout.

- .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .5 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- .6 Finishing.
 - .1 Finish concrete in accordance with ACI 301.
 - .2 Use procedures acceptable to Owner's Representative to remove excess bleed water. Ensure surface is not damaged.
 - .3 Wet cure using polyethylene sheets placed over sufficiently hardened concrete to prevent damage. Overlap adjacent edges a minimum of 6 inches and tightly seal with sand on wood planks. Weigh sheets down to maintain close contact with concrete during the entire curing period.
 - .4 Where burlap is used for moist curing, place two pre-wetted layers on concrete surface and keep continuously wet during curing period.
 - .5 Broom finish exterior concrete floor to meet requirements of slip resistance.
 - .6 Provide float finish for interior floor slabs.
 - .7 Rub exposed sharp edges of concrete with carborundum to produce ¼ inch radius edges unless otherwise indicated.
- .7 Curing.
 - .1 Curing and protection shall be in accordance with ACI 301, chapter 12.
 - .2 Freshly formed concrete may not be utilized as a base of construction until it has cured for seven days or reached a minimum of 60% of its 28 day strength.
 - .3 Protect structural floors left exposed to atmosphere for more than three days by polyethylene covering, dampened burlap, straw or equivalent materials as required to control hydration.
- .8 Waterstops.
 - .1 Chemical resistant waterstops of either thermoplastic elastomeric rubber or HDPE will be installed to provide a continuous water seal at all breaks in concrete continuity.
 - .2 Do not distort or pierce waterstop in such a way as to hamper performance.
 - .3 Do not displace reinforcement when installing waterstops. Allow clearance between waterstop and reinforcing steel to prevent rock pockets and air voids caused by aggregate bridging.
 - .4 Use equipment to manufacturer's requirements to field splice waterstops.
 - .5 Tie waterstops rigidly in place using wires tied through waterstop eyelets to adjacent reinforcing steel.

- .6 At expansion joints, keep center-bulb positioned within the limits of the expansion joint material, to prevent center-bulb from being confined in concrete.
- .7 Use factory welded corners and intersections unless otherwise approved by Owner's Representative.
- .9 Joint fillers.
 - .1 A chemical resistant filler is required for each joint in single piece for depth and width required for joint. A two part polysulfide epoxy or other flexible polymer systems resistant to intermediate exposure to weak sulfuric acid solutions such as Chemseal +5 from Emseal Joint Systems are to be selected.
 - .2 When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .3 Locate and form, isolation, construction and expansion joints as indicated. Install joint filler.
 - .4 Use ½ inch thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within ½ inch of finished slab surface unless indicated otherwise.
- .10 Damp-proof membrane.
 - .1 Install damp-proof membrane under concrete slabs-on-grade inside building.
 - .2 Lap damp-proof membrane minimum 6 inches at joints and seal.
 - .3 Seal punctures in damp-proof membrane before placing concrete. Use patching material at least 6 inches larger than puncture for cover.

3.3 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Owner's Representative in accordance with Quality Control protocol. The testing agency shall be responsible for test cylinder supply and report preparation.
- .2 Non-destructive Testing will be conducted by the testing lab personnel to calculate slump, unit weight, air content and fresh concrete temperature.
- .3 Owner's Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent. Additional samples will be taken when observations suggest possible non-compliance.
- .4 Compressive strength testing of concrete shall be in accordance with ASTM C172, C3 and C39. At least one set of four (4) test cylinders will be collected for each structure or foundation, except those containing less than 15 yards. On average, one set will be collected per 100 yards of concrete.
- .5 Waterstop and joint seal installation will be documented in QA/QC logs supported by representative photographs of the installations carried out each day.

- .6 Certificate of Field Quality Inspection and Testing with daily logs should be provided by Testing Lab and QA/QC Inspector to Owner's Representative for inclusion in Commissioning Manual and comprehensive QA/QC Report.
- .7 Inspection or testing by Owner's Representative will not augment or replace Contractor quality control nor relieve the Contractor of his contractual responsibility.

END OF SECTION