

**Volume
2
of 5**

**FALLS CREEK DIVERSION
REHABILITATION PROJECT
SOLICITATION SPECIFICATIONS CSKT
2023-018**

TECHNICAL SPECIFICATIONS



VIEW OF THE EXISTING DIVERSION STRUCTURE

BY
The Confederated Salish and Kootenai Tribes
Flathead Indian Reservation – Montana



FALLS CREEK DIVERSION REHABILITATION PROJECT CONFEDERATED
SALISH KOOTENAI TRIBE

ISSUED FOR BID –SPECIFICATIONS
November 2023

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SECTION 01 11 00 – SUMMARY OF WORK

PART 1 -- GENERAL

1.1 SUMMARY

- A. The work to be performed under this Contract shall consist of furnishing tools, equipment, materials, supplies, manufactured articles, and furnishing all labor, transportation, and services, including essential communications, and performing all work or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The work shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the work in good faith shall be provided by the Contractor as through originally so indicated, at no increase in cost to the CO.

1.2 RELATED SPECIFICATION SECTIONS

- A. Section 01 14 00 – Use of Site
- B. Section 01 22 50 – Measurement and Payment
- C. Section 01 50 00– Construction Facilities and Temporary Controls
- D. Section 01 60 00 – Material and Equipment

1.3 OWNERSHIP AND CONTRACT ADMINISTRATION

- A. Work is being administered by the Confederated Salish and Kootenai Tribes (CSKT) for the Bureau of Indian Affairs (BIA).
- B. Contract Authority:
 - 1. Contracting Officer (CO): Chairman, CSKT
 - 2. Contracting Officer's Representative (COR): Engineer, CSKT

1.4 PROJECT DESCRIPTION

- A. The Falls Creek Diversion is located along the Tabor Feeder Canal at the intersection with Falls Creek approximately 13 miles southeast of St. Ignatius, Montana in the Mission Mountains on Flathead Reservation. The Falls Creek Diversion is owned by the BIA and operated by the Flathead Indian Irrigation Project (FIIP).
- B. The Falls Creek bridge and diversion structures were initially constructed in 1925 as part of the FIIP. The diversion structure allows irrigation flows to be conveyed along the Tabor Feeder Canal while also being able to intercept flows from Falls Creek and either capturing the flows into the Tabor Feeder Canal or allowing flows to be conveyed downstream to Falls Creek. The existing bridge and diversion structures are in very poor condition.

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- C. The initial phase of construction shall be the improvements to the access roads and removal of the existing bridge over Falls Creek and replacing it with a box culvert. The existing bridge has deteriorated and is not structurally sound to support the required construction traffic necessary for replacement of the diversion structure.
- D. Irrigation water in the Tabor Feeder Canal is conveyed until approximately July 15th of each year. Construction work on the irrigation diversion structure would commence after the irrigation water is shutoff in 2024. During construction of the diversion structure replacement, all upstream flows from Falls Creek and the Tabor Feeder Canal will need to be routed to the Tabor Feeder Canal to the west (downstream of diversion structure). No upstream runoff shall be conveyed downstream along Falls Creek during construction that could degrade the water quality.

1.5 PRINCIPAL COMPONENTS OF WORK

- A. Construction work covered by the Contract Documents and these Specifications for the Falls Creek Diversion Rehabilitation Project include the following principal components of work and is not a comprehensive list.
 - 1. Mobilization and demobilization to and from site, respectively.
 - 2. Improvements to the access road to the project site to facilitate the mobilization/ demobilization of construction equipment and materials. The Contractor shall inspect the access road and the estimated amount of work required to improve the access road. As the exact quantities for the access road improvements are unknown at this time, place holders for the unit price items for clearing and grubbing, compacted fill, and road surfacing have been included in the bid form. The Contractor will be responsible for performing a pre-survey of the existing conditions where improvements are proposed along with a post construction survey to calculate access road improvement quantities. Care should be taken to minimize the footprint of the access road improvements due to the environmentally sensitive area that the road traverses. All proposed improvements will need to be approved by the CO, COR, and FIIP prior to construction.
 - 3. Demolition and removal of the existing bridge and diversion structures.
 - 4. Clearing and grubbing for construction of the replacement diversion structure, new ramp flume, and box culvert. Care should be taken to not remove trees and avoid impacts to the environment if not necessary.
 - 5. Installation of a pre-cast concrete box culvert with pre-cast cutoff walls and pre-cast wingwalls. Placing and compacting bedding under concrete components. Installing raised concrete walls sections with reflectors. Installing and compacting road surfacing material over the new box culvert sections. Installing riprap and 8 oz. non-woven geotextile downstream of the box culvert section.
 - 6. Installation of pre-cast concrete box sections for diversion structure. Installation of check board mounting hardware and check boards. Installation of grizzly bar screens. Installation of slide gates. Placing and compacting bedding under concrete components. Construction of cast-in-place concrete section to tie to the existing upstream tunnel section. Installation of riprap and 8 oz. non-woven geotextile downstream of the diversion structure along the

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Tabor Feeder Canal and between the diversion structure and the concrete box culvert. Installation grouted riprap and 8 oz. non-woven geotextile along the south side of the diversion structure. Installation of a walkway with handrail. Grading and seeding around the new diversion structure.

7. Installation of pre-cast concrete ramp flume with pre-cast cutoff walls and pre-cast wingwalls. Placing and compacting bedding under concrete components. Installing stilling well, pipe to connect stilling well to ramp flume, and a staff gage. Grading and seeding around the new diversion structure.

1.6 WORK BY THE OWNER OR OTHER CONTRACTORS

- A. Stilling well for measurement flume will be furnished and installed by CSKT staff.

1.7 CONTRACTOR USE OF THE SITE

- A. Contractor shall limit operations to the construction area and work limits shown on the Drawings and agreed to by COR, in writing.
- B. Disposal of all materials onsite will only be permitted in areas agreed to by the COR, in writing. All other material is to be disposed of offsite.
- C. The Contractor shall assume full responsibility for the health and safety of the Contractor's on-site personnel and the protection of all equipment and materials.
- D. No construction activity will be permitted until the Notice-to-Proceed has been issued for this Contract, and required submittals for that activity have been approved by the COR.
- E. For more detailed information regarding the use of the Site, see Section 01 14 00 – Use of Site.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION 01 11 00 -

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SECTION 01 14 10 – USE OF SITE

PART 1 -- GENERAL

1.1 SUMMARY

- A. The work under this Section includes the use, access, and restoration of the site.

1.2 REFERENCE STANDARDS

- A. NA:

1.3 RELATED SPECIFICATION SECTIONS

- A. Section 01 11 00 – Summary of Work
- B. Section 01 33 00 – Submittal Procedures
- C. Section 01 50 00– Construction Facilities and Temporary Controls

1.4 DEFINITIONS

- A. Contractor Work Limits: Boundary of Contractor access in the performance of work under this Contract. The Contractor Work Limits are identified as the areas immediately surrounding the diversion structure, existing bridge, ramp flume location and the three identified staging areas. Work Limits around the existing structures shall be limited as much as possible to avoid disturbance to existing vegetation and trees.

1.5 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 – Submittals.
- B. RSN 01 14 10-01 Pre-mobilization Site Photos:
 - 1. Contractor shall provide photo documentation of the pre-existing site conditions prior to mobilization.
- C. RSN 01 14 10-02 Land Use and Landscape Rehabilitation Plan for Contractor Work Limits:
 - 1. Show use location and extent of impact. Uses include but are not limited to the following:
 - a. Buildings and service areas including offices, shops, warehouses, storage areas, fuel and oil storage areas, and fabrication yards.
 - b. Parking areas, temporary roads, and haul routes.

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- c. Utilities including air, power, and water lines.
 - d. First-aid and medical facilities.
 - e. Soil Processing Area. Show sizes, rated capacities, and general features of soil processing area including transporting, storing, screening, and washing facilities.
 - f. Areas for processing, storing, and disposing of waste materials from construction operations.
 - g. Lists of construction equipment to be used on-site.
 - h. Temporary fences.
- 1) Describe methods to preserve, protect, and repair if damaged, vegetation (such as trees, shrubs, and grass) and other landscape features within or outside the Work Limits, which are not to be removed and which do not interfere with the Work required under this Contract. Include methods to mark work area limits, protect disturbed areas, and prevent erosion.
 - 2) Describe methods to protect, and repair if damaged, existing improvements and utilities at or near the jobsite.
 - 3) Describe methods for removing temporary structures and facilities, cleanup, and rehabilitating the site after completion of construction activities.
 - 4) Submit revised drawings of changes in use of Contractor Work Limits made during design and erection stages or after use.

1.6 CONTRACTOR USE OF THE SITE

- A. Contractor Staging Areas as shown on the Drawings may be used for required construction facilities.
- B. When private land is used for construction facilities, or other construction purposes, make necessary arrangements associated with the use of private land.
- C. Location, construction, operation, maintenance, and removal of construction facilities in Contractor Work Limits will be subject to written approval by the COR.
- D. Do not interfere with the work of other contractors in the vicinity, or with reservations made for use of such land.
- E. Areas in the Contractor Work Limits which will be obliterated by permanent construction may be used where use of such land will be discontinued and construction facilities, materials, equipment, and rubbish and waste materials will be removed to avoid interference with work in such areas.

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- F. Housing for construction personnel will not be permitted in Contractor Work Limits land, except housing for guards or watchmen as may be approved by the COR in writing.
- G. Camping, fishing, hunting, and the carrying or storage of firearms on-site or in vehicles will not be permitted on Contractor Work Limits land.
- H. The Contractor is responsible for maintenance of access roads, construction site and overall construction use areas. Maintenance includes blading/grading, dust control, drainage and snow/ice removal.

1.7 ACCESS TO SITE

- A. Right-of-way access to work from existing public roads will be established by CSKT. The Contractor shall comply with all security policies of the CSKT.
 - 1. In accordance with the clause entitled "Operations and Storage Areas," use only established roadways, parking areas, and haul routes, or temporary roadways, parking areas, or haul routes constructed by the Contractor when and as authorized by the COR.
 - 2. Subject to the clause entitled "Default (Fixed-Price Construction)," unavailability of transportation facilities or limitations thereon shall not become a basis for claims for damages or extension of time for completion of work.
 - 3. Access to Falls Creek Diversion is from St. Ignatius and Arlee, as shown on the Drawings. Access roads are gravel surfaced roads with a mix of one-way and two-way traffic. The Contractor is responsible for any necessary upgrades required to facilitate access to the project site for construction activities. The existing bridge (Falls Creek), as noted on Sheet 8, crosses Falls Creek on the main construction site access road. The existing Tabor Feeder Canal Tunnel is immediately upstream of the diversion structure and crosses under the access road. The bridge shall be replaced as the initial phase of construction. The Tunnel is not part of this project. The Contractor is solely responsible for ensuring all loads across the existing bridge and tunnel remain limited. Should the bridge or tunnel fail or become damaged as a result of loads conveyed by the Contractor, the Contractor is responsible for making repairs at their expense. Submit proposed hauling vehicles for review prior to construction clearly showing the maximum vehicle axle weights and spacing (RSN-14).
- B. Contractor shall provide the names of all personnel of Contractors and Subcontractors working on the site.
- C. Contractor shall provide the names of all personnel added to the site, reassigned from the site or terminated to the COR as soon as practicable.
- D. Contractor shall provide the names of all Suppliers by company and is to allow access and escort such Suppliers' delivery personnel while on site.
- E. All persons entering the site are to carry valid, current, legal identification.
- F. All persons driving on the site are to have valid, current drivers' license.

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PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 CLEANING

A. Construction Equipment:

1. Before bringing on site, the Contractor shall clean construction equipment to remove dirt, vegetation, and other organic material to prevent introduction of noxious weeds, and invasive plant and animal species.

3.2 RESTORATION

- A. After completion of work, regrade and scarify land used for construction purposes and not required for completed construction such that surfaces blend with the natural terrain and are in a condition that will facilitate revegetation, provide proper drainage, and prevent erosion.
- B. Revegetation shall be in accordance with Section 32 92 00 – Revegetation.

- END OF SECTION 01 14 10 -

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SECTION 01 22 50 – MEASUREMENT AND PAYMENT

PART 1 -- GENERAL

1.1 SECTION INCLUDES:

- A. Measurement and payment applicable to the Work performed under lump sum and unit price payment methods.
- B. List of unit price and lump sum pay items.
- C. Schedule of value requirements for lump sum pay items.
- D. Defect assessment and non-payment for rejected Work.

1.2 RELATED SPECIFICATION SECTIONS

- A. Section 01 33 00 – Submittal Procedures

1.3 DEFINITIONS

- A. NA

1.4 AUTHORITY

- A. Measurement methods delineated in the individual specification sections are intended to complement the criteria of this section. In the event of conflict, the requirements of the individual specification section shall govern.
- B. The COR, unless specified elsewhere, shall verify measurements, and compute final quantities for final payment.

1.5 UNIT QUANTITIES SPECIFIED

- A. Quantities and measurements indicated in the Bid Schedule are for bidding and contract purposes only. Actual quantities and measurements supplied or placed in the Work are expected to vary and payment will be determined based on measurements obtained/verified by the COR.
- B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the bid unit prices.

1.6 MEASUREMENT OF QUANTITIES

- A. Measurement Devices:

Weigh scales shall be inspected, tested, and certified by the Montana – Weights and Measures Bureau within the prior year.

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Platform scales shall be of sufficient size and capacity to accommodate the conveying vehicle.

Metering devices: shall be inspected, tested, and certified by the Montana – Weights and Measures Bureau within the past year.

- B. Measurement by volume: Measured by survey or by cubic dimension using mean length, width, and height or thickness.

Measurement for payment of excavations and fill placement will be limited to the lines and grades shown on the Drawings, or to the most practicable lines, grades, and dimensions as established by the COR in writing. No measurement will be made of over excavation or over build beyond design lines and grades.

Excavation fill quantities will be computed using the average end area method or other computation method approved by the COR.

- C. Measurement by area: Measured by square dimension using mean length and width or radius. Items, which are measured by the acre, square yard, or similar units, shall be measured horizontally, and for vertical features, shall be measured vertically, unless noted otherwise.
- D. Linear measurement: Items which are measured by the linear foot, such as pipe culverts, underdrains, fence, etc., shall be measured horizontally, unless otherwise specified in the plans or specifications.
- E. Stipulated sum/price measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed items or units of the Work.
- F. Lump sum items shall not be measured for payment. However, measurements may be made to monitor work progress.

1.7 MEASUREMENT AND PAYMENT

- A. Payment includes: Full compensation for furnishing all work required, including all labor, materials, products, tools, equipment, plant, transportation, services, incidentals, erection, application or installation of an item of the Work; and all other costs of whatsoever nature for the items of work complete and in place, will be included in the prices for the various bid items; 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 COR multiplied by the unit price for Work which is incorporated in or made necessary by the Work.
- C. Measurement and payment for items listed as Contract Line Item Numbers (CLIN) in the Bid Schedule shall be as defined in the following paragraphs. The cost of all work specified in Division 1 - General Requirements, unless specifically covered in other CLINs, will not be paid separately, but shall be included in CLIN 1.1 through 1.2.

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Phase 1 CLIN

CLIN 1.1- Mobilization

Includes mobilization of all personnel, equipment, and temporary construction facilities and controls to the project site and providing temporary offices and utilities.

Payment will be made at the lump sum price set in the Bid Schedule. CLIN

1.2- Project Startup and Ongoing Activities

Includes submitting a detailed CPM baseline schedule, preparing and updating detailed construction schedules, submitting a schedule of values for lump sum payment items, providing insurance certificates and bonds, attending pre-construction and progress meetings, providing submittals and permits, providing a designated full time superintendent on site, providing quality control activities, maintaining up-to-date as-built drawings, preparing and maintaining site access roads, staging, parking areas, haul roads (including grading and dust control), and all project specific overhead.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 1.3- Road Closure and Traffic Control Systems

Includes installation and maintenance of temporary traffic control systems through the duration of construction including flaggers, signage, cones, barriers, signals, and other traffic control devices as required to protect the work and public safety. Traffic control associated with any road closures associated with the Project is included.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 1.4- Construction Surveying and Staking

Includes all survey work including checking existing survey control reference points and locations and elevations, pre-survey conditions, establishing construction control, resetting of stakes and monuments, measurement for progress payments, and performing surveys needed for restoration of public and private improvements that have been damaged, destroyed, or relocated by the Contractor.

Payment will be made at the lump sum price set in the Bid Schedule. CLIN

1.5- Stormwater and Erosion Control

Includes preparation, installation, and maintenance of Storm Water Management Plans, includes environmental compliance activities required to complete the work and water pollution controls. Includes bypass pumping required to convey flows from upstream of Tabor Feeder Canal tunnel section, downstream of the diversion structure. Includes removal of controls after completion of work.

Payment will be made at the lump sum price set in the Bid Schedule.

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CLIN 1.6- Site Work

Includes restoring areas disturbed by construction activities and completion of site cleanup. Includes grading activities around proposed structures to bring to final grade.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 1.7- Demobilization

Includes demobilization of all personnel, equipment, temporary construction facilities from the project site and removal of temporary offices and decommissioning of temporary utilities.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 2.1 - Access Road - Clearing and Grubbing

Includes removal and disposal of tree branches, bushes, shrubs, grass, and weeds within the limits necessary to make access road improvements prior to earthwork activities.

Payment will be made at the unit price per acre in the Bid Schedule.

CLIN 2.2 - Access Road - Compacted Fill

Includes furnishing, placement, and final grading of the compacted fill necessary for the Contractor's proposed access road improvements.

Payment will be made at the unit price per in-place cubic yard in the Bid Schedule.

CLIN 2.3 - Access Road – Road Surfacing

Includes furnishing, placement, and grading of the road surfacing material fill necessary for the Contractor's proposed access road improvements. Road surfacing shall match existing road surfacing type and thickness.

Payment will be made at the unit price per in-place cubic yard in the Bid Schedule.

CLIN 2.4 – Access Road - Revegetation

Includes application of seed, fertilizer, and wood fiber mulch to final graded slopes and construction areas that have been impacted during construction of the access road improvements.

Payment will be made at the unit price per acre in the Bid Schedule.

CLIN 2.5 – Dust Abatement

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Includes application of an Encroachment Permit to Lake County and any dust abatement that the County requires.

Payment will be made at the lump sum price in the Bid Schedule.

CLIN 3.1 - Existing Bridge Demolition

Includes demolition, removal, and disposal of the existing timber bridge structure over Falls Creek.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.2 - Existing Diversion Structure Demolition

Includes demolition, removal, and disposal of existing concrete diversion structure, wooden logs across the top of the structure, existing gates, etc.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.3 - Clearing and Grubbing

Includes removal, disposal, and/or salvage of trees, bushes, shrubs, grass, and weeds within the limits necessary to install the new structures and Staging Area 1 on the Drawings prior to earthwork activities.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.4 - Box Culvert

Includes furnishing, placement, and setting of precast concrete box culvert, precast cutoff walls, precast wingwalls, bedding, raised concrete guardrail sections, reflectors, road mix material, grading access road to match finished grade of road above box culvert section, and other items necessary to complete the work as shown on the contract drawings or as specified in the specifications.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.5 - Riprap

Includes placement and final grading of riprap along the trapezoidal channel and underlying filter materials beneath the riprap located downstream of the box culverts, between the diversion structure and box culverts, downstream of the diversion structure along the Tabor Feeder Canal, and downstream of the ramp flume along the Tabor Feeder Canal as identified on the plans.

Payment will be made at the unit price per cubic yard in the Bid Schedule.

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CLIN 3.6 - Riprap Grouted

Includes placement and final grading of grouted riprap along the trapezoidal channel and underlying filter materials beneath the riprap located along the southern side of the new diversion structure.

Payment will be made at the unit price per cubic yard in the Bid Schedule.

CLIN 3.7 – Grizzly Bar Screens

Includes furnishing, placement, and setting of grizzly bar screens and angle iron mounting and welding, and other items necessary to complete the work as shown on the contract drawings or as specified in the specifications. The Contractor shall also provide design submittals for the screens for approval by the COR.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.8 – 36-inch Gate

Includes furnishing, placement, and setting of 36-inch slide gate, installing and welding steel angle irons, and other items necessary to complete the work as shown on the contract drawings or as specified in the specifications.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.9 – 8-foot Slide Gates

Includes furnishing, placement, and setting of two 8-foot-wide slide gates, and other items necessary to complete the work as shown on the contract drawings or as specified in the specifications.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.10 – Walkway

Includes furnishing, placement, and setting of walkway structure, grate, handrail, supports, brackets, and removal chains as shown on the contract drawings or as specified in the specifications.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.11 - Pre-Cast Box Sections

Includes furnishing, placement, and setting of all the various pre-cast box sections,

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check board mounting hardware and boards, tie bolts between all box sections, bedding material, perforated drainpipe wrapped in non-woven geotextile and ¾" washed gravel, all earthwork required for installation and compacted backfill, bentonite riprap adjacent to the structure, and other items necessary to complete the work as shown on the contract drawings or as specified in the specifications.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.12 - Cast-in-Place Concrete Tunnel Connection

Includes construction of concrete floor and walls from existing concrete tunnel to the new precast concrete box section; includes all reinforcement steel, penetrations, dowels, water stop, and joint filler.

Payment will be made at the unit price per in-place cubic yard in the Bid Schedule. Measurement for payment for concrete placed beyond neat line limits will not be included.

CLIN 3.13 - Pre-Cast Ramp Flume

Includes furnishing, placement, and setting of precast concrete box culvert, precast cutoff walls, precast wingwalls, bedding, connection pipe from flume to stilling well, staff gage, and other items necessary to complete the work as shown on the contract drawings or as specified in the specifications.

Payment will be made at the lump sum price set in the Bid Schedule.

CLIN 3.14 - Cast-in-Place Concrete on Ramp Flume Floor

Includes construction of concrete floor from the pre-cast concrete box section; includes all reinforcement steel, penetrations, dowels, water stop, and joint filler.

Payment will be made at the unit price per in-place cubic yard in the Bid Schedule. Measurement for payment for concrete placed beyond neat line limits will not be included.

CLIN 3.15 - Excess Excavated Material

Includes excavation, hauling, and placement of excess excavated material that will not be used onsite. Location of where to place excavated material is shown on the contract drawings.

Payment will be made at the unit price per cubic yard in the Bid Schedule.

CLIN 3.16 - Revegetation

Includes application of seed, fertilizer, and wood fiber mulch to final graded slopes and construction areas that have been impacted during construction.

Payment will be made at the unit price per acre in the Bid Schedule.

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1.8 SCHEDULE OF VALUES

- A. RSN 01 22 50-01: Contractor shall submit a Schedule of Values for all lump sum bid items listed in Section 1.7 within 30 days of the Notice to Proceed. The Schedule of Values shall contain a detailed breakdown of the costs for all components of the work used to arrive at the lump sum price submitted by the Contractor during the bid phase. The Schedule of Values will be submitted in accordance with Section 01 33 00 – Submittal Procedures and shall be subject to review and approval of the COR. The Schedule of Values will be used to help assess the intermediate value of work completed for the purpose of making progress payments.

1.9 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements at no additional cost to CO.
- B. If, in the opinion of the COR, it is not practical to remove and replace the Work, the COR may consider one of the following remedies:
 - 1. The defective Work may remain, but the unit price/lump sum will be adjusted to a new price/sum at the discretion of the COR.
 - 2. The defective Work will be partially repaired at the instruction of the COR, and the unit price/lump sum will be adjusted to a price/sum at the discretion of the COR
- C. The authority of the COR to assess whether the work is defective and identify equitable repair, replacement and/or payment adjustment, is final.

1.10 NON-PAYMENT FOR REJECTED WORK

- A. Payment will not be made for rejected or wasted work, including, but not limited to the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined to be unacceptable in the opinion of the COR, before or after placement.
 - 3. Products not completely unloaded from the transporting vehicle.
 - 4. Products placed beyond the lines and grades of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.
 - 7. Overly wet or frozen earth material.
 - 8. Excavation or fill made for the convenience of the Contractor.
 - 9. Over-excavation and backfill of over-excavation.

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10. Work performed that has been rejected and/or determined to be defective, except as described in Paragraph 1.7, above.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

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SECTION 01 31 00 – COORDINATION AND MEETINGS

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. Coordination.
- B. Preconstruction meeting.
- C. Progress meetings.

1.2 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various sections of the Construction Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with the construction. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.

1.3 PRECONSTRUCTION MEETING

- A. Within seven days of the issuance of the Notice to Proceed, the Contractor shall meet with CSKT and the COR for a Preconstruction Meeting at CSKT's office. The purpose of this meeting is to review construction activities, CSKT's operations onsite, submittal procedures, payrolls and labor relations, environmental protection, progress schedules, network analysis, safety issues, scheduling, field clarification procedures and payment and procurement of materials. The principal features of work will also be reviewed and any questions regarding the Contract and work site will be addressed.
- B. Attendance Required: CSKT, COR, and Contractor's Project Manager and Superintendent, the Contractor's Safety and Health Officer, Scheduler, Major Subcontractors, Major Vendors, and other key personnel.
- C. CSKT Agenda:
 - 1. Submission of list of Subcontractors, list of products and vendors, schedule of values, and construction schedule.
 - 2. Organization chart representing the parties in Contract, and the COR.
 - 3. Procedures and processing of requests for information; field decisions, submittals, substitutions, applications for payments, proposal request, change orders, and contract closeout procedures.
 - 4. Schedule and contract schedule requirements.

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a. Contractor shall prepare a preliminary construction schedule for initiating project execution strategies at the preconstruction meeting.

5. Construction facilities and controls provided by CSKT.
6. Materials provided by CSKT.
7. Temporary utilities provided by CSKT.
8. Survey and layout.
9. Security and housekeeping procedures.
10. Safety.
11. Environmental requirements.
12. Construction Stormwater Management.
13. Permit Requirements.
14. Quality control testing and quality control testing forms.
15. Procedures for testing.
16. Record documents.
17. Organization chart.

1.4 PROGRESS MEETINGS

- A. The COR will schedule and administer meetings throughout the progress of the Work at weekly intervals as agreed to with Contractor.
- B. Additional meetings may be called by either CSKT, COR, or the Contractor during any stage of the project when it is deemed necessary to raise any significant questions, establish new guidelines, introduce a new aspect to the project, or any other items that may affect the progress of work.
- C. Meetings and conferences may take place at the project site or some other location that is satisfactory to the CSKT, COR, and the Contractor.
- D. The COR will make arrangements for meetings, prepare agenda with copies for participants and preside at meetings.
- E. Attendance Required: Contractor's Project Manager, Superintendent, Contractor's Quality Control, Contractor's Safety and Health Officer, major Subcontractors and suppliers, CSKT representative, and COR, as appropriate for agenda topics for each meeting.

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F. All expenses associated with attending the meetings that are incurred by other than the CSKT and the COR shall be borne by the Contractor.

G. Agenda:

1. Review and approval of minutes of previous meetings.
2. Review of Work progress compared to planned progress from minutes of previous meeting.
3. Field observations, problems, conflicts, and decisions.
4. Identification of problems which may impede the schedule and proposed corrective actions.
5. Environmental issues.
6. Review of submittals schedule and status of submittals; expedite as required.
7. Revisions to project schedule and review of 2-week look ahead schedule.
8. Coordination of project schedules and projected progress.
9. Corrective measures and procedures to regain projected schedules.
10. Planned progress during succeeding Work period.
11. Maintenance of Quality, and Safety and Work standards.
12. Pending changes and substitutions.
13. Effect of proposed changes on progress schedule and coordination, and effect on other contracts of the project.
14. Other business relating to Work.

H. COR will record minutes; include significant proceedings and decisions and distribute copies after meeting to participants and those affected by decisions made for review and acceptance.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 DISTRIBUTION

A. Record Minutes shall be distributed to all meeting participants within two days of said meeting.

- END OF SECTION 01 31 00 -

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SECTION 01 32 00 – CONSTRUCTION PROGRESS DOCUMENTATION PART 1 -

- GENERAL

1.1 SECTION INCLUDES

- A. Construction photographs.
- B. Record Documents.
- C. Periodic site observation.

1.2 RELATED DOCUMENTS

- 1. General Conditions
- 2. Related Sections:
 - a. Section 01 77 00 - Contract Closeout

1.3 CONSTRUCTION PHOTOGRAPHS

- A. RSN 01 32 00-01 Submit photographs of major project components before the start and end of major phases of construction to meet following requirements:
 - 1. Take with high-resolution digital camera (12 Megapixels, or higher).
 - 2. Neatly label with date and component that photographs are depicting.
 - 3. Submit electronically in JPEG format and on compact disc with each progress payment.

1.4 RECORD DOCUMENTS

- A. Quality Assurance:
 - 1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.
- B. Accuracy of Records:
 - 1. Coordinate changes within record documents, make legible and accurate entries on each page of Specifications and each sheet of Drawings and other documents where such entry is required to show change.
 - 2. Document factual information regarding aspects of Work, both concealed and visible, to enable future modification of Work to proceed without lengthy and expensive site measurement, investigation, and examination.

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3. Make entries within 24 hours after receipt of information that change in Work has occurred.
4. Request COR's review and approval of current status of record documents, prior to submitting each request for progress payment.
5. Failure to properly maintain, update, and submit record documents may result in deferral by COR to recommend approval of whole or any part of Contractor's application for progress payment, either partial or final.

1.5 PERIODIC SITE OBSERVATION

- A. COR will make site observation in accordance with General Conditions.
- B. CSKT personnel on official business may visit site to monitor progress.
- C. CSKT will be available periodically for site observation – arranged by COR.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 MAINTENANCE OF AS-BUILT DOCUMENTS

- A. General:
 1. Promptly following commencement of Contract Time, secure from the Contracting Officer at no cost to the Contractor, one complete set of Contract Documents.
 2. Label or stamp each as-built document with title, "As-Built Documents," in neat large printed letters.
 3. Record information concurrently with construction progress.
 4. Do not cover or conceal Work until required information is recorded.
- B. Preservation:
 1. Maintain documents in clean, dry, legible condition and in good order.
 2. Do not use record documents for construction purposes.
 3. Make documents available at all times for observation by CSKT. Review documents with the COR at a minimum of a monthly basis.

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C. Entries on Drawings:

1. Date entries.
2. Use erasable colored pencil; clearly describe change by graphic line and note as required.
3. Color Coding:
 - a. Green when showing information deleted from Drawings.
 - b. Red when showing information added to Drawings.
 - c. Blue and circled in blue to show notes.
4. Call attention to entry by “cloud” drawn around area or areas affected.
5. Legibly mark to record actual changes made during construction, including, but not limited to:
 - a. Mark and dimension to show variations between actual construction and that indicated or specified in the Contract Drawings.
 - b. Details not in the Contract Drawings.
 - c. Depths of various elements of foundation in relation to finished slab data if not shown or where depth differs from that shown.
 - d. Horizontal and vertical locations of existing and new underground facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.
 - e. Location of existing facilities, piping, equipment, and items critical to interface between existing physical conditions or construction and new construction.
 - f. Roadway: Elevations of all roadway vertical and horizontal curves and tangents and geometries.
 - g. Ground surface elevations directly adjacent to concrete structures along the concrete walls.
 - h. Show all earthwork zones including limits of excavation and final grading.
 - i. Changes made by Addenda and Field Orders, Requests for Information, Submittals, Work Change Directive, Change Order, Written Amendment, and Contracting Officer's Representative's written interpretation and clarification

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using consistent symbols for each and showing appropriate document tracking number.

D. Dimensions on Schematic Layouts: Show on as-built drawings, by dimension, centerline of each run of items such as are described in previous subparagraph above.

1. Clearly identify item by accurate note such as "cast iron drain," "galv. water," and like.
2. Show, by symbol or note, vertical location of item ("under slab," "in ceiling plenum," "exposed," and like).
3. Make identification so descriptive that it may be related reliably to Specifications.

E. Specifications: Legibly mark and record for each product description of actual product installed if differs from that specified, including:

1. Manufacturer, trade name, and catalog model number of each product and item of equipment actually installed.

- END OF SECTION 01 32 00 -

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SECTION 01 32 10 – CONSTRUCTION PROGRAM SCHEDULING

PART 1--GENERAL

1.1 REFERENCE STANDARDS

- A. Associated General Contractors of America (AGC)
 - 1. AGC Manual Construction Planning and Scheduling Manual, 2004

1.2 DEFINITIONS

- A. Schedule: The Critical Path Method (CPM) of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the project.
- B. Project Calendar(s): Cross reference of numerical work days with calendar days. The project calendar serves as the basis for the day/date conversion and assigns work days and non-workdays.
- C. Resources: Equipment, labor or crews, materials, subcontractors, fabricators, manufacturers, and consultants.

1.3 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 - Submittals.
- B. RSN 01 32 10-01 Schedule Database Files
 - 1. Furnish database files in format compatible with Primavera P6 Professional Project Management.
 - 2. Furnish schedule and analysis data as a digital P6 file.
 - 3. Upon request, provide information and data used to develop and maintain the Construction Program to the COR.
- C. RSN 01 32 10-02 Contractor's Scheduling Representative
 - 1. Designation of authorized representative to develop and maintain Construction Program. Representative experienced in developing and maintaining construction schedules and knowledgeable of activities and progress on-site to develop and maintain accurate and reliable schedules.
- D. RSN 01 32 10-03 Baseline Schedule:
 - 1. Include:
 - a. Construction Program/Schedule database.

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- b. Definition of project calendars.
- c. Gantt chart (Bar chart) for project.
- d. Activity report including all logic constraints consisting of predecessors, successors, and constraint dates.
- e. Project Milestones
- f. Table listing equipment, manpower, and material limitations used to produce baseline schedule. This listing may be independent of the schedule database.
- g. Narrative report describing the schedule.

E. RSN 01 32 10-04 Monthly Schedule Update:

- 1. Include:
 - a. Construction Program database with updated activity and milestone data.
 - b. Definition of project calendars if revised from baseline calendars.
 - c. Gantt chart for project.
 - d. Narrative report specifically stating status of project.
 - 1) If negative float exists, cite specific actions and conditions which caused the "behind schedule" condition and provide proposed course of action to complete the project within the specified delivery time.
 - 2) List of Contractor-initiated changes to the current schedule stating the reason for the action taken and any unresolved issues relating to the Construction Program. CSKT reserves the right to reject Contractor-initiated changes to the current schedule which negatively impact any action which was initiated on the basis of the current schedule.

F. RSN 01 32 10-05 Submittal Register:

- 1. Register updated monthly includes submittals as listed in submittal table; revised submittals; dates and status. This register document is separate from the scheduling database.

G. RSN 01 32 10-06 Time Impact Analysis:

- 1. Include:
 - a. Construction Program database with proposed revised activity and milestone data.
 - b. Proposed revised schedule due to the change or delay with added, changed, or deleted activities highlighted.

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- c. Narrative report explaining results and conclusions.

1.4 GENERAL

- A. Develop, maintain, and use approved Construction Program to plan, monitor, evaluate, and report accomplishment of work.

1.5 SCHEDULES

- A. Prepare construction schedules using Critical Path Method, under concepts and methods outlined in AGC Manual. Use a computer software program to perform a mathematical analysis of the scheduling data.
 - 1. Use the Precedence Diagramming Method (PDM) in preparing the CPM networked schedule. Prepare schedule based on required sequence and interdependence of activities.
 - 2. Prepare detailed activity network for accomplishing required work organized by work breakdown structure.
 - 3. Activities except "Award" shall have predecessor activities and activities except "Contract Complete" shall have successor activities.
 - 4. Meet contract requirements; milestone(s) in accordance with the clause entitled "Commencement, Prosecution, and Completion of Work;" and funding constraints in accordance with the clause entitled "Limitation of Funds"
 - 5. Include work of subcontractors, CSKT interfaces, and contract milestones.
 - 6. Adjust Construction Program/schedule for seasonal weather conditions.
 - 7. If activity codes are utilized, use unique activity code names assigned as project codes rather than global codes. Utilize the Work Breakdown Structure in lieu of activity codes for general organization of the schedule.
 - 8. Define activities to a level of detail resulting in their durations being no greater than 20 workdays unless otherwise accepted by COR.
 - a. Durations for administrative activities (e.g., submittals and reviews, fabrication, manufacturing), or other specific activities identified in the contract will not be subject to the workday limitation.
 - 9. Include activities for review and approval. Assign CSKT submittal review activities to a seven-day calendar with durations as specified in Section 01 33 00
 - Submittals. Include activities for submittal preparation, submittal reviews, and fabrication or manufacturing activities when work involves significant quantities, long lead times, on the critical path, or as requested by the COR.
 - 10. Include contract title, contract number, and CSKT name on the transmittal cover sheet and each sheet of the Gantt chart.
 - 11. For each activity on the Gantt chart, display identification number, activity

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description, planned duration, start date, finish date, total float, and calendar identification.

12. Include table of abbreviations used in the schedule, listed and defined alphabetically.
13. Use finish to start logic relationships between activities. Do not utilize start to start, finish to finish, or start to finish logic relationships. Do not use negative lead or lag times.
14. Use durations in units of whole workdays.
15. Provide best estimate of time required to complete the activity considering the quantity of work and planned resources for the activity.
16. Equate durations of reviews and other identified actions to the maximum number of calendar days specified in their respective paragraphs.
17. Establish workday calendar(s) and use these in the schedule to translate the activity's workday duration into calendar dates. Use calendar names unique for this project, do not use software default calendar names. Save calendars as project calendars, not global calendars.

B. Baseline Schedule:

1. Represents Contractor's as-planned approach to accomplishing the work. Do not include actual start dates, percent completes, or actual finish dates.
2. Meets all requirements of the Construction Program.

C. Updated Schedule:

1. Meet monthly with COR at CSKT's project office, or at a location approved by the COR, to review progress made to the end date of the progress payment period. Establish dates that activities were started and completed and remaining duration for each activity started but not completed during the period.
 - a. Discuss and mutually agree upon changes to the schedule.
 - b. Update schedule and Construction Program database with mutually agreed upon changes.
2. Following receipt of an executed contract modification, incorporate the activity data and logic relationships stipulated in the modification into the current schedule for inclusion in the next scheduled progress update.
3. Assign a unique project file name for each schedule update.
4. Monthly updated schedules shall be submitted and approved before monthly progress payments may be submitted by the contractor.

1.6 TIME IMPACT ANALYSIS

- A. Provide a time impact analysis for contract changes, e.g., a change order, proposed modification, or value engineering change proposal to support a claim or request for

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- an equitable adjustment to the contract which involves a delay or accelerated schedule.
- B. The CO may use time impact analysis to determine if a time extension or reduction to the contract milestone dates is justified.
 - C. A time impact analysis is applicable whether the Contractor's current schedule milestone dates are the same as, earlier, or later than, those required under the contract.
 - D. Changes, additions, or deletions to activities; activity durations; or activity time frames will not automatically mean that an extension or reduction of contract time is warranted or due the Contractor.
 - E. Time extensions for performance will be considered only to the extent that the Contractor's current scheduled milestone dates exceed the contract milestone dates.
 - F. For activities directly affected by the change or delay, include the current and proposed items:
 - 1. Activity description.
 - 2. Types and quantities of major pieces of equipment, principal manpower, and pacing materials (materials that affect activity start, duration, or finish).
 - 3. Activity duration.
 - 4. A narrative containing the rationale used in developing the proposed logic relationships and activity data.
 - G. Float is not for the exclusive use by or benefit of either the CSKT or the Contractor.
 - H. Prepare a single time impact analysis for modifications issued after Notice to Proceed (NTP) and prior to approval of the baseline schedule. Submit the time impact analysis with the first progress update.
 - I. Perform time impact analyses using data in the most recent approved schedule prior to change or delay event.
 - 1. Prepare proposed revised schedule and narrative description describing and highlighting where changes or delays will be included.
 - 2. Prepare summary comparing the results of two schedule analyses: One using current schedule data from the last approved schedule prior to event requiring analysis, and one using proposed schedule data incorporating the changes or delays.
 - a. Show contract milestones and activities whose periods of performance

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have shifted as a result of any change which affects production and/or manufacture schedules, material orders, construction seasons, and labor and/or equipment utilization.

- b. Base mathematical analyses on status of work and available float at the time the CO directs or proposes a change to the work, the Contractor submits a value engineering change proposal, or when a delay occurs.

1.7 REVIEW AND EVALUATION

A. Baseline Schedule:

- 1. Within 21 calendar days after receipt of baseline schedule:
 - a. CO will accept or reject the proposed baseline schedule.
 - b. Upon request from the CO, meet with COR for a joint review of the proposed baseline schedule.
 - c. If schedule is rejected, revise and resubmit within 7 calendar days following the date of the rejection letter.
- 2. Do not proceed with onsite work, except mobilization and surveying, until baseline schedule has been approved.

B. Updated schedules:

- 1. CSKT will require up to 7 calendar days after receipt of each monthly update to review and approve or reject the updated schedule.
- 2. If the updated schedule is rejected, revise and resubmit updated schedule within 7 calendar days following the date of the rejection letter.
- 3. The COR will schedule a pre-submittal meeting with the contractor's representative each month to review a draft updated schedule prior to the contractor submitting RSN 01 32 10-3, Updated Schedule.

C. Failure to include any element of the work will not release Contractor from completing required work under the contract.

D. Performance will be evaluated by the CSKT using the approved CPM schedules.

1.8 FAILURE TO COMPLY

- A. Failure to comply with the requirements of this Section shall be grounds for a determination by the CO that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the specified time.

1.9 PART 2—PRODUCTS (NOT USED)

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1.10 PART 3—EXECUTION (NOT USED)

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SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 -- GENERAL

1.1 SUMMARY

- A. Provide submittals as required by the Contract Documents.

1.2 DEFINITIONS

- A. Product Data: Product Data includes standard printed information on materials, products and systems not specifically prepared for the Work, other than designation of selections from among available choices printed therein; this information is commonly referred to as cut sheets.
- B. Shop Drawings: Shop Drawings include specially prepared technical data for the Work, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to other contracts.
- C. Samples: Samples include both fabricated and unfabricated physical examples of materials, products and units of Work; both as complete units and as smaller portions of units of the Work; either for limited visual inspection or (where indicated) for more detailed testing and analysis.
- D. Miscellaneous Submittals: Miscellaneous Submittals related directly to the Work (non-administrative) include construction permits, Stormwater Management Plan (SWMP) requirements, Spill Prevention Control and Countermeasures Plan (SPCC), warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical Work records, quality testing and certifying reports, copies of industry standards, records, drawings, field measurement data, operation and maintenance materials, overrun stock; and similar information, devices and materials applicable to the Work and not processed as Product Data, Shop Drawings or Samples.

1.3 SUBMITTALS PROCEDURES

- A. Submittal requirements are presented in each appropriate section of the Specifications.
- B. In case of conflict between requirements of this section and requirements included elsewhere in Specification Divisions 01 through 34, the requirements included elsewhere take precedence.
- C. The Contractor shall provide all final approved Shop Drawings, Record Drawings, installation instructions, certified test reports, electrical and other schematics, drawings, data sheets, operations and maintenance manuals, and warranties and guarantees in digital electronic format. Materials available in digital format shall be furnished in accordance with the following:
 - 1. All textual data shall be provided in Adobe PDF format as approved by CSKT. All formatting and tabular data shall be preserved. Tabular data shall be embedded in the document in Microsoft Excel for windows.
 - 2. Materials not available in digital format (i.e., paper format) shall be scanned into legible digital format and cleaned to remove all smudges, fingerprints, artifacts, and

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other extraneous marks. All notes, version stamps, etc., shall be preserved. Scanning shall be done in CCITT Group 4 compression format. Scanning accuracy shall not be less than 400 dots per inch (dpi). Color maps shall be scanned in not less than the number of colors of the document or 256 colors whichever is greater. Color photographs shall be saved in not less than 16-grayscale levels. Documents shall be scanned in the existing color format of the document i.e., color documents shall be scanned in color, black and white or monochrome in grayscale.

3. All media transmittals shall be accompanied by a detailed paper printout of the files on each media. This printout shall consist of: file name, file size, date of creation, submittal number, and a brief but accurate description of the file.
4. The COR will mark each accepted paper submittal returned to the Contractor with the method of data conversion to be used for that document. The Contractor shall use that data conversion method so indicated. Converted documents shall be submitted to the COR for acceptance. Documents found to be unacceptable shall be converted as required, at the Contractor's expense, to produce an acceptable final document.
5. Contractor shall retain hardcopies of submittal originals unless requested by the COR.
6. The COR will retain hardcopies original of submittal response unless requested by Contractor.

1.4 QUALITY ASSURANCE

- A. The COR shall review submittals only for general conformance with the design concept. Such review by the COR shall not relieve the Contractor or any subcontractor of responsibility for full compliance with Contract requirements; for correctness of dimensions, clearances and material quantities; for proper design of details; for proper fabrication and construction techniques; for proper coordination with other trades; and for providing all devices required for safe and satisfactory construction and operation.
- B. Submittals reviewed by the COR and returned to the Contractor will be marked with one of the following designations:
 1. "APPROVED": formal revision and resubmission by Contractor will not be required.
 2. "APPROVED AS NOTED": Contractor shall make the corrections on the submittal, but formal revision and resubmission will not be required.
 3. "REVISE & RESUBMIT": If a submittal is returned marked "REVISE & RESUBMIT," it shall mean either that the proposed material or product does not satisfy the specification, the submittal is so incomplete that it cannot be reviewed, or is a substitution request not meeting the required specification. Contractor shall prepare a new submittal and submit an electronic copy.
- C. The Contractor shall not proceed with procurement, manufacture or fabrication of items for review until such submittals have been designated by the COR as "APPROVED" or "APPROVED AS NOTED," unless specifically authorized to do so by the COR in writing.
- D. Processing of Accepted Submittals:
 1. Each copy of the submittal so designated by the COR will be identified accordingly by being stamped and dated.

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2. The COR will return an electronic copy to the Contractor.
 3. Construction shall be carried out in accordance therewith and no further changes made therein except upon written instructions from the COR. Submit final drawings to the COR in electronic format as specified in these Contract Documents.
- E. Processing of Submittals not Accepted:
1. If corrections to the submittals are required, the COR will return an electronic copy to the Contractor for correction.
 2. Resubmissions will be handled in the same manner as first submissions. Direct specific attention, in writing or on the resubmittal, to revisions other than the corrections requested by the COR on previous submittals using the notation specified in Paragraph 3.1 of this Section.
 3. The Contractor shall promptly notify the COR, if any correction or notation indicated on submittals constitutes a change of the Contract requirements.
 4. Work indicated on submittals marked "APPROVED AS NOTED" may be carried out in accordance with all notations.

1.5 SUBMITTAL SEQUENCING AND SCHEDULING

- A. Coordinate preparation and processing of submittals with performance of the Work so that Work will not be delayed by submittal review process.
1. No time extension will be allowed if the Contractor fails to make complete approval submittals in sequence and within time periods specified.
- B. Coordinate and sequence different categories of submittals for the same Work, and for interfacing units of Work, so that one will not be delayed for coordination with another.
- C. The Contractor shall make all submittals far enough in advance of scheduled installation dates to provide all time required for reviews, for possible revisions and resubmittals, and for placing orders and securing delivery.
- D. Timing of submittals shall allow for review time by the COR.
1. Contractor scheduling will include preparation of a submittal schedule to be coordinated with the Contractor's construction sequencing and scheduling, including allowance for COR review time.
 2. The Contractor shall allow for 14 days for the COR to review all submittals, unless noted otherwise.
- E. The CO may extend the contract completion date to allow for additional time for completing work affected by excess review time. The extension will be to the extent that excess review time caused delay to the contract completion date. The time will not exceed the time used in excess of the specified number of days for review of submittals or resubmittals.
1. Concurrent days of excess review time resulting from review of two or more separate submittals or resubmittals will be counted only once in extending the contract completion date.

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- F. Adjustment for delay will be made only to the extent that:
 - 1. Acceptance was required under the contract, and
 - 2. Requests for approval were properly and timely submitted and were accepted.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 SUBMITTAL PROCEDURES

- A. Whenever submittals are required by the Contract Documents or at the COR's request, all such Contractor's submittals shall be submitted to the COR.
- B. Within 10 days after the Notice of Award, but prior to the pre-construction meeting, the Contractor shall submit the following items to the COR for review.
 - 1. RSN 01 33 00-01 A preliminary schedule of shop drawing submittals.
 - 2. RSN 01 33 00-02 A list of all permits and licenses the Contractor shall obtain indicating the permitting agency, the type of permit, the expected date of application for the permit, required date for receipt of the permit, and permit fee.
- C. The Contractor shall allow for a total of 14 days for the COR review of all submittals.
- D. All submittals shall be transmitted with pre-printed cover sheet of as provided by the CSKT, dated and signed, with the job title and Section(s) of the Specification requiring the submittal clearly indicated. Only one submittal may be submitted under a cover sheet. The forms shall be sequentially numbered.
- E. The Contractor shall certify by signing the submittal that review, verification of products required, field dimensions and coordination of information is in accordance with the Work as specified in the Contract Documents.
- F. Submittals shall be processed in accordance with this section.
- G. Identify specific variations from the Contract Documents and Product or system limitations, which conflict or may be detrimental to successful performance of the completed Work.
- H. Provide space for the Contractor's and COR's review stamps. Submittals shall contain Contractor's executed review and approval marking. Submittals which are received from sources other than through Contractor's office or do not contain the Contractor's approval marking will be returned "without action."
- I. Revise and submit resubmittal as required and identify all changes made since the previous submittal. Submission of resubmittals shall be performed in a similar manner as that of the submittals described in Paragraph 1.4E of this section.
 - 1. Resubmittals shall have the original number together with an alphabetic suffix (A, B, etc.) indicating the number of resubmittals, where appropriate.
- J. Specifically identify and list components, items, procedures, etc. which are a proposed alternative or substitution to specification requirements.

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1. Transmitted submittal's that do not identify and request approval of alternative or substitute items will be returned "without action".

K. Distribution:

1. Electronically transmit submittals required by Table 01 33 00 A – List of Submittals to the COR, CSKT, and to all Subcontractors whose work will interface with the subject of the submittal.
 - a. Submit in pdf format
 - b. Email submittals less than 9 MB to CSKT staff
 - c. Upload submittals more than 9 MB to ftp site as presented by CSKT
 - 1) CSKT will provide uploading instructions after contract award.
 - 2) Notify CSKT and COR within 1 hour of uploading submittals to the ftp site, via email.
2. Provide additional distribution of submittals (not included in other copy submittal requirements specified in this Section) to subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for performance of the Work.
 - a. Include such additional copies in transmittal to COR where required for status before final distribution, and show such distribution on transmittal form.

3.2 PROPOSED PRODUCT LIST

- A. RSN 01 33 00-03 Within 30 days from execution of the Agreement between CSKT and Contractor, submit complete list of major products proposed for use (supplied by Contractor but not supplied by CSKT), with name of manufacturer, trade name, and model number of each product, and the lead time for procurement, fabrication and delivery of all products with a lead time of more than 30 days.
- B. For products specified only by reference standards, give manufacturer, trade names, model or catalog number, and reference standard.

3.3 PRODUCT DATA, SHOP DRAWINGS

A. Product Data:

1. Collect required data into one submittal for each unit of Work or system; and mark each copy to show which choices and options are applicable to the Work. Include manufacturer's standard printed recommendations for application of labels and seals, notation of field measurements which have been checked, and special coordination requirements.
2. Maintain one set of Product Data (for each submittal) at project site, available for reference by COR and others.
3. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide all information unique to this Project.

4. After review, distribute in accordance with Paragraph 3.1 of this section.

B. Shop Drawings

1. Reproduce and distribute in accordance with Paragraph 3.1 of this section and for Record documents described in Section 01 77 00: Contract Closeout.
2. Shop Drawings and Data may include detail design calculations, shop-prepared drawings, fabrication, and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items.
3. Drawings and data shall be prepared in the English language and labeled with the contract number and title. Items to be furnished shall be marked on manufacturer's data for commercial products or equipment, such as catalog cut sheets. The manufacturer's name, type, model, size, and characteristics shall be identify and the Contractor shall illustrate that the product or equipment meets requirements of the Specifications. The Shop Drawings and Data shall be marked in a manner that will photocopy and any items that do not apply shall be crossed out.
4. Whenever the Contractor is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of an engineer registered in the appropriate discipline and in the State of Montana, unless otherwise indicated.

3.4 AS-BUILT DRAWINGS

- A. The As-Built Drawings shall, at a minimum contain identified information in the title block including the contract number and title, drawing number, and revision information. The Contractor will be allowed to provide neat and accurate As-builts in Adobe PDF, or equivalent, format with electronic mark-ups.
- B. Measurement units shall either be in US Customary Units or SI metric as appropriate for feature of work.
- C. The Contractor shall submit one set of all As-Built Drawings for review and approval by the COR in digital electronic format as specified in Section 1.3.C and Specification 01 32 00.

3.5 CONTRACTOR'S DAILY REPORTS

- A. Provide the COR with electronic copies of each daily report. These reports shall include, at a minimum, the following:
 1. The number of craftsmen and hours worked by each Subcontractor.
 2. The number and hours worked by each trade.
 3. The number and hours worked of each type of equipment.
 4. A description of work activities performed.
 5. A description of any material or equipment deliveries.
 6. Description of obstructions encountered.

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7. Temperature and weather conditions.
 8. Testing and start-ups performed.
 9. Training conducted.
 10. Selected photographs of the activities during the day
 11. Water quality monitoring activities and turbidity readings.
 12. Citation of any Corrective Action Requests issued.
 13. Citation of any work rejected or defects noted.
- B. Submit daily reports to the COR at weekly intervals. Information provided on the daily report shall not constitute notice of delay or any other notice required by the Contract Documents. Notice shall be as required therein.

3.6 MISCELLANEOUS SUBMITTALS

- A. Construction Permits
1. Acquire, maintain, and submit copies of all construction permits that are required by agencies to execute the Work.
- B. Manufacturers' Instructions:
1. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing in quantities specified herein.
 2. Identify any conflicts between manufacturers' instructions and Contract Documents.
- C. Manufacturers' Certificates:
1. When specified in individual specification Sections, submit manufacturers' certificates to COR, in quantities specified herein.
 2. Indicate that a material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 3. Certificates may be recent or previous test results on material or product, but must be acceptable to COR. If these are outdated and/or not acceptable to COR, the Contractor shall submit to the COR the new certificates and test results on materials or product.
- D. Tests and Test Reports:
1. Classify each as either "project related" or Product Data, depending upon whether report is uniquely prepared for project or a standard publication of workmanship control testing at point of production, and process accordingly.
 2. All test equipment used shall be verified to be in calibration at the time of each test and test reports shall so indicate. No test shall be made without such verification.

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E. Standards:

1. Where copy submittal is indicated, and except where specified integrally with Product Data submittal, submit a single copy for COR's use.
2. Where workmanship at project site and elsewhere is governed by standards, furnish transmit electronic copy to fabricators, installers and others involved in performance of the work.

3.7 REQUIRED SUBMITTAL TABLE (FOR INFORMATIONAL USE ONLY)

The following is a summary table (provided for informational use only) lists required submittals identified in the Specifications. This table is provided as a convenience for tracking submittals for the Project only and does not serve as a substitute for identifying and providing submittals within the Specifications that have not been identified by a Required Submittal Number (RSN).

RSN	Submittal Description	Time of Submittal
RSN-1	Bid Preparation Worksheets	5 days before Award
RSN-2	Performance Bond	Within 14 days of Award
RSN-3	Payment Bond	Within 14 days of Award
RSN-4	General Liability Insurance	Within 14 days of Award
RSN-5	Safety Program	Prior to construction activities
RSN-6	Quality Control Plan	Prior to construction activities
RSN-7	Warranty Certifications	Prior to Final Payment
RSN-8	Invoice Certification & Request for Payment	Monthly or as agreed upon by COR
RSN-9	Final Payment & Release of Claims	Upon project completion
RSN-10	Indian Employment Compliance Plan	Prior to construction activities of General or subcontractors
RSN-11	Indian Employment Plan Monthly Status Report	Monthly
RSN-12	Subcontractor Agreement and Acknowledgement	14 days prior to a subcontractor commencing construction activities
RSN-13	Certified Payrolls	Weekly
RSN -14	Vehicle Maximum Weight on Crow Creek Bridge	Prior to any construction activities
01 14 10-01	Pre-mobilization Site Photos	Prior to any mobilization activities
01 14 10-02	Land Use and Landscape Rehabilitation Plan	Prior to any mobilization activities
01 22 50-01	Schedule of Values	Within 30 days of receiving the Notice to Proceed
01 32 00-01	Construction Photographs	Before starting and after ending major phases of construction
01 32 10-01	Schedule Database Files	Prior to any construction activities

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01 32 10-02	Contractor's Scheduling Representative	Prior to any construction activities
01 32 10-03	Baseline Schedule	Prior to any construction activities
01 32 10-04	Monthly Schedule Update	Every Month
01 32 10-05	Submittal Register	Prior to any construction activities
01 32 10-06	Time Impact Analysis	As necessary
01 33 00-01	Preliminary schedule of shop drawings	Within 10 days of Notice of Award
01 33 00-02	List of Permits and Licenses	Within 10 days of Notice of Award
01 33 00-03	List of Major Products	Within 30 days of Notice of Award
01 35 10-01	LHM and MSDS	Prior to any construction activities
01 35 20-01	Contractor's Health and Safety Plan	Prior to any construction activities
01 35 22-01	Medical Facilities Plan	Prior to any construction activities
01 40 00-01	Daily Quality Control Testing	Prior to any construction activities
01 40 00-02	Field and Laboratory Test Results	Prior to any construction activities
01 40 00-03	Contractor Daily QC Reports	Prior to any construction activities
01 40 00-04	Contractor Quality Control Plan	Prior to any construction activities
01 41 10-01	Indian Preference Compliance Form	Prior to any construction activities
01 50 00-01	Field Offices, Staging, Storage and Laydown Areas	Prior to any mobilization activities
01 55 20-01	Contractor's Traffic Control and Road Closure Plan	Prior to any construction activities
01 57 13-01	Diversion Plan	Prior to any construction activities
01 57 30-01	Storm Water Management Plan	Prior to any construction activities
01 57 30-02	Spill Prevention Control and Countermeasure Plan	Prior to any construction activities
01 71 23-01	Survey Plan	Prior to any construction activities
01 71 23-02	Survey Closeout Certificate	Submitted at the end of the project
01 74 00-01	Test Results on Unknown Wastes	As necessary
01 74 00-02	Hazardous Waste Manifest	As necessary
01 74 00-03	Waste Production and Disposal Records	As necessary
01 74 00-04	Environmental Consultant Resume	Prior to any construction activities
01 74 00-05	Environmental Site Assessment	Prior to any construction activities
01 77 00-01	Certification at Closeout	Upon closeout
01 77 00-02	Final Application for Payment	Upon closeout
01 77 00-03	Record Documents	Upon closeout
02 41 13-01	Selective Site Demolition	Prior to any demolition activities

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03 10 00-01	Formwork Drawings and Calculations	Prior to any formwork activities
03 10 00-02	Product Data for Formwork Accessories	Prior to any formwork activities
03 10 00-03	Product Data for Formwork Materials	Prior to any formwork activities
03 21 00-01	Reinforcing Steel Shop Drawings	Within 14 days of receiving Notice to Proceed
03 21 00-02	Reinforcing Steel Couplers	Within 14 days of receiving Notice to Proceed
03 30 00-01	Concrete Mix Designs	Within 30 days of receiving the Notice to Proceed
03 30 00-02	Concrete Delivery Tickets	During concrete placement
03 30 00-03	Concrete Constituents Test Data	Within 30 days of receiving the Notice to Proceed
03 30 00-04	Concrete Placement Drawings	Within 30 days of the concrete placement
03 30 00-05	Certified Sealant Test Reports	Prior to installing joint sealant
03 30 00-06	Concrete Accessories Product Data	Prior to beginning concrete work
03 30 00-06A	Product Data: Preformed Joint Filler	Prior to beginning concrete work
03 30 00-06B	Product Data: Waterstop	Prior to beginning concrete work
03 30 00-07	Waterstop Samples and Welding Certifications	Prior to beginning concrete work
03 30 00-08	Concrete Accessories Certificates	Prior to beginning concrete work
03 30 00-09	Concrete Placement Plan	Prior to beginning concrete work
03 30 00-010	Concrete Pumping Equipment	Prior to beginning concrete work
03 30 00-011	Concrete Vibrators Product Data	Prior to beginning concrete work
03 41 00-01	Concrete Mix Designs	Prior to pre-casting of concrete and within 30 days of Notice to Proceed.
03 41 00-02	Shop Drawings	Prior to pre-casting of concrete.
03 41 00-03	Precaster Plant Certification	Prior to pre-casting of concrete.
03 62 00-06	Manufacturer's Representative Contact Info	Prior to using any grouts
31 23 00-01	Source Quality Control Submittals	30 Days prior to Excavation

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31 23 00-02	Excavation and Fill Plan	60 Days Prior to Excavation
31 34 19-023	Geotextile Installation Plan	Prior to using any geotextiles
31 34 19-034	Geotextiles Samples	Prior to using any geotextiles
31 34 19-045	Geotextiles Certifications	Prior to using any geotextiles
31 37 00-01	Riprap PlacementPlan	60 days prior to riprap placement
32 92 00-01	Seed MixtureCertification	Prior to revegetation activities
32 92 00-02	Fertilizer Identification and Certification	Prior to revegetation activities
32 92 00-03	Mulch Certification	Prior to revegetation activities
32 92 00-04	Delivery Schedule	10 days prior to delivery of materials
32 92 00-05	Revegetation Reports	Prior to revegetation activities
32 92 00-06	Revegetation Materials Certifications	Prior to revegetation activities

- END OF SECTION 01 33 00 -

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SECTION 01 35 10 MATERIAL SAFETY DATA SHEETS PART 1--

GENERAL

1.1 MEASUREMENT AND PAYMENT

- A. Cost:
 - 1. Include in prices offered in the schedule for other items of work.

1.2 DEFINITIONS

- A. LHM: List of Hazardous Materials.
- B. MSDS: Material Safety Data Sheet.

1.3 SUBMITTALS

- A. RSN 01 35 10-01 Submit the following in accordance with Section 01 33 00 – Submittals.
- B. LHM and MSDS (Original list and updated):
 - 1. Comply with paragraph (b) of FAR Clause 52.223-3, Hazardous Material Identification and Material Safety Data - Alternate 1 – submit list of any hazardous materials.
 - 2. Comply with paragraph (c) of FAR Clause 52.223-3, Hazardous Material Identification and Material Safety Data - Alternate 1 – update the list of any hazardous materials.

1.4 DELIVERY

- A. Do not deliver hazardous materials to jobsite which are not included on the original or previously updated LHM and MSDS before receipt of updated LHM and MSDS by COR.
- B. Maintain an updated LHM with physical copies of MSDS sheets on-site and in a location which is easily accessible to the COR and CSKT.

PART 2--PRODUCTS (NOT USED)

PART 3--EXECUTION (NOT USED)

- END OF SECTION 01 35 10 -

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SECTION 01 35 20 – SAFETY AND HEALTH

PART 1--GENERAL

1.1 MEASUREMENT AND PAYMENT

- A. Cost: Include in prices offered in the schedule for other items of work.

1.2 REFERENCE STANDARDS

- A. OSHA
1. OSHA 1910, General Industry Standards.
 2. OSHA 1926, Construction Industry Standards.
 3. 29 CFR 1910.146, Confined Spaces.
 4. 29 CFR 1910.147, Control of Hazardous Energy (Lockout/Tagout).

1.3 PROJECT CONDITIONS

- A. RSN 01 35 20-01 Submit Contractor's Health and Safety Plan
- B. Comply with all provisions of the clauses entitled "Accident Prevention" and "Safety and Health."
1. Remove employees and supervisors who refuse or repeatedly fail to comply with or enforce compliance with this Section and requirements of RSHS.
 2. Remove non-compliant employees and supervisors as directed by COR.
 3. CSKT will not be liable for any costs associated with directed removal of employees and supervisors under provisions of this Section.
- C. Provide and maintain a work environment and procedures to:
1. Safeguard the public, CSKT and their agents exposed to Contractor operations and activities.
- D. Do not require persons employed in performance of this contract, including subcontracts, to work under conditions which are unsanitary, hazardous, or dangerous to the employee's health or safety.

PART 2--PRODUCTS (NOT USED)

PART 3--EXECUTION

GENERAL

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- A. Hard hats, steel toed boots, and eye protection shall be worn in the Contractor Use Area, active construction areas, and areas along haul routes and access roads.

3.1 HIGH VISIBILITY APPAREL

- A. High visibility apparel shall be worn in the Contractor Use Area, active construction areas, and areas along haul routes and accessroads.
- B. Onsite personnel not in equipment: Wear daytime/nighttime high-visibility vest with at least 2 combination stripes made of 3-M Scotchlite yellow fluorescent cloth class 2 or greater.

- END OF SECTION 01 35 20 -

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SECTION 01 35 22 – FIRST AID AND MEDICAL SERVICES

PART 1--GENERAL

1.1 MEASUREMENT AND PAYMENT

- A. Cost: Include in prices offered in the schedule for other items of work.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 – Submittals.
- B. RSN 01 35 22-01 Medical Facilities Plan:
 - 1. Plan for providing medical attention for injured or disabled employees, including ambulance service and “Flight for Life” helicopter service.
 - 2. Include onsite emergency facilities and ambulance service.
 - 3. Plan for providing phone service.

1.3 AMBULANCE SERVICE

- A. Arrange for dependable ambulance service.

1.4 HELICOPTER SERVICE

- A. Arrange for ambulance helicopter services, at the nearest location, to be available for duration of work under this contract.

1.5 PHONE SERVICE

- A. Provide phone service capable of reaching 911.

1.6 AVAILABILITY

- A. Make facilities and services available for providing emergency aid to Contractor and subcontractor employees.

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- B. Service shall be made available for providing emergency care to CSKT personnel and their Agents, and to the general public under the following conditions:
1. Provide services free of charge to CSKT personnel and their Agents injured on job.
 2. CSKT personnel and their Agents, unless injured on the job, and general public may be charged fees for rendered services based on reasonable and established fee rates.

PART 2--PRODUCTS (NOT USED)

PART 3--EXECUTION (NOT USED)

-END OF SECTION 01 35 22-

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SECTION 01 35 53 – SECURITY MEASURES

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. Lockout/Tagout.
- B. Contractor's tools.
- C. Facility security.

1.2 RELATED SECTIONS

- 1. Section 01 14 10 – Use of Site.

1.3 LOCKOUT/TAGOUT

- A. Owner operates under strict Lockout/Tagout system. Lockout sensitive equipment, switches, and instruments with keyed lock and tag with following information:
 - 1. Name and Date of Lockout.
 - 2. Reason for Lockout.
 - 3. Contact Phone Number.
- B. Owner may also Lockout these components with separate lock with similar information. Locks may be removed only by person who installed them.
- C. Contractor's Tools, Equipment and Materials:
 - 1. Provide lockable storage container for tools that will be stored on site.
 - 2. Provide secure storage of all equipment and materials.
 - 3. CSKT is not responsible for lost or stolen tools, equipment or materials.

1.4 FACILITY SECURITY

- A. Follow requirements for site access as outlined in SECTION 01 14 10 – USE OF SITE.
- B. Close and lock entrances to facility to prevent entry from unauthorized personnel.
- C. If any vandalism or other actions threatening to the security of the jobsite are witnessed, Contractor shall immediately notify:
 - 1. Tribal Police: CSKT Tribal Law Enforcement, Tribal Complex, P.O. Box 278, Pablo, MT 59855, 406-675-4700;

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2. Lake County Sheriff: 106 4th Ave E. Polson, MT, 406-883-7279; and
3. COR:
 - a. During business hours: Given after contract is awarded.
 - b. After business hours: Contract CSKT Monitoring Center, 406-676-2604.

1.5 SITE ACCESS

- A. Site access as identified in Drawings will be via an uncontrolled access road with no locked gates.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION 01 35 53 -

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SECTION 01 40 00 – QUALITY CONTROL

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance/quality control of installation.
- B. References.
- C. Field samples.
- D. Inspection and testing laboratory services.
- E. Manufacturer's field services and reports.

1.2 RELATED SPECIFICATION SECTIONS

- A. Section 01 33 00: Submittals
- B. Section 01 41 10: Regulatory Requirements
- C. Section 01 42 10: Reference Standards
- D. Section 31 23 00: Excavation and Fill
- E. Section 03 30 00: Cast-In Place Concrete

1.3 SUBMITALS

- A. Provide Quality Control (QC) submittals in accordance with the Contract Documents.
- B. RSN 01 40 00-01: Daily Quality Control Testing
 - 1. The Contractor shall submit the results of all Quality Control testing done at the start of the following day's shift on which the Quality Control testing was completed.
- C. RSN 01 40 00-02 Field and Laboratory Test Results
 - 1. The Contractor shall coordinate with the COR to provide QC field and laboratory test submittals in a document type and format which can be easily reviewed and incorporated into a database by the COR. If requested by the COR, the Contractor shall provide QC information in a spreadsheet or word processor file format (e.g. Microsoft Word, Microsoft Excel).
- D. RSN 01 40 00-03 Contractor Daily QC Reports
 - 1. The Contractor shall submit a Daily QC Report to the COR. The report shall include items specified in Section 01 33 00 – Submittal Procedures.

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E. RSN 01 40 00-04 Contractor Quality Control Plan

1. The Contractor shall submit a Construction Quality Control Plan for review and acceptance of the COR. The Construction Quality Control Plan shall include but not be limited to the following items:
 - a. Identification of responsible parties and Contractor quality control personnel. Contractor's Quality Control Manager responsible for overseeing all QC operations for the Project.
 - b. The name, qualifications, duties, authorities, and responsibilities of each person assigned a QC function. Qualifications shall be presented in a complete resume format which includes relevant education, experience, and dates for both.
 - c. Summary of proposed training for each person assigned a QC function.
 - d. List of proposed quality control testing equipment and instruments. Include pertinent information such as manufacturer and model number.
 - e. Verification, calibration, and certification data of all proposed quality control equipment, in accordance with the relevant test standards.
 - f. Identification of testing laboratories and contractors used to perform testing and inspections required in the Specifications and needed to ensure the Work is performed in accordance with the requirements of the Contract Documents.
 - g. A summary of QC activities including the observations and testing that will be used to monitor the construction and/or installation of the Work. Include a summary of proposed material sampling methods for specific material types and material locations and a summary of proposed quality control testing methods and test frequencies.
 - h. Outline of procedures utilized for quality control inspections.
 - i. Proposed field and laboratory testing report forms for all required tests.
 - j. Proposed inspection report forms for all anticipated field inspection activities.
 - k. Proposed quality control submittal processes, including submittal frequency, organization, and transmittal method.

1.4 QUALITY CONTROL/ASSURANCE OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step, in sequence.

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- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from COR before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified regulatory requirements indicate higher standards or more precise workmanship. If codes referred to within these specifications have been superseded by a newer code, the requirements of the latest code shall apply. Specific quality assurance and quality control requirements are provided in each individual specification section.
- E. Provide and maintain competent staff of experienced construction, administrative and supervisory personnel in sufficient numbers to meet contract completion date. Work shall be performed by persons qualified to produce workmanship of specified quality.
- F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, winds, physical distortion, or disfigurement.
- G. References:
 - 1. For products or workmanship specified by association, trades, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
 - 2. Obtain copies of standards when required by Contract Documents.
 - 3. Should specified reference standards conflict with Contract Documents, request clarification from COR before proceeding.
- H. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- I. Field Samples:
 - 1. Install field samples at the site as required by individual specification Sections for review.
 - 2. Acceptable samples represent a quality level for the Work.
 - 3. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by COR.

PART 2 -- PRODUCTS

2.1 EQUIPMENT

- A. Provide quality control testing equipment and instruments necessary to complete the Work in accordance with the Contract Documents and the Construction Quality Control Plan.

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- B. The testing laboratory must have written evidence of proper calibration for instruments in accordance with the relevant testing standards.
- C. Field testing equipment must have evidence of proper calibration and verification in accordance with the relevant testing standards.

PART 3 -- EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Perform materials testing and inspections to evaluate materials and the Work for compliance with the Contract Documents. Contractor shall designate a QC manager responsible to oversee QC activities and inspections.
- B. Materials testing will be performed to evaluate placed materials for quality control and quality assurance purposes.
- C. Where tests reveal non-conformance with the requirements of the Contract Documents, further testing will be performed to delineate the limits of non-conformance and required corrective measures to the satisfaction of the COR. Corrective measures to the extent of complete replacement of material shall be made by the Contractor until conformance is achieved at no cost to CSKT.
- D. Additional testing may be required if the results of QC field or laboratory tests or observations indicate significant variability in the material characteristics or construction methods.
- E. Testing shall be performed in accordance with the methods and frequencies specified in the Contract Documents, including any increment of the listed test frequencies.
- F. Laboratory testing performed on non-representative samples of material shall not be considered when evaluating compliance with the required test frequencies.
- G. The Contractor shall record all required information for all QC testing performed and submit them to the COR in accordance with the Contract Documents.
- H. The Contractor shall maintain onsite copies of the Specifications and relevant design documents.
- I. Contractor shall obtain samples of material from stockpiles and from in-place materials for testing. The Contractor shall also conduct density tests on earth fill materials and concrete materials to be placed by the Contractor. The COR or their designated representative will also conduct tests on materials placed by the Contractor. Contractor shall provide COR access and assistance in obtaining samples.
- J. The Contractor shall assist the COR in obtaining samples for QA testing. Assistance will include excavation test trenches and excavations, providing construction equipment for mixing and sampling, and providing access to stockpile and work areas for testing and sampling as required by the COR.

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- K. The COR may inspect Contractor's off-site concrete batch plants, aggregate producing plants, and all other off-site producers of materials and products. Contractor shall provide access to these off-site facilities to the COR or their designated representative at all times during the Work.
- L. As requested by the COR in the field, the Contractor shall verbally notify the Engineer of field test results.

3.2 COORDINATION

- A. Carefully review Contract Documents and report to COR any error, omission, conflict, inconsistency or code violation discovered.
- B. Require Subcontractors to comply with requirements of Contract Documents.
- C. Await written instructions for the COR prior to correcting conflicts or problems identified.

3.3 SCHEDULING

- A. Furnish detailed time schedule of operations for the Work. Monitor schedule as Work progresses and revise schedule at appropriate intervals, or as requested by COR, to reflect actual progress.

3.4 INSPECTION AND TESTING LABORATORY SERVICES

- A. The Contractor shall perform quality control testing and inspection of the Work using a qualified tester as specified in the relevant sections.
- B. Contractor shall provide and designate competent, experienced personnel to perform quality control reviews of Work. Responsibilities of the quality control reviewer(s) is as follows:
 - 1. Review Work by Contractor
 - 2. Verify that Work is ready for COR's review
 - 3. Schedule reviews with COR
 - 4. Be responsible in conjunction with Contractor's superintendent for correction of non-conforming work.
- C. If Contractor fails to provide competent and experienced personnel to perform Quality Control reviews, CSKT will retain services of required staff and deduct their fees from periodic progress payments due to the Contractor.
- D. The COR will perform quality assurance inspection and testing of the Work performed by the Contractor.

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- E. Reports will indicate observations and results of tests and indicate compliance or non-compliance with Contract Documents.
- F. Quality control testing shall be performed by an Independent Testing Laboratory (ITL) retained by the Contractor. The ITL shall meet the requirements of ASTM E329, Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction. The ITL shall provide adequate site facilities for the required testing. All ITL personnel assigned to the project shall meet the specified qualifications. The Contractor shall submit the proposed facilities, list of equipment, and qualifications of the ITL to the COR for approval.
- G. Contractor shall cooperate with COR; furnish samples of materials, mix designs, equipment, tools, storage and assistance as requested.
 - 1. Notify COR 24 hours prior to expected time for operations requiring inspection and testing services. If proper notice is not given, the COR reserves the right to stop work and all additional costs associated with this stoppage shall be borne by the Contractor.
- H. Retesting required because of non-conformance to specified requirements shall be performed by the Contractor at no additional cost to the CSKT.

3.5 INSPECTION AND TESTING REPORT FORMS

- A. Indicate compliance or non-compliance with Contract Documents on inspection and testing report forms.
- B. Indicate observations and results of tests on inspection and testing report forms.
- C. Indicate sampling method, sampling location, and material source on testing report forms for sampled materials.
- D. Include applicable requirements of the Contract Documents on inspection and testing report forms.
- E. Inspection and test report forms shall comply with the reporting requirements of the relevant testing standards.
- F. Inspection and test report forms and tests shall be sequentially numbered.

3.6 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified in individual specification Sections, provide material or product suppliers, or manufacturers' qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, and start-up of equipment, as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of manufacturer's observer to COR 30 days in advance of required observations. Observer subject to approval of COR.

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- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Submit report in accordance with Section 01 33 00 - Submittal Procedures, within 30 days of observation to COR for review.

- END OF SECTION 01 40 00 -

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SECTION 01 41 10 – REGULATORY REQUIREMENTS

PART 1--GENERAL

1.1 SECTION INCLUDES:

- A. Contractor obtained permits
- B. Tribe obtained permits

1.2 CONTRACTOR OBTAINED PERMITS

- A. The Contractor shall familiarize with the conditions and requirements of all permits that are required by Federal, State, Tribal, and local governing agencies. The Contractor shall comply with the conditions and the requirements of all permits in the performance of this Contract. If Contractor fails to comply with the conditions and requirements of any permit and such failure to comply results in fines, penalties, and/or suspension of work by a regulatory agency, all liability for such fines, penalties and delays shall be the sole responsibility of the Contractor.
- B. The information set forth for the following Contractor obtained permits is provided to aid the Contractor in obtaining the required permits. The Contractor is responsible for researching permit requirements and obtaining the permits listed plus such other permits as may be required by Federal, State, Tribal, and local law. Duly executed copies of all permits obtained by the Contractor shall be submitted to CSKT for information only.
- C. The COR may stop any construction activity in violation of CSKT, Federal, State, or local laws and additional expenses resulting from work stoppage will be responsibility of Contractor.
- D. Contractor shall conform to the most stringent requirements, in case of conflict between regulations.
- E. CSKT Employment:
 - 1. Comply with the provisions of contract clause I.7.3 (c) entitled "Indian Preference - employment" and the Confederated Salish and Kootenai Tribes Indian Preference Ordinance 101 A and Regulations.
 - 2. RSN 01 41 10-01- Submit Indian Preference Compliance Form

1.3 TRIBE OBTAINED PERMITS

- A. The Tribe has elected to source as many permits as practical in advance of construction.

1.4 RESPONSIBILITY AND COORDINATION

- A. The Contractor shall accept full responsibility for contacting all Federal, State, Tribal, and local agencies to obtain permitting requirements for construction related activities on lands under jurisdiction by those agencies and shall be fully responsible to research and become familiar with permitting requirements that must be met for the performance of the Work. The Contractor shall perform all coordination and documentation, as well as all engineering to obtain the required permits. Any engineering required to obtain permits shall be performed by a

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professional engineer registered in the State of Montana. Copies of all permits obtained by the Contractor shall be submitted to the CSKT and COR for information.

- B. The Contractor shall be fully responsible and solely accountable for meeting the requirements of all permits. The Contractor shall be the sole permittee for all permits.

PART 2--PRODUCTS (NOT USED)

PART 3--EXECUTION (NOT USED)

- END OF SECTION 01 41 10 -

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SECTION 01 42 10 – REFERENCE STANDARDS

PART 1 -- GENERAL

1.1 SECTION INCLUDES:

- A. Reference standards utilized in the Specifications.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Referenced editions of standard specifications, codes, and manuals form a part of this Specification to the extent referenced.
- B. These Specifications take precedence when conflicting requirements occur between specifications and referenced standard.
- C. References to standards within the specifications which are not included in this Section are still to be followed by the Contractor.

1.3 JOBSITE REFERENCES

- A. Maintain at fabrication site, a copy of referenced standard specifications, codes, and manuals required for work in progress at fabrication site.
- B. Maintain onsite, a copy of referenced standard specifications, codes, and manuals required for onsite work in progress. Make available for use by the COR.

1.4 AVAILABILITY

- A. Code of Federal Regulation (CFR):
 - 1. Available online, authorized by the National Archives and Records Administration (NARA) and the Government Printing Office (GPO), at [w](#)

B. Industrial and Governmental Documents

1. Addresses for obtaining some industrial and governmental (other than Federal and Bureau of Reclamation specifications and standards) specifications, standards, and codes are listed in Table 01 42 10A - Addresses for Specifications, Standards, and Codes.

Table 01 42 10A - Addresses for Specifications, Standards, and Codes

Acronym	Name and Address	Telephone
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, NW., Suite 249 Washington, DC 20001	202-624-5800 800-231-3475
ACGIH	American Conference of Governmental Industrial Hygienists 1330 Kemper Meadow Drive Cincinnati, OH 45240 www.acgih.org	513-742-2020
ACI	ACI International 38800 Country Club Drive Farmington Hills, MI 48331 USA www.concrete.org	248-848-3800
AGC	Associated General Contractors of America 333 John Carlyle Street, Suite 200 Alexandria, VA 22314 www.agc.org	703-548-3118
AISC	American Institute of Steel Construction One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001 www.aisc.org	312-670-2400
ANSI	American National Standards Institute 1819 L. Street, NW. Washington, DC 20036 www.ansi.org	202-293-8020

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Table 01 42 10A - Addresses for Specifications, Standards, and Codes

Acronym	Name and Address	Telephone
APA/EWA	APA-The Engineered Wood Association P.O. Box 11700 Tacoma, WA 98411-0700	253-565-6600
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329	404-636-8400
ASME	American Society of Mechanical Engineers 3 Park Avenue New York, NY 10016-5990 _w www.asme.org	800-843-2763
ASTM	ASTM International 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 www.astm.org	601-832-9585
AWS	American Welding Society 550 NW LeJeune Road Miami, FL 33126 _w www.amweld.org	800-443-9353 305-443-9353
AWWA	American Water Works Association 6666 W. Quincy Avenue Denver, CO 80235 w www.awwa.org	800-926-7337 303-794-7711
COE	USACE Publications Depot Attn: CEIM-SP-D 2803 52nd Avenue Hyattsville, MD 20781-1102 w www.usace.army.mil/publications or www.hnd.usace.army.mil/techinfo/index.htm	301-394-0081 Fax 301-394-0084
IEEE	Institute of Electrical and Electronics Engineers 3 Park Avenue, 17th Floor New York, NY 10016- 5997	212-419-7900
NACE	NACE International 1440 South Creek Drive Houston, TX 77084 w www.nace.org	281-228-6200
NEMA	National Electrical Manufacturers Association 1300 N 17th Street, Suite 1847 Rosslyn, VA 22209 www.nema.org	703-841-3200

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Table 01 42 10A - Addresses for Specifications, Standards, and Codes

Acronym	Name and Address	Telephone
NETA	International Electrical Testing Association, Inc. 3050 Old Centre Avenue, Suite 102Portage, MI 49024	269-488-6382
NIBS	National Institute of Building Sciences 1090 Vermont Avenue NW, Suite 700 Washington, DC 20005	202-289-7800
NFPA	National Fire Protection Association One Batterymarch Park P.O. Box 9101Quincy, MA 02269-9101	800-344-3555 617-770-3000
NRMCA	National Ready Mixed Concrete Association 900 Spring Street Silver Spring, MD 20910	240-485-1139
PCI	Precast/Prestressed Concrete Institute 209 W Jackson Boulevard Chicago, IL 60606- 6938 www.pci.org	312-786-0300
SSPC	SSPC: The Society for Protective Coatings 40 24th Street, 6th FloorPittsburgh, PA 15222-4656 www.sspc.org	800-837-8303 412-281-2331
UL	Underwriters Laboratories Inc. 333 Pfingsten RoadNorthbrook, IL 60062-2096 www.ul.com	847-272-8800
WWPA	Western Wood Products Association 522 SW Fifth Avenue, Suite 500Portland, OR 07204-2122 www.wwpa.org	503-224-3930

PART 2 -- PRODUCTS (NOT USED)**PART 3 -- EXECUTION (NOT USED)****- END OF SECTION 01 42 10 -**

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SECTION 01 42 13 – ABBREVIATIONS OF INSTITUTIONS PART

1 -- GENERAL

1.1 GENERAL

- A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of the Specifications, the following acronyms or abbreviations which may appear shall have the meanings indicated herein.

1.2 ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials ACI American Concrete Institute
AISC	American Institute of Steel Construction
AMCA	Air Movement and Control Association International, Inc. ANSI American National Standards Institute, Inc.
APA	The Engineered Wood Association
API	American Petroleum Institute APWA American Public Works Association
ARI	Air-Conditioning and Refrigeration Institute ASA Acoustical Society of America
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASNT	American Society of Nondestructive Testing ASQ American Society for Quality
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BIA	Bureau of Indian Affairs
CLFMI	Chain Link Fence Manufacturer's Institute
CRSI	Concrete Reinforcing Steel Institute CSKT Confederated Salish Kootenai Tribe
EPA	Environmental Protection Agency
ETL	Electrical Test Laboratories
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Association
FHWA	Federal Highway Administration
IBC	International Building Code

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ICBO	International Conference of Building Officials
ICC	International Code Council
IFC	International Fire Code
IFGC	International Fuel Gas Code
IMC	International Mechanical Code
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
MBMA	Metal Building Manufacturer's Association
MIL	Military Standards (DoD)
MPTA	Mechanical Power Transmission Association
MSS	Manufacturers Standardization Society
NAAMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers
DASMA	Door and Access Systems Manufacturers Association International
NACE	National Association of Corrosion Engineers
NAPF	National Association of Pipe Fabricators
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors
NCCLS	National Committee for Clinical Laboratory Standards
NCMA	National Concrete Masonry Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NESC	National Electrical Safety Code
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association or National Fluid Power Association
NISO	National Information Standards Organization
NIST	National Institute of Standards and Technology
NRMCA	National Ready Mixed Concrete Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PPI	Plastic Pipe Institute
RCRA	Resource Conservation and Recovery Act
SSPC	Society for Protective Coating
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.

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USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
WWPA	Western Wood Products Association

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION 01 42 13 -

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SECTION 01 50 00 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS PART 1 --

GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lights, heat, ventilation, telephone, internet, potable water and sanitary facilities.
- B. Temporary Controls: Enclosures and fencing, and protection of the Work.
- C. Construction Facilities: Stockpile and equipment storage areas, equipment maintenance facilities, field office facilities, temporary construction roads, parking, progress cleaning, and project signage.

1.2 RELATED SPECIFICATION SECTIONS

- A. Section 01 33 00 – Submittal Procedures
- B. Section 01 77 00 – Contract Closeout

1.3 REFERENCE STANDARDS

- A. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE)
 - 1. ASHRAE HSE HVAC Systems Equipment (I-P), 2008 Handbook
- B. National Fire Protection Association (NFPA)
 - 1. NFPA 10-2010 Portable Fire Extinguishers
- C. Public Law (PL)
 - 1. PL 101-336 Americans With Disabilities Act of 1990

1.4 TEMPORARY ELECTRICITY

- A. The Contractor is responsible for all arrangements and coordination to complete and maintain temporary hookups throughout the duration of construction. Contractor shall pay for all hookups and monthly charges.

1.5 TEMPORARY LIGHTING

- A. Provide and maintain lighting as needed for construction operations.

1.6 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

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1.7 TEMPORARY DRINKING WATER

- A. Provide fresh, sanitary drinking water for Contractor and COR's field personnel.

1.8 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain sanitary facilities for Contractor and COR's field personnel.

1.9 BARRIERS

- A. Provide barriers around all excavations or obstructions to prevent accidents and protect the Work, on-site personnel, apparatus, equipment, and material from theft and accidental or other damages, and make good any damages thus occurring at no cost to the CSKT.

1.10 SECURITY

- A. Provide security and facilities to protect Work and CSKT's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with the CSKT to maintain locked gates as required.
- C. Protect installed Work and provide special protection where specified in individual Specification Sections.

1.11 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove waste materials, debris, and rubbish from site daily and dispose off-site at proper locations.
- C. Do not allow any condition to exist during construction which creates a nuisance; a fire hazard; an environment injurious to water quality, air quality, health or safety; or an attraction for children, animals, birds, rodents, etc.
- D. Failure to comply with the above requirements after due and proper notice has been given by CSKT will be sufficient grounds for CSKT to proceed to clean up such material and debris, make repairs and charge same to the Contractor.

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1.12 PROJECT IDENTIFICATION

- A. Provide 8-foot-wide by 4-foot-high project sign of exterior grade plywood and wood frame construction, painted, with exhibit lettering by professional sign painter, with design and colors acceptable to CSKT and COR.
- B. List title of project, names of the CSKT, COR, and Contractor as follows: PROJECT NAME:

FALLS CREEK DIVERSION REHABILITATION PROJECT

GOVERNMENT AGENCY: CONFEDERATED SALISH KOOTENAI TRIBE, BUREAU OF INDIAN AFFAIRS

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PRINCIPAL ENGINEER: WWC ENGINEERING

CONTRACTOR: _____

- C. Erect on site at location per the Contractor's approved site plan.
- D. The sign shall be set 4 feet above the ground, measured from a grade to the lower edge of the plywood sheet with mounting and supports designed for IBC indicated wind loads.
- E. No other signs are allowed without CSKT permission, except those required by law.

1.13 CONTRACTOR FIELD OFFICES AND SHEDS

- A. Contractor's Field Office shall be weather tight, with lighting and electrical outlets. Mechanical equipment and furniture are at the Contractor's option. The Field office should have adequate space for weekly progress meetings. Field office shall be located in the staging area designated for the Falls Creek Diversion Rehabilitation Project or at another location agreed to by the COR.
- B. Provide sheds for storage of tools and equipment as needed.

1.14 TEMPORARY BUILDINGS ERECTED BY THE CONTRACTOR

- A. Contractor may erect temporary buildings on the job site for such purposes as offices, warehousing, craft change rooms, and fabrication shops. The location and design of these buildings will be subject to approval by the CSKT and COR.
- B. Trailers or semitrailers parked by Contractor on the job site shall be subject to COR's approval as to type and condition. Dilapidated trailers and semitrailers are prohibited. Contractor's trailers and semitrailers shall be located in an area approved by the COR.
- C. Upon completion of the Contractor's work, any temporary buildings shall be removed including any concrete slabs or any underground utilities installed by the Contractor, unless otherwise determined by the COR, in writing.

1.15 CONTRACTORS LAND USE

- A. The Contractor will be permitted to use, without charge, for construction purposes, Contractor use areas as approved by CSKT. The Contractor's office shall be located within the designated Contractor use area established for the project.
- B. If additional land is needed, the Contractor shall make all necessary arrangements with CSKT and individual landowners and shall pay all rentals or other Contractor associated costs.
- C. Staging, storage and laydown areas for Contractor equipment and tool trailers can be established within the disturbance limits of site disturbance shown on the drawings.
- D. Contractor shall prepare a traffic management plan for normal access and construction deliveries to the project. The traffic management plan will show all signs, safety devices or signals and entry ways for all phases of construction, and meet all federal, state and

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local regulatory requirements.

1.16 REGULATORY REQUIREMENTS

- A. All temporary facilities and controls shall conform to applicable provisions of all local, state and federal laws.

1.17 SUBMITTALS

- A. RSN 01 50 00-01 – Submit Contractor's plan for placement and setup of COR's Field Office and Temporary Buildings. Plan shall include staging, storage and laydown areas shall be developed for review and approval by COR. Submit in accordance with Section 01 33 00 – Submittal Procedures.

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. The Contractor shall not remove any existing or temporary facilities without approval by COR.
- B. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- C. Clean and repair damage caused by installation of or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition, including removal of sanitary facilities at COR's field office. Restore permanent facilities used during construction to specified condition.

1.19 OWNER FACILITIES AND OPERATIONS

- A. Contractor shall provide CSKT access to the site facilities at all times.
- B. Any damage to CSKT's facilities caused by the Contractor's activities shall be repaired by the Contractor. Any resulting financial loss to CSKT will be reimbursed by the Contractor.

1.20 WILDLIFE IMPACT MITIGATION AND AVOIDANCE MEASURES

- A. Promptly clean up any project-related spills, litter, garbage, debris, etc.
- B. Store all food, food-related items, petroleum products, antifreeze, garbage, and personal hygiene items inside a closed, hard-sided vehicle or commercially manufactured bear-resistant container.
- C. Remove garbage from the project site daily and dispose of it in accordance with all applicable regulations.
- D. Notify the CSKT Wildlife Management Program of any animal carcasses found in the area.
- E. Notify the CSKT Wildlife Management Program of any grizzly bears or lynx observed in the vicinity of the project area.

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PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION 01 50 00 -

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SECTION 01 55 20 – TRAFFIC CONTROL AND ROAD CLOSURE PART

1 -- GENERAL

1.1 SECTION INCLUDES:

- A. Requirements for traffic control and road closure coordination for the project.

1.2 RELATED SPECIFICATION SECTIONS

- A. Section 01 33 00 – Submittal Procedures

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Federal Highway Administration, Department of Transportation
 - 1. MUTCD, Part 6 Part 6, Temporary Traffic Control, Manual on Uniform Traffic Control Devices, 2009 Edition, (http://mutcd.fhwa.dot.gov/kno_2009.htm)

1.4 SUBMITTALS

- A. RSN 01 55 20-01 Contractor's Traffic Control and Road Closure Plan
 - 1. The Contractor's traffic control and road closure plan shall be submitted for review by the COR. Submit in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 TRAFFIC CONTROL

- A. Provide road closure signage and barricades on Mary's Lake Road to inform the public that the road is temporarily closed at the project location. Signage shall be placed at appropriate roadway intersections leading to the project with detour directions.
- B. Provide cones, delineators, concrete safety barriers, barricades, flasher lights, danger signals, signs, and other temporary traffic control devices as required to protect work and public safety.
- C. Provide flaggers and guards as required to prevent accidents and damage or injury to passing traffic.
- D. Do not begin work along public or private roads until proper traffic control devices for warning, channeling, and protecting motorists are in place in accordance with approved traffic control plan.
- E. Maintain traffic flow and conduct construction operations to minimize obstruction and inconvenience to public traffic.
- F. Remove traffic control devices when no longer needed.

- END OF SECTION 01 55 20 -

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SECTION 01 57 13 – DIVERSION, CARE OF DRAINAGE AND DEWATERING PART 1 --

GENERAL

1.1 SECTION INCLUDES

- A. Diversion.
- B. Dewatering of foundations, excavations and borrow area.
- C. Care for water entering and leaving the adjacent drainages.

1.2 RELATED SECTIONS

- A. Section 01 41 10 – Regulatory Requirements.
- B. Section 01 33 00 – Submittal Procedures.
- C. Section 31 23 00 – Excavation and Fill
- D. Section 01 57 30 – Water Pollution Control

1.3 SUBMITTALS

- A. RSN 01 57 13-01 Diversion Plan:
 - 1. Plan for diversion and sediment control facilities to divert water from Falls Creek upstream of the diversion structure and from upstream of the Tabor Feeder Canal Tunnel, around the construction area to the Tabor Feeder Canal west of the diversion structure and for protecting the Work from storm events without violating water quality requirements.

1.4 SYSTEM DESCRIPTION

- A. Water Collection, Control, and Diversion Requirements:
 - 1. Design of water collection, control, diversion, and sediment control facilities to divert water around the construction area, or convey through the area in a controlled manner, and to control the quality of water leaving the construction area from diversion, dewatering and Contractor operations.
 - 2. Furnish, install, maintain, and operate all structures, and other equipment for collection, diversion, and removal of water from the various parts of the work areas and to maintain water-free work areas.

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3. Divert inflows from drainages and seeps away from the Work.
4. Divert surface water away from excavated areas.
5. A diversion berm or sandbags can be used as part of the diversion works. A temporary diversion berm shall be constructed in accordance with Specification Section 31 23 00 – Excavation and Fill.
6. Construct all diversion and erosion control facilities to protect facilities from erosion or damage.
7. Construct facilities as needed to maintain water quality from diversion, drainage, dewatering and all construction activities in compliance with the CSKT Water Quality Standards.

1.5 PROJECT/SITE CONDITIONS

- A. The Contractor shall be responsible for compliance with all permit conditions and shall be responsible for any water quality violations, penalties and fines resulting from construction activities.

1.6 MAINTENANCE

- A. Maintain all diversion, water quality protection and erosion control facilities as needed to meet specification and permit requirements.
- B. Repair any damage resulting from diversion operations.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Verify that Work and property upstream, downstream and adjacent to Work will not be damaged by water quality protection, erosion and sediment control diversion operations and facilities.

3.2 PREPARATION

- A. Divert surface water without causing damage to Work or property upstream, downstream and adjacent to Work.

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3.3 INSTALLATION

- A. Provide diversion channels, dikes, breaches, cofferdams, embankment channel, and other facilities as needed for diversion.
- B. Perform diversion operations so that Work is performed in dry conditions.
- C. Provide silt fencing, check dams, sedimentation ponds and other sedimentation control and erosion control facilities as needed for sedimentation and erosion control and in conformance with all applicable permits and regulations.

3.4 FIELD QUALITY CONTROL

- A. Provide testing and monitoring as required by the CSKT Water Quality Standards, and other permits required by these Specifications.
- B. Repair any damage to the foundations, structures, adjacent property, or any part of the diversion or protective works.

3.5 CLEANING

- A. After having served their purpose, remove all facilities and protective works as required by the COR so as not to interfere with the operation or usefulness of the canal and other facilities.

- END OF SECTION 01 57 13 -

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SECTION 01 57 30 – WATER POLLUTION CONTROL

PART 1 -- GENERAL

1.1 SECTION INCLUDES:

- A. Erosion and sediment control procedures.
- B. Spill prevention control and countermeasures.

1.2 SECTION INCLUDES:

- A. Section 01 57 13 – Diversion, Care of Drainage, and Dewatering

1.3 REFERENCE STANDARDS

- A. USBR RSHS-2009 Reclamation Safety and Health Standards
- B. CFR 40 CFR, Part 112 Oil Pollution Prevention
- C. Public Law
 - 1. Sections 311, 402, and 404 Clean Water Act (Public Law 92-500, as amended)

1.4 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 – Submittals.
- B. RSN 01 57 30-01 Storm Water Management Plan (SWMP):
 - 1. Detailed Storm Water Management Plan for review, approval, and use, for construction activities in the vicinity of any stream, flowing or dry watercourse, lake, wetland, reservoir, or underground water source. The storm water management plan shall be designed and signed by a professional engineer in the State of Montana and shall include:
 - a. Name of person who will be responsible for implementing and carrying out plan.
 - b. Precautions which will be taken to avoid discharge or accidental spills of pollutants into a river, stream, watercourse, or lake.
 - c. Plan for notifying the COR and the CSKT Shoreline Protection Office, Tribal Complex, P.O. Box 278, Pablo, MT 59855, 406-675-2700.
 - d. Erosion and Sediment Control Procedures

1.5 QUALITY ASSURANCE

- A. Laws, Regulations, and Permits:
 - 1. Perform construction operations to comply, and ensure subcontractors
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comply, with:

- a. Applicable CSKT, Federal, and local laws, orders, regulations, and Water Quality Standards concerning control and abatement of water pollution; requirements set forth in the Stormwater Pollution Prevention Plan prepared by CSKT; and terms and conditions of applicable permits issued by permit issuing authority.
- b. If conflict occurs between CSKT, Federal, and local laws, regulations, and requirements, the most stringent shall apply.

B. Contractor Violations:

1. If noncompliance should occur, immediately (orally) report noncompliance to the COR. Submit specific written information within 2 days.
2. Consistent violations of applicable CSKT, Federal, or local laws, orders, regulations, or Water Quality Standards may result in the COR stopping all site activity until compliance is ensured.
3. The Contractor shall not be entitled to extension of time, claim for damage, or additional compensation by reason of such a work stoppage.
4. Corrective measures required to bring activities into compliance shall be at the Contractor's expense.

1.6 REQUIRED PERMITS

- A. Prior to discharging wastewater or other pollutants, or dredged or fill materials into navigable waters, required permits shall have been obtained, and the Contractor shall abide by conditions of the permits.

1.7 CONTRACTOR RESPONSIBILITIES

A. Permits:

1. Any permits obtained by CSKT are exceptions to the clause entitled "Permits and Responsibilities," which requires the Contractor to obtain necessary licenses and permits.

B. Monitoring:

1. Conduct monitoring in order to meet the requirements of the permits which may include:
 - a. Minimum daily site inspections (or more frequent as necessary), and
 - b. Required laboratory tests to determine effluent characteristics.

C. Recordkeeping:

1. Retain records and data required by permits.

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PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 POLLUTION CONTROLS

- A. Control pollutants by use of sediment and erosion controls, wastewater and stormwater management controls, construction site management practices, and other controls including State and local control requirements.

- B. Sediment and Erosion Controls:
 - 1. Establish methods for controlling sediment and erosion which address vegetative practices, structural control, silt fences, straw dikes, sediment controls, and operator controls as appropriate. Erosion controls will be installed as described in the SWMP.

 - 2. Institute stormwater management measures as required, including velocity dissipators, and solid waste controls which address controls for building materials and offsite tracking of sediment. Stormwater management measures will be installed as described in the SWMP.

- C. Wastewater and Stormwater Management Controls:
 - 1. Pollution prevention measures:
 - a. Use methods of dewatering, unwatering, excavating, or stockpiling earth and rock materials which include prevention measures to control silting and erosion, and which will intercept and settle any runoff of sediment- ladened waters.

 - b. Prevent wastewater from general construction activities such as drainwater collection, aggregate processing, concrete batching, drilling, grouting, or other construction operations, from entering flowing or dry watercourses without the use of approved turbidity control methods.

 - c. Divert stormwater runoff from upslope areas away from disturbed areas.

 - 2. Turbidity prevention measures:
 - a. Use methods for prevention of excess turbidity which include, but are not restricted to, intercepting ditches, settling ponds, gravel filter entrapment dikes, flocculating processes, recirculation, combinations thereof, or other approved methods that are not harmful to aquatic life.

- D. Construction Site Management:
 - 1. Contractor construction operations:
 - a. Perform construction activities by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, or other

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pollutants or wastes into streams, flowing or dry watercourses, lakes, wetlands, reservoirs, or underground water sources.

- 1) Pollutants and wastes include, but are not restricted to: refuse, garbage, cement, sanitary waste, industrial waste, hazardous materials, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.
2. Stockpiled or deposited materials:
 - a. Do not stockpile or deposit excavated materials or other construction materials, near or on, stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff, or can in any way encroach upon the watercourse.
3. Petroleum product storage tanks management:
 - a. Place oil or other petroleum product storage tanks at least 20 feet from streams, flowing or dry watercourses, lakes, wetlands, reservoirs, and any other water source.
 - b. Do not use underground storage tanks.
 - c. Construct storage area dikes at least 12 inches high or graded and sloped to permit safe containment of leaks and spills equal to the capacity located in each area plus a sufficient amount of freeboard to contain the 25-year rainstorm.
 - 1) Line diked areas with an impermeable barrier at least 50 milsthick.
 - d. Areas for refueling operations: Lined with impermeable barrier atleast 10 mils thick covered with 2 to 4 inches of soil.
 - e. Geomembrane liner:
 - 1) The diked area including the area beneath tanks shall be lined with an impervious, petroleum-resistant geomembrane.
 - 2) Properly secure the geomembrane to prevent leakage at the seams.
 - 3) Properly anchor the geomembrane to prevent animals burrowing under or water flowing beneath the membrane.
 - 4) Cover with adequate earth material to prevent any tearing or damage.
 - 5) Extend the sides of the geomembrane up to the top of the dike.
 - 6) Upon completion of work remove the dike geomembrane and earth cover material in accordance with Section 01 74 00 – Cleaning and

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Offsite Transportation and Disposal.

4. Equipment:

a. Stationary equipment:

- 1) Place petroleum-powered or lubricated stationary equipment such as engine-generators and gas/diesel powered pumps, in a diked area lined with an impervious, petroleum-resistant geomembrane.
- 2) The geomembrane shall extend to the top of the dike, shall be properly secured to prevent leakage at the seams, and shall be covered with adequate earth material to prevent tearing and damage.

b. Portable equipment:

- 1) Cover underside of petroleum-powered or lubricated portable equipment with oil-absorbent material to catch drips and leaks as well as a sorbet dike or slopes to contain spills while operating or being stored onsite.
- 2) Clean up oil-absorbent material when equipment is moved. Replace oil-absorbent material when saturated with petroleum-based products.

E. Spills and Leaks:

1. Earth material and absorbent pads contaminated by as spill or leakage of oil, fuel, or lubricants: Remove from jobsite.
2. The contaminated material shall be considered hazardous waste, and shall be disposed of in accordance with Section 01 74 00 – Cleaning and Offsite Transportation and Disposal.

3.2 ALLOWABLE DISCHARGE LOCATION

- A. Discharge water from removal of water operations which meet permit requirements into the downstream creek.

- END OF SECTION 01 57 30 -

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SECTION 01 71 23 – CONSTRUCTION SURVEYING AND STAKING PART 1 --

GENERAL

1.1 SUMMARY

- A. Contractor shall provide all materials, items, operations or methods specified, listed or scheduled in Specifications and Contract Drawings, including all materials, labor, equipment and incidentals necessary and required to conduct proper surveys required to stake and layout the Work.
- B. COR will identify existing site reference points and baselines as shown on the Contract Drawings.
- C. Contractor shall perform all surveys for the Work including checking existing survey control reference point locations and elevations; reestablishing construction control, resetting of stakes and monuments, measurement for progress payments, and performing surveys needed for restoration of public and private improvements that have been damaged, destroyed, or relocated by Contractor.
- D. A professional land surveyor or supervision of work by a professional land surveyor will only be required for initial excavation surveys, access road improvements, box culvert alignment, diversion structure alignment, ramp flume alignment, and riprap limits. The data for these elements will be included with the As-Built drawings and will be sealed by the land surveyor registered in the State of Montana.
- E. The cost to the Contractor of all work and delays occasioned by giving lines and grades, or making other necessary measurements, will be considered as having been included in the unit and lump sum prices for items of Work.

1.2 RELATED SPECIFICATION SECTIONS

- A. Section 01 33 00 – Submittal Procedures

1.3 SUBMITTALS

- A. RSN 01 71 23-01 Survey Plan: At least 30 days prior to the start of the Work in accordance with Section 01 33 00 – Submittal Procedures. The Survey Plan shall, at a minimum, include the following:
 - 1. Resumes for proposed survey staff and qualifications.
 - 2. Proposed survey methods for construction work elements and work layout.
 - 3. Proposed survey submittal forms, formats, and schedule.
 - 4. Approach to check survey accuracy.

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5. Quantity calculation methodology for stockpiles, earthwork fills, and placement of filter and riprap layers.
 6. Contractor shall use the control points established and shown on the Contract Drawings. As the work progresses, all subsequent changes to the Survey Plan shall be submitted.
 7. All field books, notes, and other data developed or obtained by the Contractor in performing the surveys required by the Project shall be submitted to the COR for examination throughout the construction period or upon request by the COR.
- B. RSN 01 71 23-01 Survey Closeout Certificate: The Contractor shall submit a certificate signed by the land surveyor, stating that the elevations and locations of the Work are in conformance with Contract Documents shall be submitted to the COR at Contract closeout.

1.4 QUALITY ASSURANCE

- A. Surveyor: Provide experienced construction surveyors under supervision and direction of a surveyor licensed in the State of Montana, with a minimum of 2 years of experience in charge of construction surveys for construction similar in nature to that required by this Contract.
- B. Surveys will be subject to field and office review by the COR.

PART 2 -- PRODUCTS

2.1 SURVEY EQUIPMENT

- A. Provide materials and equipment required for surveying work, including, but not limited to instruments, stakes, spikes, steel pins, templates, platforms, and tools.
- B. Except as required to be incorporated in work or left in place, surveying materials and equipment will remain property of Contractor.
- C. Survey instruments shall be accurate and shall be subject to inspection by COR for proper operation.
1. Electronic distance measuring (EDM) instruments used by Contractor on the Site shall be checked for calibration at least every two weeks on an established base line approved by COR. Calibration results shall be kept in a log book, available for COR'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 of the EDM.
 2. Defective instruments shall be promptly replaced, repaired, or adjusted to operate within the tolerances of the instrument manufacturer.

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- D. All work not performed with the methods and equipment as submitted by Contractor and accepted by COR shall be removed and replaced by Contractor at no additional cost to the CSKT.

PART 3 -- EXECUTION

3.1 PRIMARY SURVEY CONTROL

- A. Horizontal and vertical primary survey control for the project are as shown on the Contract Drawings. Project coordinates, and vertical and horizontal data shall be those used on the Contract Drawings.
- B. Contractor shall be responsible for checking the position of the reference points comprising the primary control prior to starting site work and shall notify the COR of discrepancies found between actual and record measurements.
- C. The location of any new reference points installed by the Contractor to control the work will be approved by the COR prior to setting the new reference points. The existing reference points shall not be disturbed without prior written approval from the COR.
- D. Protection of monuments and stakes shall be the responsibility of Contractor. Replacement of damaged control and reference points shall be at Contractor's expense.

3.2 SECONDARY SURVEY CONTROL

- A. From the primary reference control provided by CSKT, 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 construction of the Work shall be established by the Contractor and taken directly from either the primary or secondary controls.
- B. Secondary control shall be tied to and closed upon the primary control.

3.3 QUANTITY SURVEYS

- A. Following the completion of all the clearing and grubbing and stripping operations in an area Contractor shall prepare a baseline survey. At the point where the Work performed under each bid item is completed, Contractor shall perform a final survey using the same survey areas as the baseline survey. This survey shall be used by Contractor to calculate quantities (as described above) which will be used as the final basis of payment for the completed item. 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. Contractor shall submit a copy of cross-section survey data and quantity calculations to COR for each monthly payment.
- B. The COR will perform check surveys in selected locations to verify measurements and quantities. The Contractor shall provide CSKT and the COR access to the Work areas for survey measurements, as required.

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- C. The Contractor shall notify the COR at least 24 hours before performing a quantity survey and, unless specifically waived, perform surveys in the presence of the COR.
- D. The Contractor shall survey the limits of the Contractor Use Area and optional temporary roads prior to construction of temporary fencing, boundary marks, and gates.

3.4 SURVEY REQUIREMENTS

- A. Structures shall be staked before and during construction.
- B. Riprap limits.
- C. Access road improvements.

3.5 ACCURACY OF SURVEYS

- A. Points for cross sections shall be located to the nearest 0.05 foot horizontally and vertically.
- B. Vertical elevation surveys shall close within 0.05 foot times the square root of the length of the circuit in miles.
- C. All grade stakes shall be set to 0.02 foot.
- D. Alignment of tangents and curves shall be within 0.03 foot.
- E. Points for structures shall be set to the nearest 0.02 foot, except where operational function of special features require closer tolerances.
- F. Survey movement monuments shall be surveyed within an accuracy of 0.03 foot vertical and 0.02 foot horizontal.
- G. Tolerances for all other Work shall be as shown or specified in the Contract Documents.

3.6 PROTECTION OF MONUMENTS, STAKES, AND MARKS

- A. Contractor shall preserve and protect all survey monuments and related marks. When removal is necessary, Contractor shall accurately reference the monuments or related marks, subject to the approval of COR.
 - 1. All survey stakes, control points, monuments, benchmark, or reference stakes disturbed or destroyed during the work shall be replaced and reset to the satisfaction of the COR at Contractor's expense.
 - 2. Primary or secondary control monuments removed shall be reset by Contractor as soon as the Work requiring the removal is complete. Alternatively, other control points may be set so as to reestablish the control network.
 - 3. The position of monuments, control points, or other marks that are subject to

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movement due to the passage of equipment or other forces shall be rechecked at regular intervals, but not less than monthly.

3.7 FIELD RECORDS

- A. Original field notes, computations, and other surveying data shall be recorded in fieldbooks.
- B. Contactor shall furnish copy of workday survey notes to COR when requested.
- C. If Electronic fieldbooks are utilized, the Contractor shall comply with the following:
 - 1. Written fieldbooks shall still be kept to record each point number shot along with sketched and narrative of shot. These shots shall be referenced and labeled in the written fieldbook.
 - 2. At the end of each day's survey, a hard copy printout of the electronic survey files, containing as a minimum the Northing, Easting, and elevation coordinates, and description of each shot shall be submitted to the COR.
 - 3. Upon completion of the field survey for quantity calculations, the Contractor shall submit the surveys electronically to the COR.
- D. Record survey data in accordance with recognized professional surveying standards. Notes or data not in accordance with standard formats will be rejected.

- END OF SECTION 01 71 23 -

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SECTION 01 74 00 CLEANING AND OFFSITE TRANSPORTATION AND DISPOSAL

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Final cleanup and disposal of hazardous and non-hazardous waste.

1.2 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures

1.3 REFERENCE STANDARDS

- A. Code of Federal Regulations (CFR)
 - 1. 40 CFR 261.3 Definition of Hazardous Waste
 - 2. 49 CFR 171-179 Transportation - Hazardous Waste Regulations

1.4 DEFINITION

- A. Hazardous Waste: Defined as hazardous by 40 CFR 261.3; or by other Federal, State, Tribes, or local laws or regulations.

1.5 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 – Submittals.
- B. RSN 01 74 00-01: Test Results on Unknown Wastes.
- C. RSN 01 74 00-02: Hazardous Waste Manifest.
- D. RSN 01 74 00-03: Waste Production and Disposal Records.
- E. RSN 01 74 00-04: Environmental Consultant Resume: Describe experience on similar projects.
- F. RSN 01 74 00-05: Environmental Site Assessment.

1.6 REGULATORY REQUIREMENTS

- A. Comply with Federal, CSKT, and local laws and regulations.

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- B. Comply with USBR RSHS.
- C. Conform to most stringent requirement in cases of conflict between specifications, regulatory requirements, and RSHS.

1.7 PROJECT CONDITIONS

- A. Report waste materials discovered at jobsite to the COR.
 - 1. If waste is hazardous, the COR may order delays in time of performance or changes in work, or both.
 - 2. If such delays or changes are ordered, an equitable adjustment will be made in the contract in accordance with applicable clauses of the contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 TESTS

- A. Test unknown waste materials found at the jobsite which may be hazardous.

3.2 PROGRESS CLEANING

- A. Keep work and storage areas free from accumulations of waste materials and rubbish.

3.3 FINAL CLEANUP

- A. Remove temporary materials processing facilities, buildings, concrete footings and slabs, rubbish, unused materials, concrete forms, and other similar materials which are not part of permanent work.

3.4 NONHAZARDOUS WASTE DISPOSAL

- A. Combustible Waste:
 - 1. Dispose of combustible waste materials by removing from jobsite.
 - 2. Burning of waste will not be permitted.
- B. Noncombustible Waste:
 - 1. Dispose of noncombustible waste by removing from jobsite.
 - 2. Burying of waste will not be permitted.
- C. Disposal by Removal:
 - 1. Dispose of waste materials at a permitted landfill.
 - 2. Dispose prior to completion of work under these specifications.
- D. Where waste materials are to be disposed of, the Contractor shall make any

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necessary arrangements with private parties and county and Tribal officials pertinent to locations and regulations of such dumping, and shall pay any required fees.

3.5 HAZARDOUS WASTE DISPOSAL

- A. Recycle hazardous waste whenever possible.
- B. Dispose of waste materials known or found to be hazardous at permitted treatment or disposal facilities.
- C. Transport hazardous waste in accordance with 49 CFR 171-179.

3.6 RECORDS

- A. Keep records of types and amounts of waste materials produced.
- B. Keep records of disposal of waste materials on or off jobsite.

- END OF SECTION 01 74 00 -

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SECTION 01 77 00 – CONTRACT CLOSEOUT

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. Closeout Procedures
- B. Final Cleaning
- C. Final Approval
- D. Project As-Built Documents

1.2 RELATED SECTIONS

- A. Section 01 33 00 - Submittal Procedures
- B. Section 01 50 00 - Construction Facilities and Temporary Controls

1.3 CLOSEOUT PROCEDURES

- A. RSN 01 77 00-01 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 COR's and CSKT's review.
- B. Provide submittals to COR that are required by the Contract Documents, governing or other authorities including project Record Documents as indicated in Section 01 33 00 – Submittal Procedures.
- C. RSN 01 77 00-02 Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. RSN 01 77 00-03 Submit all Record Document to the COR in accordance with Section 01 33 00 – Submittal Procedures.

1.4 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean equipment and fixtures to a sanitary condition.
- C. Disconnect all temporary utilities to the site.
- D. Remove temporary site facilities and utilities.
- E. Remove all Contractor constructed access roads and parking areas.
- F. Clear, grade, and seed as required.

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- G. Remove equipment, waste and surplus construction materials, rubbish, wood, bituminous concrete, concrete debris, demolished materials, other foreign material, and construction facilities from the site.

1.5 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.6 FINAL AS-BUILT DOCUMENTS

- A. Submit final as-built documents to COR with request for final Application for Payment.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION 01 77 00 -

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SECTION 02 41 13 – SELECTIVE SITE DEMOLITION

PART 1 -- GENERAL

1.1 SUMMARY

- A. Demolition, removal, and disposal of concrete and other miscellaneous materials for the existing bridge and diversion structures in accordance with Contract Documents.

1.2 RELATED DOCUMENTS

- A. Section 01 33 00 - Submittal Procedures
- B. Section 01 50 00 - Construction Facilities and Temporary Controls
- C. Section 01 74 00 - Clearing and Offsite Transportation and Disposal

1.3 GENERAL

- A. The Contractor shall coordinate demolition and reconstruction work with CSKT and the COR. Unless otherwise indicated, the Contractor shall be responsible for the sequence of activities. Work shall be performed in accordance with applicable safety rules and regulations.
- B. The Specifications and Contract Drawings identify the major facilities that shall be demolished and reconstructed.
- C. The Contractor shall note that the Contract Drawings used to indicate the extents of the demolition and reconstruction are based on record drawings. Within 14 days of receiving the NTP, the Contractor shall conduct a comprehensive survey at the Site to verify the correctness and exactness of the Contract Drawings, and the Scope of Work.

1.4 CONTRACTOR SUBMITTALS

- A. RSN 02 41 13-01: Demolition Plan
 - 1. A plan for demolition and reconstruction activities and procedures, including operational sequences, shall be submitted to the COR for approval. The plan shall provide for safe conduct of the Work, careful removal and disposition of materials, protection of existing facilities which are to remain undisturbed, coordination with existing facilities to remain in service, and timely disconnection and reconnection of utility services. The plan shall include a detailed description and time schedule of the methods and equipment to be used.

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PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 PROTECTION OF EXISTING FACILITIES

- A. Before beginning any demolition, the Contractor shall carefully survey the existing facilities and examine the Specifications and Drawings to determine the extent of demolition. Existing facilities and roads not subject to demolition shall be protected and maintained. Damaged existing facilities shall be repaired to the previous condition or replaced at the Contractor's expense.

3.2 DEMOLITION

- A. The Contractor shall verify that any utilities connected to structures, equipment, and facilities to be removed, relocated, salvaged, replaced, abandoned and rendered inoperable, replaced with new utilities, or adequately bypassed with temporary utilities before proceeding with demolition and reconstruction.
- B. The Contractor shall take precautions to preclude damage to adjacent facilities and to limit the Work activities defined by the work limits in the Contract Drawings. If reconstruction beyond the scope indicated is required, the Contractor shall obtain approval from the COR prior to commencing.
- C. Provide safe passages and access for site personnel around areas of demolition per OSHA requirements.
- D. The removal of existing facilities for demolition, salvage, and relocation shall include the following requirements:
 - 1. Demolish concrete slabs, side walls, headwalls, and diversion structure concrete in accordance with the Contract Drawings. Cut ends of all exposed rebar during demolition activities.
 - 2. Remove existing bridge deck and timber abutments in accordance with the Contract Drawings.
 - 3. The Contractor shall protect existing facilities and connections made to existing structures.

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3.3 DISPOSAL

- A. The Contractor shall be responsible for the offsite disposal of removed concrete, bridge timbers, gates, wooden logs for debris catch, gates, and other miscellaneous materials resulting from demolition of the existing diversion and bridge structure in compliance with local, state, and federal codes and requirements. CSKT shall have the first right to the salvaged material. Contractor to coordinate with CSKT on the location where salvaged material shall be placed. CSKT may elect to salvage a portion or none of the items to be removed. Disposal of these materials shall be in accordance with Section 01 74 00– Cleaning and Offsite Transportation and Disposal.
- B. Demolition and removal of debris shall minimize interference with access roads and other adjacent facilities that shall not be closed or obstructed without permission from CSKT.

3.4 POLLUTION CONTROL

- A. Watering or other suitable methods shall be used to control dust. The Contractor shall comply with local, state, and federal codes and requirements pertaining to environmental protection.

- END OF SECTION 02 41 13 -

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SECTION 03 10 00 – CONCRETE FORMWORK

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. The Contractor shall furnish concrete formwork, bracing, shoring, and supports for cast- in-place concrete and shall design and construct falsework, all in accordance with the Contract Documents.

1.2 RELATED DOCUMENTS

- A. Section 03 21 00 - Reinforcement Steel
- B. Section 03 30 00 - Cast-in-place Concrete

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.4 QUALITY ASSURANCE

- A. Tolerances: The variation from required lines or grade shall not exceed 1/4-inch in 10-feet, non-cumulative, and there shall be no offsets or visible waviness in the finished surface. Other tolerances shall be within the tolerances of ACI 117 – Standard Tolerances for Concrete Construction and Materials.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Except as otherwise expressly accepted by the COR, lumber brought on the Site for use as forms, shoring, or bracing shall be new material. Forms shall be smooth surfaceforms and shall be of the following materials:

Walls	Steel, fiberglass, or plywood panel
Columns	Steel, plywood or fiberglass
Roof and floor	Plywood
All other Work	Steel panels, fiberglass, plywood or tongue and groove lumber

2.2 FORM AND FALSEWORK MATERIALS

- A. Materials for concrete forms, formwork, and falsework shall conform to the following requirements:
 - 1. Lumber shall be Douglas Fir or Southern Yellow Pine, construction grade or better, in conformance with U.S. Product Standard PS 20 – American Softwood Lumber Standard

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2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Yellow Pine plywood manufactured especially for concrete formwork, shall conform to the requirements of PS 1-09 (B-B) – Construction and Industrial Plywood, for Concrete Forms, Class I, and shall be edge sealed.
 3. Form materials shall be metal, wood, plywood, or other material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade indicated. Metal forms shall accomplish such results. Wood forms for finished walls and surfaces to be painted shall be Medium Density Overlaid plywood, MDO Ext. Grade.
 4. Steel leave in place forms shall not be used.
- B. Unless otherwise indicated, exterior corners in concrete members shall be provided with $\frac{3}{4}$ -inch chamfers or be tooled to $\frac{1}{2}$ -inch radius. Re-entrant corners in concrete members shall not have fillets unless otherwise indicated.

2.3 FORM TIES

- A. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties or other removable form tie fasteners having a circular cross-section shall not exceed $1\frac{1}{2}$ inches; and all such fasteners shall be such as to leave holes of regular shape for reaming. Form ties for water-retaining structures shall have integral waterstops that tightly fit the form tie so that they cannot be moved from mid-point of the tie. Form ties shall be **Hex Head Snap Ties by Meadow Burke; Snap Ties by Dayton Superior**; or equal.
- B. Removable taper ties may be used when approved by the COR. A preformed neoprene or polyurethane tapered plug sized to seat at the center of the wall shall be inserted in the hole left by the removal of the taper tie. Use **Taper Ties by Meadow Burke, Taper Ties by Dayton Superior**, or equal.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The Contractor shall assume full responsibility for the adequate design of forms, and any forms that are unsafe or inadequate in any respect shall promptly be removed from the Work and replaced. Provide worker protection from protruding reinforcement bars in accordance with applicable safety codes. A sufficient number of forms of each kind shall be available to permit the required rate of progress to be maintained. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable local, state, and Federal regulations. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by Contractor's personnel and by the COR and shall be in sufficient number and properly installed. During concrete placement, the Contractor shall continually

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monitor plumb and string line form positions and immediately correct deficiencies.

- B. Concrete forms shall conform to the shape, lines, and dimensions of members required, and shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly placed concrete. If adequate foundation for shores cannot be secured, trussed supports shall be provided.
- C. Forms shall not be removed earlier than specified unless approved otherwise by the COR.

3.2 FORM DESIGN

- A. Forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Plywood, $\frac{5}{8}$ -inch and greater in thickness, may be fastened directly to studding if the studs are spaced close enough to prevent visible deflection marks in the concrete.
- B. Forms shall be tight so as to prevent the loss of water, cement, and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1- to 1½-inch-diameter polyethylene rod held in position to the underside of the wall form. Adequate clean-out holes shall be provided at the bottom of each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the COR. Whenever concrete cannot be placed from the top of a wall form in a manner that meets the requirements of the Contract Documents, form windows shall be provided in the size and spacing needed to allow placement of concrete to the requirements of Section 03 30 00 – Cast-in-Place Concrete. The size, number, and location of such form windows shall be as acceptable to the COR.

3.3 CONSTRUCTION

- A. Vertical Surfaces: Vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is indicated. Not less than 1-inch of concrete shall be added to the indicated thickness of a concrete member where concrete is permitted to be placed against trimmed ground in lieu of forms. Permission to do this on other concrete members will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.
- B. Construction Joints: Concrete construction joints will not be permitted at locations other than those indicated, except as may be acceptable to the COR. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the forms where required.

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C. Form Ties:

1. **Embedded Ties:** Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers so as to leave the surface of the holes clean and rough before being filled with mortar. Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties that cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1 inch back from the formed face or faces of the concrete.
2. **Removable Ties:** Where taper ties are approved for use, the larger end of the taper tie shall be on the wet side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with non-shrink grout for water bearing and below- grade walls. The hole shall be completely filled with non-shrink or regular cement grout for above-grade walls that are dry on both sides. Exposed faces of walls shall have the outer 2 inches of the exposed face filled with a cement grout that shall match the color and texture of the surrounding wall surface.

3.4 REUSE OF FORMS

- A. Forms may be reused only if in good condition and only if acceptable to the COR. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces, which are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic/water retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the COR.

3.5 REMOVAL OF FORMS

- A. Careful procedures for the removal of forms shall be strictly followed, and this Work shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of slabs on grade and walls, forms shall remain in place until test cylinders attain a minimum compressive strength of 75 percent of the 28 Day strength in Section 03 30 00 unless approved in writing by the COR. Forms and bracing for vertical walls of waterholding structures shall remain in place at least 36 hours after the concrete has been placed. If forms are removed prior to the completion of the curing periods specified in 03 30 00, the Contractor shall determine means and methods to continue curing operations for the durations specified herein. Forms for parts of the Work not specifically mentioned herein shall remain in place for periods of time as recommended in ACI 347 – Guide to Formwork for Concrete.

3.6 MAINTENANCE OF FORMS

- A. Forms shall be maintained in good condition, particularly as to size, shape, strength,

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rigidity, tightness, and smoothness of surface. Before concrete is placed, the forms shall be thoroughly cleaned. The form surfaces shall be treated with a nonstaining mineral oil or other lubricant acceptable to the COR. Any excess lubricant shall be satisfactorily removed before placing the concrete. Where field oiling of forms is required, the Contractor shall perform the oiling at least 2 weeks in advance of their use and reapply oil as necessary. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

3.7 FALSEWORK

- A. The Contractor shall be responsible for the design, engineering, construction, maintenance, and safety of falsework, including staging, walkways, forms, ladders, and similar appurtenances, which shall equal or exceed the applicable requirements of the provisions of the OSHA Safety and Health Standards for Construction and the requirements herein. Design of falsework shall be signed and sealed by a professional engineer registered in the state of Montana.
- B. Falsework shall be designed and constructed to provide the necessary rigidity and to support the loads. Falsework for the support of a superstructure shall be designed to support the loads that would be imposed if the entire superstructure were placed at one time.
- C. Falsework shall be placed upon a solid footing, safe against undermining, and be protected from softening. When the falsework is supported on timber piles, the maximum calculated pile loading shall not exceed 20 tons. When falsework is supported on any portion of the structure, which is already constructed, the load imposed by the falsework shall be spread, distributed, and braced in such a way as to avoid any possibility of damage to the structure.

- END OF SECTION 03 10 00 -

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SECTION 03 21 00 – REINFORCEMENT STEEL

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. The Contractor shall provide reinforcement steel and appurtenant work, complete and in place, in accordance with the Contract Documents.

1.2 RELATED DOCUMENTS

- A. Section 03 10 00 - Concrete Formwork
- B. Section 03 30 00 - Cast-in-place Concrete
- C. Section 03 62 00 - Grout

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures
- B. RSN 03 21 00-01 Reinforcing Steel Shop Drawings:
 - 1. Shop bending diagrams, placing lists, and drawings of reinforcement steel prior to fabrication. The shop bending diagrams shall show the actual lengths of bars to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. Include bar placement diagrams that clearly indicate the dimensions of each bar splice. Shop drawings shall contain the total tonnage of rebar detailed per sheet.
 - 2. Details of the concrete reinforcement steel and concrete inserts shall be submitted no later than 14-days receipt by the Contractor of the Notice to Proceed. Said details of reinforcement steel for fabrication and erection shall conform to ACI 315 – Details and Detailing of Concrete Reinforcement and the requirements herein.
- C. RSN 03 21 00-02 Reinforcing Steel Couplers
 - 1. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, the Contractor shall submit manufacturer's literature which contains instructions and recommendations for installation for each type of coupler used; certified test reports that verify the load capacity of each type and size of coupler used; and Shop Drawings that show the location of each coupler with details of how they are to be installed in the formwork.
 - 2. Welder qualifications and procedure qualifications shall be as specified in AWS D1.4.

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1.4 QUALITY ASSURANCE

- A. If requested by the COR, the Contractor shall furnish samples from each heat of reinforcement steel in a quantity adequate for testing. Costs of initial tests will be paid by the Contracting Officer. Costs of additional tests if material fails initial tests shall be the Contractor's responsibility.
- B. If requested by the COR, the Contractor shall furnish samples of each type of welded splice in a quantity and of dimensions adequate for testing. At the discretion of the COR, radiographic testing of direct butt-welded splices will be performed. The Contractor shall provide assistance necessary to facilitate testing. The Contractor shall repair any weld that fails to meet AWS D1.4.

PART 2 -- PRODUCTS

2.1 REINFORCEMENT STEEL

- A. Reinforcement steel for cast-in-place reinforced concrete construction shall conform to the following requirements:
 - 1. Bar and spiral reinforcement shall conform to ASTM A 615 – Deformed and Plain Carbon – Steel Bars, for Grade 60 reinforcement unless otherwise indicated.
 - 2. Bar and spiral reinforcement that is welded shall conform to ASTM A 706 – Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement, for Grade 60 reinforcement unless otherwise indicated. In addition, the carbon equivalent in reinforcing that is welded shall not exceed 0.55 percent.
 - 3. Welded wire fabric reinforcement shall conform to ASTM A 1064 – Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete, and the details indicated. Welded wire fabric with longitudinal wire of W4 size wire and smaller shall be in flat sheets or in rolls with a core diameter of not less than 10- inches. Welded wire fabric with longitudinal wires larger than W4 size shall be in flat sheets only.
- B. Accessories:
 - 1. Accessories shall include necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. Bar supports shall meet the requirements of the Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice, including special requirements for supporting epoxy-coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating that extends at least 1/2-inch from the concrete surface. Plastic shall be gray in color.
 - 2. Concrete blocks (dobies) used to support and position reinforcement steel shall have the same or higher compressive strength as required for the concrete in which they are located. Wire ties shall be embedded in concrete block bar supports.

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- C. Epoxy coating for reinforcing and accessories shall conform to ASTM A 775 – Epoxy – Coated Reinforcing Steel Bars. Bars shall not receive epoxy coating, unless otherwise noted in the Contract Drawings.

2.2 MECHANICAL COUPLERS

- A. Mechanical couplers shall be provided where indicated and where approved by the COR. The couplers shall develop a tensile strength that exceeds 125 percent of the yield strength of the reinforcement bars being spliced at each splice.
- B. Where the type of coupler used is composed of more than one component, components required for a complete splice shall be provided. This shall apply to mechanical splices, including those splices intended for future connections.
- C. The reinforcement steel and coupler used shall be compatible for obtaining the required strength of the connection. Straight threaded type couplers shall require the use of the next larger size reinforcing bar or shall be used with reinforcing bars with specially forged ends which provide upset threads which do not decrease the basic cross section of the bar.
- D. Couplers shall be **Lenton Form Saver by Pentair, Dowel Bar Splicer System by Dayton Superior**, or equal.

2.3 WELDED SPLICES

- A. Welded splices shall be provided where indicated and where approved by the COR. Welded splices of reinforcement steel shall develop a tensile strength that exceeds 125 percent of the yield strength of the reinforcement bars that are connected.
- B. Materials required to conform the welded splices to AWS D1.4 shall be provided.

2.4 EPOXY GROUT

- A. Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature, and orientation of the hole to be filled. Epoxy grout shall meet Section 03 62 00 –Grout.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Reinforcement steel, welded wire fabric, couplers, and other appurtenances shall be fabricated, and placed in accordance with the Building Code and the supplementary requirements herein.

3.2 FABRICATION

- A. General:

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1. Reinforcement steel shall be accurately formed to the dimensions and shapes indicated, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318 – Building Code Requirements for Structural Concrete, except as modified by the Drawings. Bars shall be bent cold. Bars shall be bent per ACI 318.
 2. The Contractor shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists, and placing drawings.
- B. Fabricating Tolerances: Bars used for concrete reinforcement shall satisfy the following fabricating tolerances:
1. Sheared length: plus and minus 1-inch
 2. Depth of truss bars: plus zero, minus 1/2-inch
 3. Stirrups, ties, and spirals: plus and minus 1/2-inch
 4. Other bends: plus and minus 1-inch

3.3 PLACING

- A. Reinforcement steel shall be accurately positioned as indicated and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. Reinforcement steel shall be supported by concrete, plastic or metal support spacers, or metal hangers that are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. Concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties that are embedded in the blocks. For concrete over formwork, the Contractor shall provide concrete, metal, plastic, or other acceptable bar chairs and spacers.
- B. Limitations on the use of bar support materials shall be as follows.
1. Concrete Dobies
 - a. Permitted at any location except where architectural finish is required. Compressive strength of the dobies shall be equal to the compressive strength of the structural concrete.
 2. Wire Bar Supports: permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.
 3. Plastic Bar Supports: permitted at every location except on grade.
- C. Tie wires shall be bent away from the forms in order to provide the required concrete coverage.
- D. Bars additional to those indicated that may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at its own expense.

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- E. Unless otherwise indicated, reinforcement placing tolerances shall be within the limits in Section 7.5 of ACI 318 except where in conflict with the Building Code.
- F. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter or enough to exceed the above tolerances, the resulting arrangement of bars shall be as reviewed and accepted by the COR. Cutting of reinforcement shall be prohibited unless written permission is issued by the COR.
- G. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30-inches on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane indicated.
- H. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3-feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.
- I. Epoxy-coated reinforcing bars shall be stored, transported, and placed in such a manner as to avoid chipping of the epoxy coating. Non-abrasive slings made of nylon and similar materials shall be used. Specially coated bar supports shall be used. Chips or cracks in the epoxy coating shall be repaired with a compatible epoxy repair material prior to placing concrete.
- J. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

3.4 SPACING OF BARS

- A. The clear distance between parallel bars (except in columns and between multiple layers of bars in beams) shall be not less than the nominal diameter of the bars, nor less than 1- 1/3 times the maximum size of the coarse aggregate, nor less than one-inch.
- B. Where reinforcement in beams or girders is placed in 2 or more layers, the clear distance between layers shall be not less than one-inch.
- C. In columns, the clear distance between longitudinal bars shall be not less than 1-1/2 times the bar diameter, nor less than 1-1/2 times the maximum size of the coarse aggregate, nor less than 1-1/2 inches.
- D. The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

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3.5 SPLICING

A. General:

1. Reinforcement bar splices shall only be used at locations indicated. When it is necessary to splice reinforcement at points other than where indicated, the character of the splice shall be as reviewed and accepted by the COR.
2. Unless otherwise indicated, dowels shall match the size and spacing of the spliced bar.

B. Splices of Reinforcement:

1. The length of lap for reinforcement bars, unless otherwise indicated, shall be in accordance with ACI 318, Section 12.15.1 for a Class B splice and plan set.
2. Laps of welded wire fabric shall be in accordance with ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.
3. Splices in column spiral reinforcement, when necessary, shall be made by welding or by a lap of 1½ turns.

C. Bending or Straightening: Reinforcement shall not be straightened or rebent in a manner which will injure the material. Bars shall be bent or straight as indicated. Do not use bends different from the bends indicated. Bars shall be bent cold, unless otherwise permitted by the COR. No bars partially embedded in concrete shall be field-bent except as indicated or specifically permitted by the COR.

D. Couplers that are located at a joint face shall be a type that can be set either flush or recessed from the face as indicated. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. Couplers intended for future connections shall be recessed a minimum of 1/2-inch from the concrete surface. After the concrete is placed, the coupler shall be plugged with plastic plugs which have an O-ring seal and the recess filled with sealant to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged.

1. Unless indicated otherwise, mechanical coupler spacing and capacity shall match the spacing and capacity of the reinforcing indicated for the adjacent section.

3.6 CLEANING AND PROTECTION

- A. Reinforcement steel shall always be protected from conditions conducive to corrosion until concrete is placed around it.
- B. The surfaces of reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of dirt, grease, loose scale and rust, grout, mortar, concrete, and other foreign substances immediately before the concrete is placed. Where there is

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delay in depositing concrete, reinforcement shall be re-inspected and, if necessary, re- cleaned.

3.7 EMBEDMENT OF DRILLED REINFORCING STEEL DOWELS

A. Hole Preparation:

1. The hole diameter shall be as recommended by the epoxy manufacturer but shall be no larger than 1/4-inch greater than the diameter of the outer surface of the reinforcing bar deformations.
2. The depth of the hole shall be as recommended by the epoxy manufacturer to fully develop the bar but shall not be less than 12 bar diameters, unless indicated otherwise.
3. The hole shall be drilled by methods that do not interfere with the proper bonding of epoxy.
4. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes shall be adjusted to avoid drilling through or nicking any existing reinforcing bars.
5. The hole shall be blown clean with clean, dry compressed air to remove dust and loose particles.

B. Embedment:

1. Epoxy shall be injected into the hole through a tube placed to the bottom of the hole. The tube shall be withdrawn as epoxy is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth that ensures excess material will be expelled from the hole during dowel placement.
2. Dowels shall be twisted during insertion into the partially filled hole so as to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.

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SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. The Contractor shall provide cast-in-place concrete in accordance with the Contract Documents.
- B. The following types of concrete are covered in this Section:
 - 1. Structural Concrete:
 - a. For use on the tunnel tie in and the ramp flume floor.

1.2 RELATED DOCUMENTS

- A. Section 03 21 00 – Reinforcement Steel

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. RSN 03 30 00-01 Concrete Mix Designs:
 - 1. Prior to beginning the work and within 30 days of the Notice to Proceed, submit preliminary concrete mix designs which shall show the proportions and gradations of materials proposed for each class and type of concrete. Mix designs shall be checked through trial batch and laboratory testing by an independent testing laboratory acceptable to the COR. Costs related to trial batch and related laboratory testing shall be the Contractor's responsibility as part of the work. The Contractor shall test a minimum of two (2) mix designs for each class of concrete. All admixtures planned for use in the Work shall be included in the mix designs.
- C. RSN 03 30 00-02 Concrete Delivery Tickets:
 - 1. Where ready-mix concrete is used, the Contractor shall furnish delivery tickets at the time of delivery of each load of concrete. Each ticket shall show the state-certified equipment used for measuring and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, the amount of water in the aggregate added at the batching plant, and the amount allowed to be added at the Site for the specific design mix. In addition, each ticket shall state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to the times when the batch was dispatched, when it left the plant, when it arrived at the Site, when unloading began, and when unloading was finished. The COR will have the option to inspect the ready mix batch plant and concrete trucks.
- D. RSN 03 30 00-03 Concrete Constituents Test Data
 - 1. Material test data relating to the cement, aggregate, and admixtures shall be less than 6 months old. Furnish the following submittals in accordance with ACI 301 – Structural Concrete:

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- a. Mill tests for cement.
 - b. Admixture certification. Chloride ion content shall be included.
 - c. Aggregate reactivity per ASTM 1260 and gradation test results and certification.
 - d. Materials and methods for curing.
- E. RSN 03 30 00-04 Concrete Placement Drawings:
- 1. Placement drawings showing the type of concrete to be placed, the finish requirements, and location and types of joints and embedded items for each structure. Placement drawings shall also assign a pour identification number to each concrete placement.
- F. RSN 03 30 00-05 Certified Sealant Test reports
- 1. Provided certified sealant test reports from the sealant manufacturer on the actual batch of material supplied, indicating compliance with requirements. Furnish test report before using the sealant on the Project.
- G. RSN 03 30 00-06 Manufacturer's information demonstrating compliance of the following with indicated requirements:
- a. RSN 03 30 00-06A: Preformed Joint Filler
 - b. RSN 03 30 00-06C: Waterstop
- H. RSN 03 30 00-07 Waterstop Samples and Welding Certifications:
- 1. Prior to production of the material required under this Section, qualification samples of waterstops shall be submitted which represent accurately the material proposed. Such samples shall be extruded or molded sections of each size or shape to be installed. The balance of the material to be used shall not be produced until after the COR has reviewed the qualification samples.
 - 2. Copies of the waterstop welding certification by manufacturer or authorized agent of the manufacturer. Every person who is to be involved with waterstop installation is required to have individual certification on file with COR, stating that the named individual is certified and trained to install waterstop per manufacturer's recommendations and specifications.
- I. RSN 03 30 00-08 Concrete Accessories Certificates:
- 1. Written certification from the manufacturer as an integral part of the shipping form, that the material shipped to the Site meets or exceeds the physical property requirements of the Contract Documents. Supplier certificates are not acceptable.
- J. RSN 03 30 00-09 Concrete Placement Plan
- 1. Contractor shall submit detailed procedures for production, transportation,

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placement, protection, curing, and temperature monitoring of concrete, especially during hot or cold weather. The submittal shall include procedures to be implemented upon abrupt changes in weather conditions or equipment failures. A minimum of 3 thermistors shall be installed by the contractor in each slab and wall placement in order to monitor the temperature of freshly placed concrete. Location of the thermistors shall be per the direction of the COR. The plan shall include methods for controlling differential cooling and cracking of mass concrete placements. The maximum allowable internal temperature of the concrete shall be 155 degrees F with a maximum differential temperature of 35 degrees F.

K. RSN 03 30 00-10 Concrete Pumping Equipment

1. If the Contractor chooses to place concrete using pumping equipment, the details of the concrete pump to be used shall be submitted to the COR for review.

L. RSN 03 30 00-11 Concrete Vibrators Product Data

1. The Contractor shall submit product data on the Concrete vibrators to be used in the Work. The vibrations shall satisfy the requirements of specification section 03 30 00- 3.9A.

1.4 QUALITY CONTROL

- A. Codes and Standards: The codes and standards referred to in this section are declared to be part of this specification as if fully set forth herein. In addition, the following ACI Standards are incorporated in their entirety, unless specifically required otherwise:
- a. ACI Standard 301, "Specifications for Structural Concrete," American Concrete Institute, current edition.
 - b. ACI Standard 318, "Building Code Requirements for Structural Concrete", American Concrete Institute, current edition.
 - c. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
 - d. International Building Code of I.C.B.O.
- B. Employ, at the Contractor's expense, a testing laboratory acceptable to the COR to perform material evaluation tests and/or perform the mix design prior to placing any concrete, and all acceptance testing during the onsite placement of the concrete. Retesting or additional testing of concrete or materials failing to meet the requirements of these specifications must be done by the Contractor at no additional cost to the CO.

1.5 TESTING

- A. All concrete quality assurance testing must be performed by an ACI Grade I certified testing technician. Unless otherwise specified, the COR shall be responsible for all quality assurance testing during the on-site placement of the concrete.
1. Materials
 - a. The COR or their representative must have access to the ready-mix production facility for sampling constituent materials during production to assure the materials meet these specifications and represent those stated on the approved mix design.
 2. Standard Slump Tests

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- a. The COR shall, during each day's placement, check the consistency of the concrete by slump test. A slump test will also be made each time that strength specimens are made. Slump tests are performed meeting ASTM C143 "Method of Test for the Slump of Portland Cement Concrete".
3. Air Content Tests
 - a. The COR shall during each strength test, check the air content by either the "Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method" (ASTM C231), "Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method" (ASTM C173) or "Method of Test for Unit Weight, Yield and Air Content (Gravimetric) of Concrete" (ASTM C138).
4. Compressive Strength Tests.
 - a. A minimum of three specimens, 6-inch (150 mm) diameter or four 4 inch (100 mm) diameter, shall be made and tested for every concrete placement. Mold and test 1 set of test cylinders for every 50 cubic yards of concrete or fraction thereof placed each day or once per class of concrete supplied per day. On a given project, if the total volume of concrete is such that frequency of testing required above would generate less than 5 strength tests for a given class of concrete, make tests from at least 5 randomly selected batches or from each batch if fewer than 5 batches are used. Cure these cylinders under laboratory conditions except that additional test cylinders cured entirely under field conditions may be required by the COR to check the adequacy of curing and protection of the concrete.
 - b. Take samples for strength tests in accordance with ASTM C172, entitled "Standard Practice for Sampling Freshly Mixed Concrete".
 - c. Mold test cylinders and laboratory-cure in accordance with ASTM C31. Test cylinders in accordance with ASTM C39, entitled "Method of Test for Compressive Strength of Cylindrical Concrete Specimens", ASTM C39, using an independent testing laboratory, as approved by the COR.
 - d. Each set of cylinders cast per placement, test 1 for information strength at 7 days and test the remaining cylinders for acceptance strength at 28 days. To meet this specification, average strength of 28-day cylinders from the same sample is classified at the compressive strength test result. Strength level of an individual class of concrete is considered satisfactory if both of the following requirements are met:
 - 1) The average of all sets of 3 consecutive tests equal or exceed the specified strength.
 - 2) No individual strength test (average of 28-day cylinders) falls below specified strength by more than 500 psi (3400 kPa).
 - e. Cure field cylinders under field conditions meeting the provisions of "Field Curing" of the Standard Practice for "Making and Curing Concrete Test Specimens in the Field" (ASTM C31).
 - f. Mold field cured test cylinders at the same time and from the same samples as laboratory cured test cylinders. Improve procedures for protecting and curing concrete when strength of field cured cylinders at the test age designated for measuring specified strength is less than 85% of that of companion laboratory

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cured cylinders. When laboratory cured cylinder strengths are appreciably higher than the specified strength, field cured cylinder strengths need not exceed the specified strength by more than 500 psi (3400 kPa) even though the 85% criterion is met.

- g. The strengths of any specimens cured on the job are to indicate the adequacy of protection and curing of the concrete and may be used to determine when the forms may be stripped, shoring removed, or the structure placed in service. When the strengths of the job cured specimens are below those specified above, the Contractor must improve the procedures for protecting and curing the concrete. The strengths of any field cured specimens should never be used solely for concrete acceptance purposes.
 - h. When concrete fails to meet the requirements above or when tests of field cured cylinders indicate deficiencies in protection and curing, the CO's representative may order tests on the hardened concrete in accordance with ACI-301 for that portion of the structure where the questionable concrete has been placed. In the event the core tests also indicate that the structure is unsatisfactory, make all modifications as directed by the COR to make the structure sound. If the core tests indicate the concrete is satisfactory, all cost of testing shall be paid by CO.
- 5. Temperature
 - a. Performed each time a set of compressive strength test specimens is made.
 - 6. Testing Reports
 - a. In addition to the reports provided to the OCOwner and COR, the Contractor shall ensure that the concrete producer is provided copies of all reports of tests performed on concrete samples taken to determine compliance with the specification requirements. Reports shall be provided on a timely basis.

PART 2 -- PRODUCTS

2.1 CLASSIFICATION

- A. Concrete is classified as set forth by aggregates size referenced in ASTM C33, sizes 4 and 467 for Class C concrete and 56, 57, and 6 for Class M concrete. Place the specified class of concrete for each structure element as specified.
 - 1. Use M-4500 ($f'_c=4,500$ psi) concrete for curb and gutter, sidewalks, driveways, approaches, curb turn fillets and valley gutters and structural concrete. The maximum allowable water cement (w/c) for this concrete is 0.45.
 - 2. Use M-3000 ($f'_c=3,000$ psi) concrete for manholes, storm drain inlets and miscellaneous or C-3000 Concrete Construction class. The maximum allowable w/c for this concrete is 0.50.
- B. If concrete strength or durability requirements established by design exceed the above strength classifications, the COR may specify additional concrete classifications to meet those requirements.

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2.2 CONCRETE MATERIALS

A. Materials for concrete shall conform to the following requirements:

1. Cementitious Material: Cementitious material consists of Portland cement meeting ASTM C150 Type I, II, III, or V, with or without the addition of cementitious or pozzolanic mineral admixtures meeting, ASTM C618 or ASTM C989, and ASTM C1240, or blended hydraulic cement meeting ASTM C595 Type 1P, 1S, or 1L, or hydraulic cement meeting ASTM C1157 Type GU, MS, HS, or HE. Unless otherwise specified, assure cementitious material meets ASTM C 150 Type I or Type II. Assure cementitious material used in concrete is the same brand and type and from the same plant of manufacture as the cementitious material used in the concrete represented by the submitted field test data or used in the trial mixtures.
2. Water for mixing and curing shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts, and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets ASTM C 1602
– Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete. Agricultural water with high total dissolved solids (greater than 1000 mg/l TDS) shall not be used.
3. Aggregates: Assure aggregates meet ASTM C33. When a single size or a combination of two or more sizes of coarse aggregates are used, assure the final gradation meets the grading requirements of ASTM C33 or provide an optimized combined aggregate gradation plan. Obtain concrete aggregates from the same source and use the same size ranges as the aggregates used in the concrete represented by submitted historical data or used in trial mixtures.
4. Ready-mix concrete shall conform to the requirements of ASTM C 94 – Ready-Mixed Concrete and all application standard from the National Ready Mixed Concrete Association (NRMCA).
5. Tenting: Tenting is allowed for creation of heated spaces to avoid cold temperature problems associated with concrete curing.
6. Admixtures: Use admixtures meeting the following requirements:
 - a. Air entraining, admixtures ASTM C260
 - b. Chemical admixtures ASTM C494
 - c. Chemical admixtures for use in producing, flowing concrete ASTM C1017
 - d. Calcium Chloride ASTM D98
 - e. Use admixtures in the concrete that are the same as those used in the concrete represented by submitted field test data or in trial mixtures.
7. Change of materials
 - a. When brand, type, size, or source of cementitious materials, aggregates, water, ice or admixtures are requested to be changed, submit new field data or data from new trial mixtures or furnish evidence that indicates that the change will not adversely affect the relevant properties of the concrete for acceptance before using the concrete.
8. Fly ash

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- a. Fly ash shall be substituted for cement, 20% by weight for the higher strength mix.
- b. For other concrete, fly ash may be substituted for not more than 15%, by weight, of cement in structural concrete and not more than 30% by weight for site work concrete.
- c. Fly ash shall conform to ASTM C618 and shall not have loss-on-ignition greater than 3%.
- d. The water/cement ratio shall be calculated based on cement plus fly ash.

B. Performance and Design Requirements

1. Assure the cementitious material content is adequate to meet the specified requirements for strength, water-cement ratio and finishing requirements. For concrete exposed to freezing and thawing or concrete exposed to deicers, assure a maximum water-cement ratio of 0.45.
2. Furnish concrete at the point of delivery having a slump of 4 inches (max) (100 mm) determined by ASTM C143. Meet slump tolerances in ACI 117. When a plasticizing admixture is used meeting ASTM C1017 or when a Type F or G high range water reducing admixture meeting ASTM C494 is approved to increase the concrete slump, assure the concrete has a slump of 2 to 4 inches (50-100mm) before the admixture is added and a maximum slump of 8 inches (200 mm) at the point of delivery after the admixture is added.
3. Assure the nominal maximum size of coarse aggregate does not exceed three fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms or one-third of the thickness of slabs or toppings.
4. Concrete exposed to cycles of freezing and thawing or in the presence of deicers must be air entrained. Montana is considered a "severe" exposure state. Measure air content under ASTM C 138, C 173 or C231. Unless otherwise specified, ASTM C231 shall be used. Table 2.1 lists the required air contents for various nominal maximum size aggregates.

Table 0.1 Total Air Content* of Concrete for Various Sizes of Coarse Aggregate

Nominal Maximum Size of aggregate in.	Total air content, percent
	Severe exposure
Less than 3/8	9
3/8	7.5
1/2	7
3/4	6
1	6
1-1/2	5.5
2	5
3	4.5
6	4

* Measure in accordance with ASTM C 138, C 173, or C 231.

Air content tolerance is plus 2 percent (+2%) to minus 1 percent (-1%).

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- a. When admixtures are specified in the Contract documents for particular parts of the work, use types specified. Use of calcium chloride or other admixtures containing chloride ions is subject to the limitations in Table 2.2 Chloride Ion Concentration. When approved, use calcium chloride in solution form only, when introduced into the mixture.
 - 1) Assure the maximum water-soluble chloride ion concentrations in hardened concrete at ages from 28 to 42 days attributed to the ingredients including water, aggregates, cementitious materials, and admixtures do not exceed the limits of Table 2.2. Use tests to determine water soluble chloride ion content meeting AASHTO T260. The type of member described in Table 2.2 applies to the work as indicated in the Contract Documents.

Table 0.2 Maximum Allowable Chloride Ion Content

Type of Member	Maximum water-soluble chloride (Cl) Content in concrete, percent by weight of cement
Prestressed concrete	0.06
Reinforced concrete exposed to chloride in service	0.15
Reinforced concrete that will be dry or protected from moisture in service	1.00
Other reinforced concrete construction	.30

- b. When the air temperature has fallen to or is expected to fall below 40oF (4oC) during the protection period, deliver concrete in accordance with minimum temperatures identified in ASTM C94. The protection period is defined as the time required to prevent concrete from being affected by exposure to cold weather.
- c. Furnish the compressive strength and the water-cement or water cementitious, material ratio of concrete for each portion of the work as specified in the Contract documents.
 - 1) If cementitious or pozzolanic mineral admixtures meeting, ASTM C618 or ASTM C989, or ASTM C1240 are used, the cement portion of the water-cement ratio must be the total weight of cementitious material.
 - 2) The combined weight of fly ash and other pozzolans, slag cement, silica fume meeting applicable ASTM standards, cannot exceed limits in ACI 318-14, Table 26.4.2.2 (b). The fly ash and pozzolan present in an ASTM Type IP cement meeting ASTM C595 must be included in the calculated percentage.

ACI Table 26.4.2.2(b) - Limits on Cementitious materials for concrete assigned to Exposure Class F3

Cementitious Materials	Maximum Percent of Total Cementitious Materials by Mass
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Fly ash or other pozzolans conforming to ASTM C618	25
Slag cement conforming to ASTM C989	50
Silica fume conforming to ASTM C1240	10
Total of fly ash or other pozzolans and silica fume	35
Total of fly ash or other pozzolans, slag cement, and silica fume	50

- 3) Strength requirements are based on the 28-day compressive strength determined on 6" x 12" (150mm x 300mm) (average of two specimens), or 4" x 8" (100mm x 200mm) (average of three specimens) cylindrical specimens made and tested under ASTM C31 and C39 respectively.

2.3 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to the COR for preparing and reporting proposed mix designs.
- B. Submit written reports of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until design mixes have been reviewed and approved.

PART 3 -- EXECUTION

3.1 CONCRETE MIXES

- A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch match mixer. For mixers of 1 cu. yd., or small capacity, continue mixing at least 1-½ minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-½ minutes of mixing time by 2.5 minutes for each additional cu. yd., or fraction thereof. Aggregates or bags of cement containing lumps or crusts shall not be used.
- B. Provide batch ticket in compliance with ASTM C94 for each batch discharged and used in work.
- C. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1-½ hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes, unless a hot weather concreting plan has been approved.
- D. The mix may be designed for delayed set time to allow for long haul or other project conditions. Information pertaining to the delayed set admixture needs to be included on the Batch Ticket. Include with the mix design submittal information on the delayed set provisions of the design and specific time to final placement requirements.

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3.2 MIXING

- A. Thoroughly mix concrete to assure a uniform distribution of the materials throughout the mass. Mix concrete only in quantities required for immediate use and place it within the time limits specified. Waste all concrete which initial set has begun. Retempering of concrete is prohibited. Mix concrete in an approved truck mixer meeting the requirements of ASTM C94 herein.
1. WATER:
 - a. Do not exceed the approved w/c ratio.
 - b. The addition of water is allowed only one time and a minimum of 30 revolutions at mixing speed are required before discharge of concrete.
 - c. Do not add water if part of the batch has been discharged as a W/C ratio cannot be determined.
 - d. Do not add water if the slump is within specified range.
 2. ADMIXTURE
 - a. Do not exceed manufacturer's recommended dosage rates unless otherwise approved in the mix design stage.
 - b. Only admixtures included in the approved mix design may be dosed on- site.
 - c. A minimum of 30 revolutions at mixing speed are required before discharging of concrete.
 - d. Do not add admixtures if any concrete has been discharged from the mixer other than the minimal amount for initial testing.
 - e. When measured plastic air content or slump exceeds the upper test limit and there is time available within the discharge time limit specified, rotate the load at agitation speed and re-test the air content and/or slump.
 - f. Do not use additives to reduce the air content and/or slump.
- B. The capacity of the plant and the transportation equipment must ensure delivery at a rate that will permit proper handling, placement and finishing at the point of delivery. Maintain the concrete delivery rate to provide for the continuous operation of placing, handling, and finishing concrete as is practical. Maintain the interval between delivery of loads so that layers or lifts of concrete in place do not harden before succeeding layers or lifts are placed. In general, no lift or layer of concrete can remain exposed for more than 20 minutes before being covered by fresh concrete.
- C. The volume of mixed concrete in the mixing drum shall not exceed the manufacturer's rating, on the capacity plate.
- D. A recording water metering device is always required at the primary point of the batching operation.
- E. Do not add water to concrete in transit. Water may be introduced into the mixer at the job site, one time only, under direction of the COR, if the specified water-cement ratio is not exceeded. Water must be added in accordance with ASTM C94, Assure the drum revolves continuously after the introduction of the cement and water until the concrete is discharged.
- F. Begin mixing immediately after introduction of the cement and water and continue for at least 70 revolutions of the drum at mixing speed. This minimum revolution count will be

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waived when the concrete is produced at a central mixing plant. Not more than 100 drum revolutions can exceed 6 revolutions per minute. All other revolutions must be at agitating speed of not less than 2 or more than 6 revolutions per minute.

- G. Provide a revolution counter on each truck that registers the number of revolutions of the drum.
- H. Mount the counter so it can be easily read by both the operator and the COR.

3.3 PREPARATION OF SURFACES FOR CONCRETING

- A. General: Earth surfaces shall be thoroughly wetted by sprinkling prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling for a 12 hour period within 24 hours of the concrete placement. The surface shall be free from standing water, mud, and debris at the time of placing concrete. Concrete shall not be placed upon any surface that has not been approved by the COR in writing.
- B. Placing Interruptions: When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means that will secure proper union with subsequent work; provided that construction joints shall be made only where acceptable to the COR.
- C. Embedded Items: No concrete shall be placed until formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the COR in writing at least 4 hours before placement of concrete. Surfaces of forms and embedded items that have become encrusted with dried grout from previous usage shall be cleaned before the surrounding or adjacent concrete is placed. Any concrete placed without written approval from the COR shall be removed by the Contractor at their own expense.
 - A. Inserts or other embedded items shall conform to the requirements herein.
 - B. Reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms at locations indicated on the Drawings or shown by Shop Drawings and shall be acceptable to the COR before any concrete is placed. Accuracy of placement is the responsibility of the Contractor.
- D. Casting New Concrete against Old: Where concrete is to be cast against old concrete (defined as any concrete which is greater than 60 days old), the surface of the old concrete shall be thoroughly cleaned and roughened by hydroblasting or sandblasting to expose aggregate. The joint surface shall be coated with an epoxy bonding agent unless determined otherwise by the COR.
 - A. No concrete shall be placed in any structure until water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes or other means, and carried out of the forms, clear of the work. No concrete shall be deposited underwater nor shall the Contractor allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, shall be subject to review by the COR.

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- E. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2-inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.
 - A. Openings for pipes, inserts for pipe hangers and brackets, and anchors shall, where practicable, be provided during the placing of concrete.
 - B. Anchor bolts shall be accurately set and shall be maintained in position by templates while embedded in concrete.
- F. Cleaning: The surfaces of metalwork to be in contact with concrete shall be thoroughly cleaned of dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.4 PLACING

- A. Thoroughly consolidate concrete into its final position. Assure it is thoroughly consolidated around fittings and embedded items. Assure all reinforcement and embedded items are accurately placed as shown on the plans and are clean and free from coatings of dried mortar, detrimental rust, scale, oil or foreign matter.

3.5 CONSOLIDATING

- A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted throughout the entire depth of the layer which is being consolidated into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete. Vibrators shall be Group 3 per ACI 309 – Consolidation of Concrete, high speed power vibrators (8000 to 12,000 rpm) of an immersion type in sufficient number and with at least one standby unit as required. Group 2 vibrators may be used only at specific locations when accepted by the COR.
- B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.
- C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against each surface. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the required results within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall not contact the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents. If the COR believes that proper consolidation is not being achieved, the Contractor shall provide additional training and

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instruction to personnel operating the vibrators or assign this duty to more experienced personnel.

3.6 CURING

- A. Protect freshly placed concrete from freezing, high temperature, large temperature differentials, premature drying, excessive moisture, and moisture loss for a period of time necessary to develop the desired concrete properties.
- B. Thoroughly cure concrete surfaces by covering as soon as possible with canvas, plastic sheets with sealed joints, burlap and sand or other satisfactory materials and keep concrete moist. If the concrete surfaces are not covered, keep them moist by flushing or sprinkling. Continue curing for at least 7 days after placing the concrete. Concrete surfaces placed against forms may be cured by leaving the forms in place for at least 7 days, when approved.
- C. Protect concrete against freezing or other conditions detrimental to strength development meeting the applicable requirements of this specification.
- D. To aid finishing, side forms on ornamental work, curbs and sidewalks, railing and parapets may be removed after 12 hours, not to exceed 48 hours, depending on weather conditions. Continue moist curing during the concrete finishing operation.
- E. Untreated forms and existing concrete must be kept continuously wet for at least 1 hour before any concrete is placed. Keep wet until covered with concrete except that adequately treated forms must be thoroughly washed with a water spray immediately before placing the concrete.
- F. The curing of concrete, by either water curing or membrane curing, must be as follows unless otherwise approved by the COR.
 - 1. Water Curing
 - a) Keep all concrete top surfaces continuously moist after finishing, with a fine water spray, until the concrete has set. Cover the moist concrete with water or an approved curing covering.
 - b) Cure concrete deck slabs and concrete floors for at least 7 days. Cure by placing burlap, cotton mats or other absorptive material as close behind the finishing operation as possible without marring the finished surface. Keep the absorptive material continuously moist for the full time it is used. The absorptive material may be kept in place for the entire curing period, or it may be removed as soon as practical and the entire surface covered with approximately 1-1/2 inches (38.1 mm) of sand, kept continuously moist for the entire curing period.
 - c) Remove forms and repair surface irregularities without interfering with any of the curing requirements. As soon as the vertical forms have been removed and the surface irregularities repaired, cover the concrete with absorptive material, kept continuously wet for the balance of the curing period.
 - 2. Impervious Membrane Curing
 - a) Assure membrane curing compounds are delivered to the job in the

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manufacturer's original container, clearly labeled to show the name of the manufacturer and the contents. The clear curing compound must be sufficiently transparent and free from permanent color that would change the color of the natural concrete. Use clear compound containing a fugitive dye having color sufficient to render the film visible on the concrete for at least 4 hours after application. The concrete surface must maintain its natural color after curing.

- b) Use a compound ready for use as shipped by the manufacturer. Dilute following the manufacturer's recommendations. Use curing compound only with written approval. Sampling will not be required if manufacturer's certification is available. Apply the curing compound under pressure with a spray nozzle to cover the entire exposed surface thoroughly and completely with a uniform film not exceeding manufacturer's specifications. Maintain the required pressure in the spray machine to force the material to leave the nozzle in a fine mist. Keep all concrete surfaces moist with a fine water spray or with wetted burlap until the sealing compound is applied. Keep the curing compound application close to the finishers of the top surface of concrete at all times. Seal the concrete immediately after the finishing operations have been completed, to the satisfaction of the COR.
- c) If it is necessary to allow workers or equipment on the surface before the 7-day curing period is completed, protect the concrete from damage and maintain the curing environment.
- d) Keep concrete, which has not completed its curing period, continuously moist during the stripping and surface repair operations. Remove all surface irregularities, repair all depressions, voids, or holes, including those formed by trapped air, to the satisfaction of the COR. Immediately apply the curing compound before the surface has had an opportunity to dry out. Keep concrete, from which forms have been stripped, continuously moist until surface repair and finishing are completed, and the impervious membrane curing has been applied.

3.7 WEATHER AND NIGHT LIMITATIONS

A. General

1. Stop concreting operations when darkness prevents obtaining the specified placing and finishing work. Night operations may be conducted with written approval and when approved artificial lighting is provided.
2. Cold weather concreting is governed by ACI 306.1 unless otherwise specified herein. Cold weather exists when the ambient air temperature has fallen or is expected to fall below 40°F during the protections and curing period. The protection and curing period is defined as the time required to prevent concrete from being affected by exposure to cold weather.
3. When cold weather conditions are expected, all concreting operations will be suspended unless authorized by the COR. Contractor may receive authorization from concrete placement in cold weather by submitting a cold weather concreting plan for review and approval. The plan shall include detailed procedures to protect the fresh concrete from

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freezing during placement and maintaining the concrete surface temperature at a minimum of 55°F during the curing period.

4. Assume all risk of placing concrete in cold weather. Placing concrete during cold weather does not relieve the Contractor of the responsibility for obtaining the specified results. Remove and replace all concrete injured by frost at Contractor expense.
5. Before any concrete is placed, remove all ice, snow, and frost completely from the formwork receiving the concrete. The subgrade must be frost free and above freezing before any concrete can be placed. Increase the temperature of formwork, reinforcement, subgrade, and base gravel to a minimum of 35°F (2°C).
6. Concrete shall be mixed, placed, and maintained according to Table (306-R10 5.1) 3.1.
7. Protection of Concrete
 - a. Unless otherwise approved, Maintain the surface temperature of the concrete in place between 55° F and 75° F for a minimum of 7 days using approved heating devices or enclosures during the protection and cure period. The minimum 7-day protection and cure period is intended only to protect the concrete from the effects of cold. A longer protection period may be needed for the concrete to gain additional strength to support the loads it will experience when in service. Contractor may, bearing all expenses, field cure concrete test cylinders with the in-place concrete and discontinue protection and curing when the field test cylinders reach 3500 psi. Contractor shall monitor the concrete temperature daily throughout the protection and cure period and make adjustments as needed to maintain the temperature between 55° F and 75° F. Forms shall be kept in place for the duration of the protection and cure period. When the protection and cure period has ended reduce the heat gradually, so the concrete surface temperature does not decrease faster than 15° per hour until the concrete temperature is the same as the outside temperature. Modifications may be allowed if approved by COR and in conformance with ACI 306.1.
 - b. A Contractor may, at their expense, determine the in-place strength of the concrete using appropriate test methods and discontinue protection when those test methods indicate the concrete has reached 3500 psi.

3.8 PROTECTION

- A. The Contractor shall protect concrete against injury until final acceptance. Repairs due to damage made by the Contractor shall be as directed by the COR.
- B. Fresh concrete shall be protected from damage due to rain, hail, sleet, or snow. The Contractor shall provide such protection while the concrete is still plastic and whenever precipitation is imminent or occurring.

3.9 TREATMENT OF SURFACE DEFECTS

- A. As soon as forms are removed, exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the COR. In no case will extensive patching of honeycombed concrete be permitted. Voids 1/4" and greater in any dimension within 3" from a water bearing surface shall be repaired by the Contractor at their own expense. Concrete containing minor voids, holes, honeycombing,

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or similar depression defects shall be repaired as indicated below. Concrete containing extensive voids, holes, honeycombing, or similar depression defects shall be completely removed and replaced per the direction of the COR. Repairs and replacements shall be performed promptly.

- B. Defective surfaces to be repaired shall be cut back from true-line a minimum depth of ½-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of laitance and soft material, plus not less than 1/32-inch depth of the surface film from hard portions by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces underneath will remain moist but not so wet as to overcome the suction upon which a good bond depends. The material used for repair shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white Portland cement as is required to make the color of the patch match the color of the surrounding concrete.
- C. Holes left by tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. Holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross section and other imperfections having a depth greater than their least surface dimension shall not be reamed but shall be repaired in an approved manner with dry-packed cement grout.
- D. Repairs shall be built up and shaped in such a manner that the completed Work will conform to the requirements of this Section, as applicable, using approved methods which will not disturb the bond, or cause sagging, or cause horizontal fractures. Surfaces of repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

3.10 CARE AND REPAIR OF CONCRETE

- A. The Contractor shall protect concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed Work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the COR's discretion.
- B. Cracks identified by the COR shall be repaired at no additional cost to the Owner. Depending upon the crack width, repair techniques may involve routing and filling with sealant conforming to the requirements of Paragraph 2.4 or may require chemical grouting or epoxy injection. The COR shall determine the method of repairing cracks.

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CAST IN PLACE CONCRET

FALLS CREEK DIVERISION REHABILITATION PROJECT PAGE 03 30 00-25

SECTION 03 30 53 – FLOWABLE FILL CONCRETE

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. This work consists of furnishing and placing Flowable Fill to the lines and grades shown on the plans as backfill in trenches and/or at other locations. Flowable Fill is a self-compacting cementitious material using mineral aggregates (sand and/or gravel), native or processed materials, fly ash/cement/slag cement, water, air-entraining solution, and (optionally) other admixtures. Flowable Fill is also known as Controlled Low-Strength Material (CLSM) and Controlled Density Fill (CDF). Flowable Fill is only permitted when specifically called out in the contract documents or approved by COR. Flowable fill shall be used in conjunction with the riprap in the grouted riprap area shown on the plans. The use of Flowable Fill in-lieu of compacted aggregate or fill material is allowed for the ease of construction by the Contractor; no additional payment shall be made for the use of Flowable Fill.

1.2 REFERENCES

- A. The current publications listed below form a part of the specification.

ASTM D4832	Preparation/Testing of Soil-Cement Slurry Test Cylinders
ASTM C39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM D6023	Standard Test Method for Unit Weight
ASTM C150	Specification for Portland Cement
ASTM C618	Specification for Fly Ash
ASTM C989	Specification for Slag Cement
ASTM C494	Specification for Chemical Admixture for Concrete
ASTM E329	Practice for Use in the Evaluation of Testing and Inspection Agencies as Used in Construction Concrete
ASTM C117	Materials Finer Than 0.075 mm (No. 200) Sieve in mineral Aggregates by Washing
ASTM C136	Sieve Analysis of Fine & Coarse Aggregate
ASTM C117	Materials Finer Than No. 200 (0.075 mm) Sieve in Mineral Aggregates by Washing
ASTM D4318	Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM C94	Ready Mix Concrete
ACI 301	Standard Specifications for Structural Concrete for Buildings
ACI 304	Guide for Measuring, Mixing, Transporting and Placing Concrete

1.3 TESTING

- A. The COR may perform occasional quality assurance tests on the flowable fill consisting of slump, air content measurements, and casting 3 cylinders for compressive strength test. The required compressive strength test method

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and required range are described in section 2.4, Compressive Strength below.

PART 2 -- PRODUCTS

2.1 MIXTURE OF MATERIALS

- A. Provide a mixture of the materials described below to produce a self-compacting cementitious material batched on a per cubic yard basis.

2.2 MATERIALS

- A. Portland Cement. Portland Cement shall conform to the requirements of ASTM C150, Type 11.
- B. Fly Ash. Fly Ash shall conform to ASTM C618, Class C or F.
- C. Slag Cement. Slag Cement shall conform to ASTM C989.
- D. Coarse Aggregate, Fine Aggregate, and Native Materials. Any aggregate gradation which produces performance characteristics of the flowable fill specified herein will be accepted, except as follows: The amount of material passing the #200 sieve shall not exceed 20 percent. Also, liquid limit and plasticity index shall not exceed 25 and 5, respectively.
- E. Water. Water used in mixing shall be free of oil, salt, acid, alkali, sugar, vegetable matter, or other substances injurious to the finished product.
- F. Chemical Admixtures. Chemical Admixtures shall conform to the requirements of ASTM C494.

2.3 PROPORTIONS

- A. A variety of sand/gravel aggregates and/or native (or processed) materials meeting the above requirements in conjunction with appropriate amounts of Portland Cement and fly ash, slag cement, air-entraining solution, and (optionally) other admixtures may be used to produce the required mix properties described herein.
- B. The Contractor shall submit to the COR a mix design based upon a trial batch or field experience, including the proportions and sources of all constituent materials, air-entraining, and (optionally) other admixtures, expressed as cubic yard batch weights. The mix shall contain a minimum of 50 pounds (23 kg) of cement and up to 250 pounds (114 kg) fly ash or slag cement per cubic yard, with the remainder of the volumes composed of aggregates, water, and any approved admixtures. Measured compressive strength, air content, and yield for the mix design trial batch (or for the field experience-based mix design) shall be submitted.

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2.4 COMPRESSIVE STRENGTH

- A. Flowable Fill shall be designed to achieve a 28-day compressive strength of 2,000 psi to 3,000 psi when tested in accordance with ASTM C39 for flowable to be installed with riprap. Excavatable mixes shall be designed to attain 28-day strengths in the range of 30 to 150 psi. Test specimens shall be made in accordance with ASTM D4832. Compressive strength tests shall be performed at frequencies of at least one test set per 50 yd³ (114m³) and at least one test set per day of placement.

2.5 CONSISTENCY

- A. Consistency of the fresh mixture shall be such that the mixture may be readily placed without segregation. High flowability material generally has a slump greater than 8 inches (20.3 cm). As an alternative to slump testing, desired consistency may be approximated by filling an open-ended 3-inch (76.2 mm) diameter cylinder, 6 inches (15.2 cm) high, with the mixture and cylinder immediately pulled straight up. The correct consistency of the mixture will produce an approximate 8-inch (20.3 cm) diameter circular type spread without segregation. Adjustments of the proportions of constituents may be made to achieve proper solid suspension and optimum flowability. However, strength requirements and proper yield shall be maintained for the actual batch weights.

PART 3 -- EXECUTION

3.1 CONSTRUCTION

- A. Comply with ACI 304 and ASTM C94 for Measuring, Mixing, Transporting, and Placing the Flowable Fill, and as herein specified.

3.2 CONSTRUCTION

- A. Do not place CLSM on frozen ground. Mix and place only when the air temperature is at least 35 degrees Fahrenheit (2°C) and rising. At the time of placement, Flowable Fill shall be at least 40 degrees Fahrenheit (4°C). Stop mixing and placement when the air temperature is 40 degrees Fahrenheit (4°C) and falling.
- B. Flowable backfill shall be placed by methods that preserve the quality of the material in terms of compressive strength, flow, homogeneity, plasticity, and workability. The material shall be transported, placed, and/or consolidated to flow easily around, adjacent to, and under structures. It shall have the flow, consistency, and workability such that the material is self-compacting.
- C. Protect freshly placed Flowable Fill from premature drying, excessive cold, or hot temperatures. The air in contact with the backfill surface shall be maintained at temperatures above freezing. Begin curing immediately following placement before the backfill has dried. Continue with curing until

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the backfill has attained the 28-day strength requirement. This strength is to be determined prior to any load applications or construction activity unless otherwise directed by an COR.

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CAST IN PLACE CONCRET

FALLS CREEK DIVERISION REHABILITATION PROJECT PAGE 03 30 00-30

SECTION 03 41 00 – PRECAST STRUCTURAL CONCRETE

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. The Contractor shall provide precast and prestressed concrete elements in accordance with the Contract Documents.
- B. The following types of precast concrete are covered in this Section:
 - 1. Precast box culvert sections, cutoff walls, and wingwalls
 - 2. Precast diversion structure box sections
 - 3. Precast ramp flume structure, cutoff walls, and wingwalls

1.2 RELATED DOCUMENTS

- A. Section 01 33 00 – Submittal Procedures
- B. Section 03 10 00 – Concrete Formwork
- C. Section 03 21 00 – Reinforcement Steel
- D. Section 03 30 00 – Cast-in-place Concrete

1.4 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. RSN 03 41 00-01 Concrete Mix Designs:
 - 1. Prior to beginning the work and within 30 days of the Notice to Proceed, submit preliminary concrete mix designs which shall show the proportions and gradations of materials proposed for each concrete mixture in accordance with Section 03 30 00 Cast-in-place Concrete.
- C. RSN 03 41 00-02 Shop Drawings:
 - 1. Furnish drawings sealed by a licensed Professional Engineer showing the type of concrete to be placed, predicted camber, the finish requirements, fabrication details, reinforcement, connection details, dimensions, openings, and unit layout and relationship to adjacent members.
 - 2. Design calculations for all concrete structures, sealed by a licensed Professional Engineer.
- D. RSN 03 41 00-04 Manufacturer Certificates:
 - 1. Written certification from the manufacturer as an integral part of the shipping form, that the material shipped to the Site meets or exceeds the physical property

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requirements of the Contract Documents. Supplier certificates are not acceptable.

E. RSN 03 41 00-05 Precaster Plant Certification:

1. Proof of certification of precast concrete Precaster's plant under NPCA certification program.

F. RSN 03 41 00-06 Welding Certificates:

1. Provide certificates for welding procedures and personnel.

1.5 QUALITY ASSURANCE

A. Evaluation and Acceptance of Concrete:

1. The Precaster shall sample, test, and report the following tests:
 - a. The compressive strength of concrete will be according to AASHTO T23 and AASHTO T22.
 - b. Make at least one set release strength test cylinders according to AASHTO T 23 in addition to those required to determine the 28-day compressive strength. Cure the release strength test cylinders with the concrete member they represent.
 - c. Sample and test for air content in accordance with AASHTO T 152 or AASHTO T 196.
 - d. Precaster shall conduct production testing and monitor testing reports and records to ensure consistency with data and compliance with Project requirements. Testing is subject to observation by Owner's Representative.

B. Fabrication Tolerances:

1. Fabricate precast concrete foundation units straight and true size and shape with exposed edges and corners precise and true so each finished unit complies with the following dimension tolerances as well as position tolerances for cast in items:
 - a. Length shall not vary by more than $\frac{3}{4}$ inch.
 - b. Height/Width shall not vary from that shown in the design by more than $\frac{1}{4}$ inch.
 - c. Local smoothness shall be no more than $\frac{1}{4}$ inch in 10 ft for any surface.
 - d. Position of inserts for structural connections shall not vary from that shown in the shop drawings by more than $\frac{1}{2}$ inch.
 - e. Placement of non-prestressed reinforcement shall comply with Section 03 21 00 Reinforcement Steel.

C. Defective Work: Precast concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

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PART 2 -- PRODUCTS

2.1 CONCRETE MATERIALS

A. Concrete: See Section 03 30 00 Cast-in-place Concrete except as specified here.

1. Portland Cement: Conform to AASHTO M85

2.2 REINFORCING MATERIALS

A. See Section 03 21 00 - Reinforcement Steel.

2.3 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application. Acceptable materials:

1. MASTERFLOW 928 GROUT, manufactured by Chemrex.
2. CRYSTEX GROUT, manufactured by L&M Construction Chemicals, Inc.
3. CRYSTEX GROUT, manufactured by L&M Construction Chemicals, Inc.
4. SURE-GRIP HIGH PERFORMANCE GROUT manufactured by Dayton Superior.

2.4 MORTAR MATERIALS

A. Mortar: Premixed cementitious system made up of:

1. Natural aggregate, 3/8" maximum size, that meets the requirements specified in ASTM C 33 except for grading. Accomplish grading by blending sieve sizes to obtain the optimum density.
2. Metallic aggregate free from nonferrous material, soluble alkaline compounds, and visible rust.
3. Water reducers, workability agents, air-entraining agents, and catalysts.
4. Blend the materials to minimize bleeding, increase workability, resist exposure to freeze-thaw cycles and deicing salts, and prevent shrinkage within and at the perimeter of the patch, keyway, or other area to be filled.

B. Ensure that the minimum compressive strength of the mortar, as tested by ASTM C 109 for a 3" slump, is:

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24-hour.....	5000 psi
7-day.....	8500 psi
28-day	,000 psi

- C. Provide certification from the manufacturer that the product is compatible for work that is 3" or more in depth and more than 3" in width; and where the mixing, placing, and curing temperatures may range from 5° C to 30° C (40° F to 85° F).
- D. Submit products proposed for use to the CO for approval, and accompany them with the manufacturer's submittals substantiating all requirements in this section, including (1) graphs or charts showing the time, temperature, humidity, and curing requirements to achieve mortar strengths equal to the adjacent concrete; and (2) complete recommendations for storage, mixing, application, and curing procedures.
- E. As specified as mortar on the contract plans, the following products meet the above requirements:
 - 1. MASTEREMACO T430, manufactured by BASF.
 - 2. RAPID SET DOT REPAIR MIX manufactured by CTS Cement Manufacturing Co.
 - 3. SURE-GRIP HIGH PERFORMANCE GROUT (when extended with pea gravel) manufactured by Dayton Superior.

PART 3 -- EXECUTION

3.1 FABRICATION

- A. Concrete. Construct prestressed concrete according to Section 03 30 00 - Cast-in-place Concrete. Construct reinforcing steel according to Section 03 21 00 - Reinforcement Steel.

3.2 FINISHES

- A. Finish precast foundation units in accordance with paragraph 3.10 of Section 03 30 00 - Cast-in-place Concrete. The top surface (bearing surface) shall be given a U3 Finish.

3.3 STORING AND TRANSPORTING

- A. Do not ship concrete members until concrete cylinder tests, manufactured of the same concrete and cured under the same conditions as the members; indicate that the concrete in each member has attained the minimum required design strength and is at least 7 days old.
- B. Before transporting concrete members, provide written certification from a professional engineer that the members were fabricated and visually inspected according to the contract and meet minimum quality requirements.
- C. Store, and transport precast in the upright position with the points of support and directions of the reactions, with respect to the member, approximately the same as when

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the member is in its final position. Prevent cracking or damage during hoisting, handling, and storing of the precast units. Replace units damaged by improper handling or storing.

3.4 ERECTING AND PLACEMENT OF PRECAST FOUNDATION MEMBERS

- A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.
- B. Erect members level and plumb without exceeding the following allowable tolerances:
 - 1. Plan Location from Design Datum: Plus or Minus 1/2 in. (± 13 mm).
 - 2. Top Elevation from Nominal Top Elevation: Plus or Minus 3/8 in. (± 6 mm).
 - 3. Plumb in Any 10 ft (3 m) of Element Height: 1/4 in. (6 mm).
 - 4. Maximum Jog in Alignment of Matching Edges: 1/4 in. (6 mm).

3.5 ERECTING AND PLACEMENT OF PRECAST MEMBERS

- A. Advise the CO a minimum of 48 hours before any field grout or mortar is to be placed.
- B. Use high-pressure water blasting to remove all debris and loosened paste in the keyways immediately prior to placing mortar.
- C. Maintain air and concrete keyway temperatures between 45 °F and 85 °F before placing mortar. Maintain the temperature within these limits until mortar placement and application of curing method is completed. Require air and concrete temperatures for grout placement to be the same as required for mortar.
- D. Thoroughly saturate the areas to be grouted with water and remove all free-standing water just prior to grout placement.
- E. Strike off exposed grout surfaces flush with the same surface texture finish as the surrounding concrete as soon as the grout has set sufficiently.
- F. Cure the exposed surface as specified in Section 03 30 00 - Cast-in-place Concrete. When artificial means are used to control the curing temperature of the mortar or grout, as during hot or cold weather, the CO will approve the method in advance. Use combustion heaters only if fully vented outside their enclosure. Store all dry mortar materials and mixing and placing equipment such that their temperature is above freezing. Warm mixing water to provide mortar or grout at desired temperature, but ensure that it is at 85 °F or less when mixed with the dry materials. Use ice as part of the mixing water provided it is completely melted prior to the introduction of the water to the dry materials.
- G. Ensure that patching mortar and grout are the same color as the parent concrete.

- END OF SECTION 03 41 00 -

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SECTION 03 62 00 – GROUT

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. The Contractor shall provide grout, complete and in place, in accordance with the Contract Documents.
- B. Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature, and orientation of the hole to be filled.
- C. Types of grout
 - 1. Cement Grout
 - 2. Non-Shrink Grout - Class I (cement-based)
 - 3. Non-Shrink Grout - Class II (cement-based)
 - 4. Non-Shrink Epoxy Grout
 - 5. Epoxy Anchor Grout for Adhesive Anchors
 - 6. Topping Grout and Concrete/Grout Fill

1.2 RELATED DOCUMENTS:

- A. Section 03 21 00 - Reinforcement Steel
- B. Section 31 68 20 - Drilled Anchors

1.3 SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 –Submittal Procedures.
 - 1. RSN 03 62 00-01: Grout Lab Test Reports
 - a. Certified testing lab reports for tests herein indicated.
 - 2. RSN 03 62 00-02: Grout Field Test Reports
 - a. Test results and service report from the field tests and the demonstration and training session verifying the requirements indicated herein.
 - 3. RSN 03 62 00-03: Grout Constituent Certification
 - a. Certification that grouts used on the project contain no chlorides or other chemicals that cause corrosion.
 - b. Manufacturer's certification that its non-shrink grout does not contain aluminum, zinc, or magnesium powders as a method of expansion.

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4. RSN 03 62 00-04: Grout Product Data
 - a. Manufacturer's literature containing instructions and recommendations for the mixing, handling, placement, curing, and appropriate uses from each type of grout used in the WORK, and location of use. ICBO/ES report shall be submitted for epoxy anchor grout for adhesive anchors.
5. RSN 03 62 00-05: Grout Warranty
 - a. Submit manufacturer's written warranty as indicated herein.
6. RSN 03 62 00-06: Manufacturers Representative Contact Info
 - a. Name and telephone number of grout manufacturer's representative who will give on-Site service. The representative shall have at least one year of experience with the indicated grouts.

1.4 QUALITY ASSURANCE

A. Field Tests

1. Compression test specimens will be taken from the first placement of each type of grout, and at intervals thereafter selected by the COR. The specimens will be made by the COR or its representative.
2. Compression tests and fabrication of specimens for cement grout and cement based non-shrink grout will be performed in accordance with ASTM C 1107 - Packaged Dry, Hydraulic-Cement Grout (Nonshrink), at intervals during construction selected by the COR. A set of 3 specimens will be made for testing at 7 Days, 28 Days, and each additional time period as appropriate.
3. Compression tests and fabrication of specimens for topping grout and concrete/grout fill will be performed in accordance with Section 03 30 00 - Cast-in-Place Concrete, at intervals during construction selected by the COR.
4. Compression tests and fabrication of specimens for epoxy grouts will be performed in accordance with ASTM C 579 - Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings and Polymer Concretes, Method B, at intervals during construction selected by the COR. A set of 3 specimens will be made for testing at 7 Days and each earlier time period as appropriate.
5. The cost of laboratory tests on grout will be paid by Contractor including test results showing the grout to be defective. Contractor shall pay for the tests, removal and replacement of Defective Work, and re-testing, all as part of the work.
6. The Contractor shall assist the COR in obtaining specimens for testing and shall furnish materials necessary for fabricating the test specimens.

- B. Construction Tolerances: Construction tolerances shall be as indicated in Section 03 30 00 unless indicated otherwise.

1.5 GENERAL WARRANTY

- A. Furnish one-year warranty for work provided under this section.

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- B. Manufacturer's warranty shall not contain a disclaimer limiting responsibility to the purchase price of products or materials.

PART 2 -- PRODUCTS

2.1 APPLICATION

- A. Unless indicated otherwise, grouts shall be provided as listed below, whether or not indicated on drawings:

Application	Type of Grout
Anchor bolts and reinforcing steel required to be set in grout that is not in high temperature or high fire risk areas.	Epoxy Anchor Grout
Filling blockout spaces for embedded items such as railing posts, gate guide frames, etc.	Non-Shrink - Class I (Class II where placement time exceeds 20 min.)
Under precast concrete elements	Non-Shrink - Class II
Toppings and concrete/grout fill less than 3-inches thick	Topping Grout
Toppings and concrete/grout fill greater than 3-inches thick	Structural Concrete per 03 30 00
Surface repairs	Cement Grout
Repair of holes and defects in concrete members which are not water bearing and not in contact with soil or other fill material	Non-Shrink - Class I
Repair of holes and defects in concrete members which are water bearing or in contact with soil or other fill materials	Non-Shrink - Class II
Any application not listed above, where grout is indicated	Non-Shrink Class I, unless specifically indicated otherwise

2.2 CEMENT GROUT

- A. Cement grout shall be composed of one part cement, 3 parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 Days shall be 4000 psi.
- B. Cement grout materials shall be as indicated in Section 03 30 00 – Cast-In Place Concrete

2.3 NON-SHRINK GROUTS (CEMENT BASED)

- A. General
1. Cement-based non-shrink grout shall be a prepackaged, inorganic, fluid, non-gas liberating, non-metallic, cement type grout requiring only the addition of water. Cement from kilns burning metal-rich hazardous waste fuel shall not be used.
 2. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink

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grout shall be as recommended by the manufacturer for the particular application.

3. Grout shall not contain chlorides or additives that may contribute to corrosion.
4. Grout shall be formulated to be used at any consistency from fluid to plastic.
5. Cement-based non-shrink grout shall have the following minimum properties when tested at a fluid consistency, at 28 Days:
 - a. Minimum tensile splitting strength of 500 psi per ASTM C 496 - Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 - b. Minimum flexural strength of 1000 psi per ASTM C 580 - Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - c. Minimum bond strength (concrete to grout) of 1900 psi per modified ASTM C 882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
 - d. Grout shall be certified for use in a marine environment.
 - e. Grout shall be certified for use in freeze/thaw environments

B. Class I Non-Shrink Grout

1. Class I non-shrink grout shall have a minimum 28 Day compressive strength of 5000 psi when mixed at a fluid consistency.
2. Class I non-shrink grout shall meet the requirements of ASTM C 1107, Grade B or C, when mixed to fluid, flowable, and plastic consistencies.
3. Grout shall have a maximum early age height change of 4.0 percent expansion, and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827 – Test Method for Early Volume Change of Cementitious Mixtures. The grout when tested shall not bleed or segregate at maximum allowed water.
4. Grout shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C 1090 - Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.
5. Furnish certification that the non-shrink property of grout is not based on gas production or gypsum expansion.
6. Class I Non-Shrink Grout shall be Five Star Grout by Five Star Products, **SikagROUT 212 by Sika Corporation, Premier by L&M Construction Chemicals; High-Flow Grout by Euclid Chemical Company, CG 200 PC by Hilti**, or equal.

C. Class II Non-Shrink Grout

1. Class II non-shrink grout shall be a high precision, fluid, extended working time, grout. The minimum 28-Day compressive strength shall be 7500 psi, when mixed at a fluid consistency.
2. Grout shall have a maximum early age height change of 4.0 percent expansion, and

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shall have no shrinkage (0.0 percent) in accordance with ASTM C 827.

3. Grout shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C 1090.
4. Class II non-shrink grout shall have an extended working time of 30 minutes minimum when mixed to a fluid consistency as defined in ASTM C 827 at temperature extremes of 45 to 90 degrees F in accordance with ASTM C 1107.
5. Class II non-shrink grout shall meet the requirements of ASTM C 1107, Grade B or C when tested using the amount of water needed to achieve fluid consistency per ASTM C 939.
6. The grout when tested shall not bleed or segregate at maximum allowed water content.
7. Provide certification that its non-shrink property is not based on gas production or gypsum expansion.
8. Class II non-shrink grout shall be **Masterflow 928 by MBT/Degussa Building Systems, Five Star Fluid Grout 100 by Five Star Products, Crystex by L&M Construction Chemicals**, or equal.

2.4 NON-SHRINK EPOXY GROUT

- A. Non-shrink epoxy grout shall be a flowable, non-shrink, 100 percent solids system. The epoxy grout system shall have 3 components: resin, hardener, and specially blended aggregate, each premeasured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.
- B. Epoxy grout shall have a maximum early age height change of 4.0 percent expansion, and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827, (modified for epoxy grouts by using an indicator ball with a specific gravity between 0.9 and 1.1).
- C. Epoxy grout shall have a negligible (less than 0.0006 in/in) length change after hardening, and a coefficient of thermal expansion less than 0.00003 in/in F when tested according to ASTM C 531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.
- D. The epoxy grout shall develop a minimum compressive strength of 9000 psi in 24 hours and 13,000 psi in seven days when tested in accordance with ASTM C 579, method B.
- E. The mixed epoxy grout shall have a minimum working life of 90 to 120 minutes at 70 degrees F.
- F. The effective bearing area shall be a minimum of 95 percent EBA in accordance with ASTM C 1339 – Standard Test Method for Flowability and Bearing Area of Chemical- Resistant Polymer Machinery Grouts, for bearing area and flow.
- G. The chemical formulation of the epoxy grout shall be recommended by the manufacturer for the particular application. Do not reduce aggregate loading or add solvents to increase flowability.

- H. Non-shrink epoxy grout shall have the following minimum properties when tested at 7 Days:
 - 1. Minimum bond strength to concrete of 3000 psi per ASTM C 882 modified.
 - 2. Minimum bond strength to steel of 1700 psi per ASTM C 882 modified.
 - 3. Minimum flexural strength of 2500 psi per ASTM C 580.
- I. Minimum tensile strength of 2000 psi per ASTM C 307 -- Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
- J. Non-shrink epoxy grout shall be **Five Star DP Epoxy Grout by Five Star Products Inc., Masterflow 648 CP Plus by MBT/ Degussa Building Systems, Sikadur 42 Grout Pak by Sika Corporation**, or equal.

2.5 EPOXY ANCHOR GROUT

- A. Epoxy anchor grout shall conform to ASTM C 881 - Epoxy-Resin-Base Bonding Systems for Concrete, Type IV, Class C, Grade 3 with the exception of gel time.
- B. Heat deflection temperature per ASTM D 648 -- Test Method for Deflection Temperature of Plastics Under Flexural Load shall be a minimum 120 degrees F.
- C. Manufacturer shall certify that the epoxy anchor grout will maintain 90 percent of its strength up to a temperature of 125 degrees F.
- D. Grout shall come in a 2 chambered cartridge with a metering system that provides the proper ratio of hardener and resin. The grout shall also come with a static mixer nozzle to thoroughly mix the hardener and resin together.
- E. Epoxy anchor grout shall be capable of being used in submersed applications once cured.
- F. Compressive strength per ASTM D 695 - Test Method for Compressive Properties of Rigid Plastics shall be 10,000 psi minimum.
- G. If the average working or operating temperature will be over 100 degrees F or in a high fire risk area, use cement based non-shrink grout and oversized holes.
- H. Overhead anchors and anchors in fire-resistive construction shall be cast-in anchors.
- I. Embedment of adhesive anchors/rebar shall be deep enough to develop the anchor/rebar. Embedment shall not exceed 67 percent of the member depth.
- J. Epoxy anchor grout shall be **Epcon C6 by ITW Ramset/Red Head; Power-Fast Epoxy Injection Gel by Powers Fasteners; HIT-RE 500 V3 by Hilti, Sikadur AnchorFix-4 by Sika Corporation**, or equal.

2.6 TOPPING GROUT AND CONCRETE/GROUT FILL

- A. Where fill is thicker than 3-inches, structural concrete as indicated in Section 03 30 00 - Cast-in-Place Concrete, may be used when accepted by the COR.
- B. Grout for topping of slabs and concrete/grout fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and be mixed as indicated. Materials and procedures

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indicated for normal concrete in Section 03 30 00- Cast-in-Place Concrete, shall apply unless indicated otherwise.

- C. Topping grout and concrete/grout fill shall contain a minimum of 564 pounds of cement per cubic yard with a maximum water cement ratio of 0.45.
- D. Coarse aggregate shall be graded as follows:

U.S. STANDARD SIEVE SIZE	PERCENT BY WEIGHT PASSING
1/2 in	100
3/8 in	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

- E. Final mix design shall be as determined by trial mix design as indicated in Section 03 30 00 except that drying shrinkage tests are not required.
- F. Topping grout and concrete grout/fill shall contain air-entraining agent per Section 03 30 00.
- G. Strength: Minimum compressive strength of topping grout and concrete/grout fill at 28 Days shall be 4000 psi.

2.7 CURING MATERIALS

- A. Curing materials shall be in accordance with Section 03 30 00 and as recommended by the manufacturer of prepackaged grouts.

2.8 CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is defined such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of that consistency; the type of grout to be used shall be as indicated herein for the particular application.
- B. The slump for topping grout and concrete/grout fill shall be adjusted to match placement and finishing conditions but shall not exceed 4-inches.

2.9 MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurements shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the

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manufacturer.

PART 3 -- EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

- A. Grout shall be stored in accordance with manufacturer's recommendations.

3.2 GENERAL

- A. Contractor shall arrange for the manufacturer of prepackaged grouts to provide on-Site technical assistance within 72 hours of request, as part of the work.
- B. Grout shall not be placed until base concrete or masonry has attained its design strength, unless authorized otherwise by the COR.
- C. When cementitious grouts are used on concrete surfaces, the concrete surface shall be saturated with water for 24 hours prior to placement. Upon completion of the saturation period, excess water shall be removed with clean, oil free compressed air prior to grouting. Concrete substrate shall not be wet prior to placement of epoxy grouts.
- D. Surface preparation, curing, and protection of cement grout shall be in accordance with Section 03 30 00. The finish of the grout surface shall match that of the adjacent concrete unless otherwise indicated.
- E. Surfaces that will be in contact with grout shall be free of dirt, loose rust, oil, wax, grease, curing compounds, laitance, loose concrete, and other deleterious materials.
- F. Shade the work from sunlight for at least 24 hours before and 48 hours after grouting.
- G. Contact the grout manufacturer's representative for assistance on hot and cold weather grouting techniques and precautions if applicable.

3.3 GROUTING PROCEDURES

- A. General: Mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.
- B. Structural, equipment, tank, and piping support bases shall be grouted, unless indicated otherwise.
 - 1. The original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a minimum one-inch thickness of grout or other thickness if indicated.
 - 2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout through a headbox of appropriate size. The mixture shall be of a fluid consistency and poured continuously into the space between the plate and the base concrete. Forms for grout shall be tight against retaining surfaces, and joints shall be sealed as recommended by the grout manufacturer to be liquid-tight. Forms shall be coated as recommended by the grout manufacturer for easy form release. Where this method of placement is not practical or where required by the COR, alternate grouting methods shall be submitted for acceptance by the COR.

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3. Concrete equipment pads for equipment bases that will be epoxy-grouted shall be sized so that, when the equipment base is fully grouted, the epoxy grout is stopped not less than 4-inches from the edge of the pad.

C. Drilled Anchors and Reinforcing Bars

1. General

- a. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions. Holes shall be roughened with a brush on a power drill, and cleaned. Drilled anchors shall not be installed until the concrete has reached the required 28 Day compressive strength. Anchors shall not be loaded until the grout has reached its indicated strength in accordance with the manufacturer's instructions.
- b. The Contractor shall identify position of reinforcing steel and other embedded items prior to drilling holes. Care shall be exercised in coring and drilling to avoid damaging existing reinforcing or embedded items. Notify the COR if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and communications conduit, and piping.

2. Epoxy Adhesive Anchors

- a. Grout shall be proportioned and mixed with automatic equipment.
- b. Unless otherwise indicated, embedment shall be sufficient to develop the ultimate tensile strength of the anchor or reinforcing bar per the manufacturer's ICBO/ES report, but shall not be less than 8 rod diameters for threaded rod or 12 bar diameters for reinforcing or smooth bars.
- c. Holes shall be dry.

3. Cement Based Non-Shrink Grout

- a. In places of high temperature or fire hazard, anchor bolts shall be grouted in using cement based non-shrink grout, Class I.
- b. Unless otherwise indicated, embedment shall be sufficient to develop the ultimate tensile strength of the anchor or reinforcing bar per the manufacturer's ICBO/ES report, but shall not be less than 16 rod diameters for threaded rod or 24 bar diameters for reinforcing or smooth bars.
- c. When the bolt diameter is one-inch or less, the hole diameter shall be a minimum of 2-inches. When the bolt diameter is greater than one-inch, the hole diameter shall be at least twice the bolt diameter.
- d. Drilled holes shall be saturated with water for not less than 24 hours before installation of anchor/rod/rebar.
- e. The non-shrink grout shall be placed in the holes in a non-sag (trowelable) consistency. The grout shall be placed in the holes before the anchor and then the anchor inserted and vibrated to ensure proper coverage.

D. Topping Grout and Concrete/Grout Fill

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1. Mechanical, electrical, and finish work shall be completed prior to placement of topping or concrete/grout fill. To ensure bonding to the base slab, the base slab shall be given an exposed aggregate finish. Alternatively, where accepted by the COR, the base slab shall be given a roughened textured surface by a close-spaced rake while the surface is green. After curing, high pressure washing shall expose the aggregates and produce not less than a 3/16-inch amplitude roughness. Jackhammers or chipping hammers shall not be used.
2. The minimum thickness of grout topping and concrete/grout fill shall be one-inch. Where the finished surface of concrete/grout fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2 inches wide by 1-1/2 inches deep.
3. The base slab shall be thoroughly cleaned and wetted to saturated surface dry (SSD) condition per the International Concrete Repair Institute (ICRI) -- Technical Guide for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, prior to placing topping and fill. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat cement grout shall be broomed into the surface of the slab just before topping or fill placement. The neat cement grout shall not be allowed to dry before topping placement. If it does dry, it must be immediately removed using wet stiff brooms and reapplied. The topping and fill shall be compacted by rolling or thorough tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade. Coat surface with evaporation retardant as needed to prevent plastic shrinkage cracks.
4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.
5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping or fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement, or mixture of dry cement and sand shall be applied to the surface.
6. As soon as topping or fill finishing is completed, coat surface with curing compound. The tank shall be filled with sufficient water to cover the entire floor for 14 days, where required by the COR.

3.4 CONSOLIDATION

- A. Grout shall be placed in such a manner, for the consistency necessary for each application, to assure that the space to be grouted is completely filled.

3.5 CURING

- A. Cement based grouts shall be cured per 03 30 00 and per the manufacturer's recommendations

- END OF SECTION 03 62 00 -

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SECTION 31 11 00 – CLEARING AND GRUBBING

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. The chipping or removal of trees, bushes and shrubs, grass, weeds and other vegetation, rocks, existing improvements or obstructions that exist within the construction areas for the diversion structure, box culvert, ramp flume, stockpiling/staging areas, and all permanent works.

1.2 RELATED DOCUMENTS

- A. Section 31 23 00 - Excavation and Fill

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 GENERAL

- A. No clearing and grubbing activities will be allowed to occur prior to the implementation of BMPs as detailed in the SWMP and required by federal, state, local regulations.

3.2 CLEARING

- A. Clearing operations shall be conducted in a manner, which will prevent damage to vegetation outside the clearing limits
- B. Remove trees, bushes, shrubs, weeds and other vegetation within the work limits in accordance with the Contract Drawings, which includes the following: excavation and fill footprint, diversion structure, box culvert, ramp flume, access roads, and staging areas.

3.3 GRUBBING

- A. General: Includes removal of all rocks and boulders, stumps, roots and other vegetation below ground level; and removal of all debris and obstructions within the limits of the work area left from clearing, unless designated to remain.
- B. Stumps: Includes removal of all tree stumps. Remove all roots larger than 1/2 inch in diameter remaining from trees, tree stumps, bushes and shrubs in all areas within the limits of site disturbance, except for the reservoir area.
- C. Backfilling: Backfill holes created by removal of stumps and roots with earthfill materials, and compact earthfill materials as determined by the COR.

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3.4 DISPOSAL OF CLEARED AND GRUBBED MATERIALS

- A. General: Unless indicated otherwise, all material removed as a result of clearing and grubbing shall be disposed of off-site by the Contractor in a legal manner in accordance with local, state and federal regulations.
- B. Chipping: All trees with trunks 5-inch diameter and smaller, and all bushes and shrubs shall be chipped for use as mulch for site restoration. All mulch stockpiles shall be located as approved by the COR. Extra chipped material after restoration shall be removed from the project site to a location approved by the COR. All trees with trunks with diameter greater than 5 inches shall be transported to a location approved by the COR.
- C. Burning: Burning of vegetation within the project limits is strictly prohibited.
- D. Off-site Disposal: Organic material that cannot be chipped and spread on-site shall be disposed of off-site. The Contractor shall obtain all necessary permits and shall also obtain a written permit from the property owner on whose property the disposal is to be made and shall file the permit, or a copy thereof, with the CSKT before any such material is removed from the site. In addition, the Contractor shall obtain from the property owner, upon completion of the disposal, a written statement of acceptance of this disposal work. A copy of this statement shall also be filed with the CSKT.

3.5 PROTECTION AND RESTORATION

- A. The Contractor shall protect all trees beyond the areas to be cleared and any trees designated to be replanted, structures, utilities and other features.
- B. All trees, shrubs and plants and other features damaged by construction operations shall be replaced in kind by the Contractor at no cost to the CSKT.
- C. The edges of clearings and cuts through trees shall be irregularly shaped to soften the visual impact of straight lines.
- D. Clearing and Grubbing will not extend unless agreed to in writing with the COR.

- END OF SECTION 31 11 00 -

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SECTION 31 23 00 – EXCAVATION AND FILL

PART 1 -- GENERAL

1.1 SECTION INCLUDES

- A. The Contractor shall perform excavation, fill, and backfilling for structures, drainage features, slope armoring, and roadways indicated and required for construction of the Work, complete and in place, in accordance with the Contract Documents.

1.2 RELATED DOCUMENTS

- A. Section 03 11 00 – Clearing and Grubbing
- B. Section 31 34 19 - Geotextiles

1.3 REFERENCES

- | | |
|----------------|--|
| A. ASTM C 128 | Standard Test Method for Relative Density (Specific Gravity) and Absorption of Fine Aggregate |
| B. ASTM D 422 | Standard Test Method for Particle-Size Analysis of Soils |
| C. ASTM D 698 | Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ [600 kN-m/m ³]) |
| D. ASTM D 1556 | Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method |
| E. ASTM D 2487 | Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) |
| F. ASTM D 4253 | Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table |
| G. ASTM D 4254 | Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density |
| H. ASTM D 4318 | Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils |
| I. ASTM D 6938 | Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth). |

1.4 DEFINITIONS

- A. Fines: Materials passing the No. 200 sieve.
- B. Borrow: Material excavated within the work area or obtained from on-site borrow areas approved by the COR.

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- C. Topsoil: Native surface soil capable of supporting native plant growth.
- D. Coverage: One coverage is defined as the result of successive passes by a piece of compaction equipment, which by means of sufficient overlap will ensure that all areas of the layer or lift being compacted have been subjected to one pass of the compaction equipment. One pass of compaction equipment is defined by a single pass in one direction.
- E. Optimum Moisture Content: The moisture content that will result in a maximum dry unit weight of soil when subjected to the designated compaction test.
- F. Percent Compaction: The percent compaction in place shall be calculated as the ratio (in percent) of the in place dry density to the calculated maximum dry density, in accordance with the designated test.

1.5 CONTRACTOR SUBMITTALS

- A. Submit in accordance with Section 01 33 00 – Submittal Procedures.
 - 1. RSN 31 23 00-01 Source Quality Control Submittals:
 - a. Prior to use and at least 30 days in advance of the start of each earthwork activity covered in this section, submit samples of materials for COR's approval. If on-site borrow area source materials are designated on Drawings, samples from these borrow areas are to be submitted. For imported material, submit samples prior to shipment of the material to site. Submit samples of materials proposed for the Work in accordance with the requirements in Section 01 33 00 – Submittal Procedures. Sample sizes shall be as determined by the testing laboratory.
 - b. Submit gradation reports or sieve analyses for each fill material or filter based on the requirements provided in Specification section 31 23 00-2.1
 - 2. RSN 31 23 00-02 Excavation and Fill Plan: Submit a construction plan for each earthwork activity covered in this Section and additional activities as deemed necessary by the Contractor, at least 60 days in advance of the start of each earthwork activity covered in this Section. The plan must be approved by the COR prior to any earthwork activities. The construction plan shall, at a minimum, include the following:
 - a. Proposed borrow source(s) and proposed method(s) of sampling borrow source(s) for acceptance.
 - b. Proposed soil processing, placement, compaction, and moisture conditioning equipment, including:
 - 1) Equipment catalog with weight, dimensions, and operating data.
 - 2) Proposed work schedule.

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- 3) Proposed methods of protecting Work, to include temporary dewatering, drainage, moisture conditioning, and frost protection measures.
- 4) Proposed excavation, stockpiling, regrading, and staging plan describing handling and transport of on-site and off-site borrow/fill materials.
 - a) The Contractor, prior to beginning any trench or structure excavation 5- feet deep or deeper shall submit to the COR and shall be in receipt of the COR's written acceptance of the Contractor's detailed plan showing design of shoring, bracing, protection of slopes from wetting and saturation, or other provisions for worker protection against the hazard of caving ground during the excavation of such trenches or structure excavation.
- 5) Include proposed spreading and compaction equipment including weights, dimensions, and operating data.
- 6) Include plan for placing and compacting soils on steep slopes (greater than 10%).
- 7) Include proposed work sequence describing measures to be taken to protect Environmental Quality, method of transporting material including proposed haul routes, material processing means and methods, reclamation plan for staging area (including slopes and contours), and measures to provide the required moisture content for all materials.
- 8) Include methods and procedures for implementing a quality control system.

PART 2 -- PRODUCTS

2.1 FILL AND BACKFILL MATERIAL GENERAL REQUIREMENTS

- A. General: Fill and backfill materials shall be select or processed clean, fine earth, rock, gravel, or sand, free from grass, roots, brush, other vegetation, and organic matter.
 1. Fill and backfill materials to be placed within 4 feet of any structure or pipe (designated herein as special compaction) shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 1 inch.
- B. Suitable Materials: Materials not defined as unsuitable in this Section are suitable materials and may be used in fills and backfills subject to the indicated requirements.
 1. Suitable materials may be obtained from on-site excavations, may be processed on site materials from excavations, or may be imported. If imported materials are required by this Section or to meet the quantity requirements of the Work, the Contractor shall provide the imported materials as part of the Work, at the unit price or lump sum included for the specified type of fill.

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C. Unsuitable Material: Any earthen material that contains vegetable or organic silt, topsoil, frozen materials, trees, stumps, construction or industrial waste, sludge or landfill, lignite, or other undesirable materials. Unsuitable materials include the materials listed below:

1. Soils which, when classified under ASTM D 2487 – Classification of Soils for Engineering Purposes, fall in the classifications of Pt, OH, or OL.
2. Soils that cannot be compacted sufficiently to achieve the density specified for the intended use.
3. Materials that contain hazardous or designated waste materials including petroleum hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.
4. Soils that contain greater concentrations of chloride or sulfate ions, or have a soil resistivity or pH less than the existing on-site soils.
5. Topsoil, except as allowed in this Section.
6. Soils with more than 2.5% organic content, or rocks of 6-inch-diameter or greater, unless otherwise indicated.

D. Fill Material:

1. Fill material shall consist of suitable inorganic mixtures of GW, GP, GM, SW, SP, and SM or a combination of these groups from on-site structure excavations or offsite locations, as determined in accordance with ASTM D 2487.
2. Maximum particle size of 6-inches.
3. Provide fill material with a gradation as follows and a maximum plasticity index of 10, determined by AASHTO T89 and T90 or by ASTM D4318.

Sieve Size	% Passing by Weight
1"	70-100
No. 4	40-80
No. 10	25-60
No. 200	2-35

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E. Structural Fill:

1. As determined by AASHTO Methods T11 and T27, furnish material for the grading specified in the contract documents including binder or filler, which may have been added at the plant or at the site, meeting the requirements of that grading in the Table of Gradations below:

**TABLE OF GRADATIONS
PERCENTAGES BY WEIGHT PASSING
SQUARE MESH SIEVE**

Passing	1 1/2" Minus
1 1/2 Inch	100
1 Inch	
3/4 Inch	
1/2 Inch	
No. 4 Sieve	25 - 60
No. 10 Sieve	
No. 200 Sieve	2 - 10

2. Up to 5% "oversized" material is permitted provided that the "oversized" material passes the screen size immediately larger than the top size specified. The produced material between the maximum screen opening and the No.4 sieve shall be reasonably well graded.
3. Suitability of the aggregate is based on samples obtained during placement in the project within limits allowed in the table for the particular grading specified.
4. That portion of the fine aggregate passing the No. 200 sieve must be less than 60% of that portion passing the No. 40 sieve.
5. The liquid limit for that portion of the fine aggregate passing a No. 40 sieve cannot exceed 25, nor the plasticity index exceed 6, as determined by AASHTO T89 and T90.

2.1 COMPACTION EQUIPMENT

- A. General: Compaction equipment shall conform to the manufacturer's specifications and shall be maintained in good working condition at all times.
- B. Select Structural Fill: Compaction equipment for structural fill material shall be selected and used based on manufacturer's recommendations for the material type to be compacted and capable of compacting materials to the required compaction level.

2.2 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

- A. The Contractor shall use the types of materials as designated herein for all required fill and backfill as indicated on the Drawings.
- B. Where these Specifications conflict with the requirements of any local agency having

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jurisdiction, the COR shall be immediately notified. In case of conflict between types of fills or backfills the Contractor shall use the agency-specified backfill material if that material provides better engineering properties, as determined by the COR.

PART 3 -- EXECUTION

3.1 EXCAVATION AND BACKFILLING – GENERAL

- A. General: Except when specifically provided to the contrary, excavation shall include the removal of materials, including obstructions that would interfere with the proper execution and completion of the Work. The removal of such materials shall conform to the lines and grades indicated on the Drawings or determined by the COR in the field. Unless otherwise indicated, the entire area of construction shall be stripped of vegetation and debris and shall be grubbed, and such material shall be removed from the Site prior to performing any excavation or placing any fill. Stripped topsoil shall be stockpiled at material stockpile locations as directed by the COR. The Contractor shall furnish, place, and maintain supports and shoring that may be required for the sides of excavations. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926). The Contractor shall provide quantity surveys where so required to verify quantities for unit price contracts. Surveys shall be performed prior to beginning Work and upon completion of Work by a surveyor licensed in the State of Montana.
- B. Removal and Exclusion of Water: The Contractor shall remove and exclude water, including stormwater, groundwater, irrigation water, and wastewater, from excavations. Dewatering wells, wellpoints, sump pumps, or other means shall be used to remove water and continuously maintain groundwater at a level at least 2 feet below the bottom of excavations before the excavation Work begins at each location. Water shall be removed and excluded until backfilling is complete and field soils testing has been completed.

3.2 EXCAVATION

- A. No classification as to class, nature, or condition will be made of any soil or rock material excavated from required excavations or borrow areas.
- B. Excavate to the lines and grades shown on the Drawings or as superseded by written field clarification provided by the COR.
- C. The required excavation lines shown on the Drawings shall not be interpreted as indicating the final or actual depths. Final excavation lines shall be in all cases as determined by the COR in the field, and the Contractor will be entitled to no additional compensation above the unit prices bid in the Schedule as a result of actual excavation lines, except as provided for in the Contract – General Conditions. Final quantities may be higher or lower than the estimated volume in the Bid Schedule.
- D. Transport stripped materials to waste or stockpile areas outside of waterways, and wetlands, subject to COR's approval.
- E. Excess excavation and excavations made for the convenience of the Contractor for any purpose or reason shall not be paid for and shall be backfilled at no expense to CSKT.

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- F. Take precautions to preserve, in a sound condition, the material below and beyond the lines of all excavations. Disturbed material may be considered unsuitable.
- G. Perform operations so that the excavations will yield as much suitable material for construction purposes as practicable.
- H. As much as practical, re-use all suitable materials from required excavations in the permanent construction.
- I. Separate suitable materials for construction purposes from materials to be wasted; and to the extent practical, minimize handling by placing suitable materials directly in the designated final locations.
- J. Aerate (and moisture condition) excavated materials which are suitable for the Work, but which when excavated are too wet or too dry for direct placement and compaction in the fill, until the material is moisture conditioned to the specified moisture content.
- K. Level and trim waste piles to reasonably regular lines, cover and protect, sandbag perimeter, and slope to drain.
- L. Excavate soft, wet or otherwise unsuitable materials below areas to receive fill, as determined by the COR.
- M. Backfill unauthorized and excessive soil and rock removal, as determined by the COR, with material approved by the COR.

3.3 EXCAVATION IN VICINITY OF TREES

- A. Except where trees are indicated to be removed, trees shall be protected from injury during construction operations. No tree roots larger than 2-inches-diameter shall be cut without written approval/concurrence of the COR. Trees shall be supported during excavation by any means previously reviewed and accepted by the COR.

3.4 EXCESS EXCAVATED MATERIAL

- A. Unless otherwise indicated, excess excavated material shall be the property of CSKT.
- B. The Contractor shall be responsible for the selective stockpiling of excess excavated material in areas indicated of the Drawings.

3.5 SUBGRADE PREPARATION.

- A. Grade areas to receive fill material or under structures to the lines and grades shown prior to placement. Subgrades below structures shall be within a +/- tolerance of 1 inch.
- B. Moisten excavated surfaces upon or against which concrete is to be placed with water, and tamp or roll to form a firm foundation upon which to place concrete.
- C. All loose, disturbed, saturated, soft, organic, man-made fill or otherwise deleterious material shall be removed from within all areas that will receive fill, to expose a stiff

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foundation surface as determined by the COR.

- D. Proof roll all structure subgrades and areas to receive fill with a minimum of 4 passes of approved compaction equipment. Excavate soft/yielding subgrade as determined by the COR. Replace excavated material with the appropriate compacted fill material for the location.
- E. Operation of equipment on the prepared soil foundation shall be minimized to avoid unnecessary disturbance. Disturbed material may be considered unsuitable by the COR.
- F. Scarify, moisture condition, and re-compact all soil foundation areas prior to proof rolling and/or fill placement.
- G. The compacted surface of any layer of fill which is too wet or too dry for bonding to the next layer of material shall be dried or moistened, compacted, and scarified before the next layer is placed.
- H. Conform to the grades and cross-sections shown on the Drawings and written field clarifications by the COR.
- I. When a fill is to be made and compacted against hillsides or excavated slopes steeper than 4H:1V (Horizontal:Vertical), the slopes of hillsides or excavations shall be horizontally benched to key the embankment or fill to the underlying ground. A minimum of 12 inches perpendicular to the slope of the hillside or fill shall be removed and re-compacted as the embankment or fill is brought up in layers. Material thus cut shall be re-compacted along with the new material.

3.6 STRUCTURAL BACKFILL

- A. Structural backfill material shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained the minimum of 75% of the 28-day design strength to withstand the loads imposed.
- B. Structural material backfill shall be placed after water is removed from the excavation and the excavation slopes and bottom have been dried or wetted to a moisture content suitable for compaction.
- C. Immediately prior to placement of structural backfill material, the bottoms and slopes of structure excavations shall have loose, sloughing, or caving soil and rock materials removed. Excavation slopes shall consist of excavated surfaces that are in a relatively undisturbed condition before placement of backfill materials.
- D. Structural backfill material shall be placed and spread evenly in layers. Layers shall be evenly spread so that when compacted, each layer shall not exceed 6-inches in thickness. If larger compaction equipment is to be used, the Contractor can utilize layer thicknesses of up to 8-inches for the structural backfill.
- E. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer.
- F. Where the structural backfill material moisture content is below the optimum moisture

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content, water shall be added before or during spreading until the proper moisture content is achieved. The addition of water to the top of a lift which has a low moisture content will not be permitted. Where the backfill material moisture content is too high to permit the indicated degree of compaction, the material shall be dried until the moisture content is satisfactory.

- G. Structural backfill shall be compacted to at least 95% of its maximum dry density (ASTM D 698).
- H. Structural backfill material shall be placed within $-3/+3$ from optimum moisture content.

3.7 STRUCTURE AND ROADWAY EXCAVATION AND BACKFILL

A. Compaction of Fill and Backfill Materials:

1. Each layer of backfill material shall be mechanically compacted to the indicated percentage of density. Only equipment that is consistently capable of achieving the required degree of compaction shall be used, and each layer shall be compacted over its entire area while the material is at the required moisture content.

a. Structural backfill material shall be placed within $-3/+3$ from optimum moisture content.

b. Each layer of drainage materials shall be compacted by means of at least 2 passes from a vibratory compactor that is capable of consistently obtaining the required density in 2 passes.

2. Fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated as necessary. Unless otherwise approved by the COR, no layer shall exceed 6 inches of compacted thickness. The fill shall be compacted in accordance with the compaction requirements below.

- B. Compaction Requirements: The following compaction requirements shall be in accordance with ASTM D 698 or ASTM D 4253 and ASTM D 4254.

C. Schedule:

Backfill/Fill Material	Percentage of Maximum Dry Density	Percentage of Relative Density
Structural Fill	95	N/A
Backfill/Fill Material	Compaction Requirement	

3.8 TOLERANCES

- A. All finish surfaces against structures or other appurtenances shall be within an allowable tolerance of plus or minus 2 inches from the grades shown on the Drawings. All finished surfaces with varying elevations which are not in contact with a structure or other buried utility shall be within an allowable tolerance of plus or minus 6 inches.

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3.9 FIELD TESTING

- A. General: Field soils QC testing and laboratory testing of soils will be done by a testing laboratory of the COR's choice at the Contractor's expense.
- B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 698. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556, ASTM D 6938, or by such other means acceptable to the COR.
- C. Standard Proctor curves and minimum and maximum relative density values for QC use in compaction testing shall be consistent with the materials being tested in the field.
- D. QC compaction and moisture testing (ASTM D6938) shall be performed on placed structural backfill at a frequency of one test per workday of material placement and one test per lift of material placed.
- E. QC testing of gradation and plasticity of structural backfill shall be performed at a frequency of one test per 500 cubic yards of material placed.
- F. In case the test of the fill or backfill show non-compliance with the required density, the Contractor shall accomplish such remedy as may be required to ensure compliance. Subsequent testing to show compliance shall be performed by a testing laboratory selected by the COR and paid by the Contractor.

- END OF SECTION 31 23 00 -

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SECTION 31 34 19 – GEOTEXTILES

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The Contractor shall provide geotextiles, complete and in place, in accordance with the Contract Documents.
- B. Definitions: The following definitions apply to the Work of this Section:
 - 1. Fabric: Geotextile, a permeable geosynthetic comprised solely of textiles.
 - 2. Minimum Average Roll Value (MinARV): Minimum of series of average roll values representative of geotextile provided.
 - 3. Nondestructive Sample: Sample representative of finished geotextile, prepared for testing without destruction of geotextile.
 - 4. Overlap: Distance measured perpendicular from overlapping edge of one sheet to underlying edge of adjacent sheet.
 - 5. Seam Efficiency: Ratio of tensile strength across seam to strength of intact geotextile, when tested according to ASTM D 4884.
 - 6. Woven geotextile: A geotextile fabric composed of polymeric yarn interlaced to form a planar structure with uniform weave pattern.
 - 7. Nonwoven geotextile: A geotextile fabric composed of a pervious sheet of polymeric fibers interlaced to form a planar structure with uniform random fiber pattern.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. The following standards are referenced in this Section:

ASTM D 4355	Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus
ASTM D 4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D 4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

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ASTM D 4751	Standard Test Method for Determining Apparent Opening Size of a Geotextile
ASTM D 4833	Standard Test Method for Index Puncture Resistance Geomembranes and Related Products
ASTM D 4886	Standard Test Method for Abrasion Resistance of Geotextiles (Sand Paper/Sliding Block Method)
ASTM D 6524	Standard Test Method for Measuring the Resiliency of Turf Reinforcement Mats (TRMs)
ASTM D 6525	Standard Test Method for Measuring Nominal Thickness of Rolled Erosion Control Products
ASTM D 6566	Standard Test Method for Measuring Mass per Unit Area of Turf Reinforcement Mats
ASTM D 6567	Standard Test Method for Measuring the Light Penetration of a Turf Reinforcement Mat (TRM)
ASTM D 6575	Standard Test Method for Determining Stiffness of Geosynthetics Used as Turf Reinforcement Mats (TRMs)
ASTM D 6818	Standard Test Method for Ultimate Tensile Properties of Rolled Erosion Control Products

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. RSN 31 34 19-01 Geotextiles Shop Drawings:
 - 1. Manufacturer material specifications and product literature.
- C. RSN 31 34 19-02 Geotextile Installation Plan: Description of proposed method of geotextile deployment, sewing equipment, sewing methods, and provisions for holding geotextile temporarily in place until permanently secured.
- D. RSN 31 34 19-03 Geotextiles Samples:
 - 1. Geotextile: One-piece, minimum 18-inches long, taken across full width of roll of each type and weight of geotextile. Label each with brand name and furnish documentation of lot and roll number from which each sample was obtained.
 - 2. Securing Pin and Washer: 1 each.
- E. RSN 31 34 19-04 Geotextile Certifications:

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1. Certification from geotextile manufacturer that products satisfy the indicated requirements.
2. Field seam efficiency test results.

PART 2 -- PRODUCTS

2.1 NONWOVEN GEOTEXTILE

- A. Nonwoven geotextile shall be composed of a pervious sheet of polymeric fibers interlaced to form a planar structure with uniform random fiber pattern. Products shall be calendared or finished so that yarns will retain their relative position with respect to each other.
- B. Polymeric yarn shall be long-chain synthetic polymers (polyester, polypropylene, or polyethylene) with stabilizers or inhibitors added to make filaments resistant to deterioration due to heat and ultraviolet light exposure.
- C. Geotextile Edges: Seamed or finished to prevent outer material from separating from sheet.
- D. Unseamed Sheet Width: Minimum 6-feet.
- E. Nominal Weight per Square Yard: 12 ounces.
- F. Sheet Thickness: Minimum 3 mm (120 mils).
- G. Physical Properties: Conform to requirements below.

PHYSICAL PROPERTY REQUIREMENTS FOR NONWOVEN GEOTEXTILE		
Property	Requirement	Test Method
Apparent Opening Size (AOS)	No. 100 to No. 140 U.S. Standard Sieve Size	ASTM D 4751
Water Permittivity	0.8 sec.-1, MinARV	ASTM D 4491 (Falling Head)
Vertical Waterflow Rate	65 gpm/sq ft, MinARV	
Wide Width Strip Tensile Strength	300 lbs, MinARV	ASTM D 4632
Wide Width Strip Elongation	50 percent, MinARV	ASTM D 4632
Trapezoidal Tear Strength	115 lb, MinARV	ASTM D 4533
Puncture Strength	175 lb, MinARV	ASTM D 4833
Ultraviolet Radiation Resistance	70 percent strength retention, MinARV after 500 hours	ASTM D 4355

- H. Nonwoven-Geotextile shall be **Mirafi 1100N** or equal.

2.2 SECURING PINS

- A. Securing pins shall be steel rods or bars conforming to the following:

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1. $\frac{3}{16}$ -inch diameter.
 2. Pointed at one end; head on other end, sufficiently large to retain washer.
 3. Minimum Length: 12-inches.
- B. Steel washers for securing pins shall be:
1. Outside Diameter: Not less than 1½ inches.
 2. Inside Diameter: ¼ inch.
 3. Thickness: ⅛ inch.
- C. Steel Wire Staples:
1. U-shaped.
 2. 10-gauge.
 3. Minimum 6-inches long.

PART 3 -- EXECUTION

3.1 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver each roll with sufficient information attached to identify manufacturer and product name or number.
- B. Handle products in manner that maintains undamaged condition.
- C. Do not store products directly on ground. Ship and store geotextile with suitable wrapping for protection against moisture and ultraviolet exposure. Store geotextile in a way that protects it from elements. If stored outdoors, elevate and protect geotextile with waterproof cover.

3.2 LAYING GEOTEXTILE

- A. Notify the COR whenever geotextiles are to be placed. Do not place geotextile prior to obtaining COR's approval of underlying materials.
- B. Lay and maintain geotextile smooth and free of tension, folds, wrinkles, or creases.

3.3 ORIENTATION ON SLOPES

- A. Orient geotextile with long dimension of each sheet parallel to direction of slope.
- B. Geotextile may be oriented with long dimension of sheet transverse to direction of slope only if sheet width, without unsewn seams, is sufficient to cover entire slope and anchor trench and extend at least 18 inches beyond toe of slope.

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3.4 JOINTS

A. Unseamed Joints:

1. Unseamed joints shall be overlapped to the following dimensions unless otherwise indicated:
 - a. Foundation/Subgrade Stabilization: Minimum 18-inches.
 - b. Riprap: Minimum 18-inches.
 - c. Drain Trenches: Minimum 18-inches, except overlap shall equal trench width if trench width is less than 18-inches.
 - d. Other Applications: Minimum 12-inches.

3.5 SECURING GEOTEXTILE

- A. Secure geotextile during installation as necessary with sand bags or other means approved by the COR and according to the manufacturers' recommendations.

B. Securing Pins:

1. Insert securing pins with washers through geotextile, midway between edges of overlaps and 6 inches from free edges.
2. Spacing:

Slope	Maximum Pin Spacing, feet
Steeper than 3:1	2
3:1 to 4:1	3
Flatter than 4:1	5

3. Install additional pins across each geotextile sheet as necessary to prevent slippage of geotextile or to prevent wind from blowing geotextile out of position.
4. Push each securing pin through geotextile until washer bears against geotextile and secures it firmly to subgrade.

3.6 PLACING PRODUCTS OVER GEOTEXTILE

- A. Notify the COR before placing material over geotextile. Do not cover installed geotextile prior to receiving authorization from the COR to proceed.
- B. If tears, punctures, or other geotextile damage occurs during placement of overlying products, remove overlying products as necessary to expose damaged geotextile. Repair damage as indicated below.

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3.7 INSTALLING GEOTEXTILE IN TRENCHES AND UNDERDRAINS

- A. Place geotextile in a way that will completely envelope granular drain material to be placed in trench and with indicated overlap at joints. Overlap geotextile in direction of flow. Place geotextile in a way and with sufficient slack for geotextile to contact trench bottom and sides fully when trench is backfilled.
- B. After granular drain material is placed to grade, fold geotextile over top of granular drain material, unless otherwise indicated. Maintain overlap until overlying fill or backfill is placed.

3.8 RIPRAP APPLICATIONS

- A. Overlap geotextile at each joint with upstream sheet of geotextile overlapping downstream sheet.

3.9 REPAIRING GEOTEXTILE

- A. Repair or replace torn, punctured, flawed, deteriorated, or otherwise damaged geotextile. Repair damaged geotextile by placing patch of undamaged geotextile over damaged area plus at least 18 inches in all directions beyond damaged area. Remove interfering material as necessary to expose damaged geotextile for repair. Sew patches or secure them with pins and washers, as indicated above for securing geotextile, or by other means approved by COR

3.10 REPLACING CONTAMINATED GEOTEXTILE

- A. Protect geotextile from contamination that would interfere, in COR's opinion, with its intended function. Remove and replace contaminated geotextile with clean geotextile.

- END OF SECTION 31 34 19 -

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SECTION 31 37 00 – RIPRAP

PART 1 -- GENERAL

1.1 SUMMARY

- A. The Contractor shall provide riprap, including associated earthwork, complete and in place, in accordance with the Contract Documents.

1.2 RELATED DOCUMENTS

- A. Section 01 33 00 – Submittal Procedures
- B. Section 31 23 00 – Excavation and Fill

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C535	Standard Test Method for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
AASHTO T85	Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate.
AASHTO T210	Method of Test for Aggregate Durability Index.

1.4 SUBMITTALS

- A. Prepare submittals in accordance with Section 01 33 00 – Submittal Procedures.
- B. RSN 31 37 00-01 Riprap Placement Plan:
 - 1. At least sixty (60) days prior to commencement of the first riprap placement of any area of the Work, a riprap placement plan shall be submitted for review and acceptable by the COR. The plan shall include, but not be limited to:
 - a. Conceptual methods, procedures, drawings, and diagrams for handling all riprap and filter fabric.
 - b. A description of the sequencing of the riprap placement.
 - c. A list of equipment proposed for use in hauling and placing riprap and riprap filters.

Methods and procedures for implementing a quality control system.

- C. RSN 31 37 00-02 Riprap Source Certificates

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1. Proposed source of the riprap and riprap filters. Testing certificates from a qualified testing agency shall be submitted prior to acceptance of the rock source to verify the conformity to the requirements of the Contract Documents.
2. Submit gradation reports or sieve analyses for each rip rap type and filter based on the requirements provided in Specification section 31 37 00-2.1 and 31 37 00-2.2

PART 2 -- PART 2 -- PRODUCTS

2.1 RIPRAP

- A. Riprap shall be graded in size to produce a reasonably dense mass. Riprap shall consist of dense, angular, natural rock fragments that are resistant to abrasion. Riprap shall be resistant to weathering and to water action; free from overburden, cracks, spoil, shale, and organic material; and shall meet the gradation requirements below. Shale and stones with shale seams are not acceptable.
- B. Riprap shall be angular in shape with the largest dimension not more than twice the smallest. Flat rock fragments shall not be used. Individual rock fragments shall be dense, sound and resistant to abrasion and shall be free of cracks, seams and other defects that would tend to increase unduly their degradation by water and frost action.
- C. Material for riprap shall consist of durable, sound, hard, angular rock meeting the following requirements unless otherwise noted:

Characteristics Test	Criterion	Standard
Sodium Sulfate Soundness	<10% weight loss after 5 cycles	ASTM D5240
Specific Gravity	≥2.5	ASTM C127
Absorption	≤2%	ASTM C127
Hardness	Hardest available (comparative)	ASTM D5873
LA Abrasion Durability	≤20% loss	ASTM C535
Uniaxial Compressive Strength Point Load Index Strength	Hardest available (comparative)	ASTM D5731/ASTM D7012

- A. Riprap shall be uniformly, from the smallest to the largest size, and shall be graded within the following limits:
 1. Riprap Class II:

Mean Particle Size (in)	% of Mean Particle Size Passing
24	100
21	70-90

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16	40-60
7	0-10

- D. Riprap which has been salvaged from within the project limits may be reused and incorporated into the Work if it is in good condition and capable of satisfying the required gradations. Use of salvaged riprap will only be allowed following review and approval from the COR in the field.

PART 3 -- EXECUTION

3.1 MATERIAL

- A. Riprap shall be obtained from sources that are approved by COR.

3.2 SURFACE PREPARATION

- A. Surfaces to receive riprap shall be smooth and firm, free of brush, trees, stumps, and other objectionable material, and shall be brought to the line and grade indicated.

3.3 PLACING RIPRAP

- A. Place riprap at the locations, thicknesses, lines, and grades shown on the Contract Drawings.
- B. Placement of riprap shall begin at the toe of the slope and proceed up the slope. Placement operations, including handling, stockpiling, and transporting, shall be accomplished in such a manner as to produce a reasonably well graded mass of rock between the specified maximum and minimum sizes with a minimum practical percentage of voids, having a reasonably regular finished surface, and such that the material, when in place is stable. Riprap shall be placed by dumping and working with the bucket of a hydraulic excavator. The average thickness of riprap layer shall not be less than the full thickness shown on the Contract Drawings. The finished riprap shall be free from objectionable pockets of unacceptable soil fines, small stones and clusters of nested large rocks, as determined by the COR.
- C. Place riprap materials to full layer thickness in one operation in such a manner as to minimize segregation, avoid displacement of underlying filter blanket materials, and minimize breakage of rock fragments.
- D. Chinking: Provide laborers during placement for rearrangement of loose rock fragments, "chinking" of void spaces, and hand placement as needed to comply with the requirement of a well-keyed and stable layer of rock riprap.
- E. Compaction: Compact the surface of the riprap by track-walking with a bulldozer or other means as long as underlying material is not displaced and as approved by the COR.
- F. Where riprap is placed over a geotextile fabric, the riprap shall be placed so as to avoid

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damage to the geotextile. No equipment shall be operated on in-place geotextile. Riprap shall not be dropped from a height greater than 3 feet, nor shall large stones be allowed to roll downslope.

3.4 CONSTRUCTION TOLERANCES

- A. All riprap shall be placed to within a +/- 2-inch tolerance in elevation.
- B. All other riprap and filter placement shall be to tolerances as approved by the COR.
- C. The thickness of filter and riprap materials shall be measured perpendicularly to the final surface.

3.5 QUALITY CONTROL

- A. Testing specified for the material requirements of riprap will be performed by the Contractor.
- B. Contractor shall perform a gradation test in accordance with ASTM D5519 prior to the initial placement of riprap and per each 1000 cubic yards of each class of riprap placed.
- C. The frequency of testing may be increased or decreased at the discretion of the COR.

- END OF SECTION 31 37 00 -

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SECTION 32 92 00 – REVEGETATION

PART 1 -- GENERAL

1.1 SUMMARY

- A. The work shall consist of the application of seed, fertilizer, wood fiber mulch (and often a tackifier) in a slurry of water to prevent soil erosion. The slurry application is intended to provide an environment conducive to plant growth. It is useful on steep, erosive slopes particularly where access is limited. Slope lengths of 125 to 225 feet can be treated by this method. Areas to be revegetated include final fill slopes; construction staging areas; areas disturbed for temporary stockpiles; and temporary stormwater management facilities.

1.2 DEFINITIONS

- A. Areas to Be Reclaimed and Revegetated: All disturbed areas as a result of construction activities.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Federal Specifications:

USDA-NRCS-Montana / MT-EWP-122

Hydro seeding and Mulching

- B. Commercial Standards:

ANSI/ASTM D 422

Method for Particle-Size Analysis of Soils.

1.4 SUBMITTALS

- A. Furnish submittals in accordance with Section 01 33 00 – Submittal Procedures for approval.
- B. RSN 32 92 00-01 Seed Mixture Certification
- C. RSN 32 92 00-02 Fertilizer Identification and Certification
- D. RSN 32 92 00-03 Mulch Certification
- E. RSN 32 92 00-04 Delivery Schedule:
 - 1. Submit a delivery schedule at least 10 days prior to the intended date of the first delivery.
- F. RSN 32 92 00-05 Revegetation Reports:
 - 1. Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.
- G. RSN 32 92 00-06 Revegetation Materials Certifications:

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1. Submit certificates of compliance that materials meet the indicated requirements prior to the delivery of materials.

H. RSN 32 92 00-07 Revegetation Records:

1. Plant Establishment Period
2. Maintenance Report
3. Maintenance Instructions

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.6 MAINTENANCE

- A. General: The Contractor shall be responsible for protecting, watering, fertilizing, and maintaining turf and seeded areas until final acceptance of the Work.
- B. The Contractor shall replace any materials or equipment it has damaged or which has been damaged by its employees or subcontractors.
- C. Contractor shall immediately reapply hydro seed in areas where bare spots are visible
- D. Contractor shall protect seeded areas subject to vehicular traffic with warning signs during maintenance period
- E. Maintenance shall include, in addition to the foregoing, cleaning, edging, the repair of erosion, and other maintenance work.

1.7 FINAL INSPECTION AND GUARANTEE

- A. Written notice requesting inspection shall be submitted to the COR at least 10 days prior to the anticipated inspection date.
- B. Any delay in completing the Work of this Section beyond a single season will be cause for extending the correction of defects period an equal time.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Delivery certificates shall be given to the COR as each shipment of material is delivered. A list of the materials used, together with typical certificates of each material, shall be submitted to the COR prior to final acceptance.

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2.2 FERTILIZER

Fertilizer shall be applied as recommended by the seed supplier. At a minimum fertilizer shall comply with Montana Department of Agriculture.

2.3 GENERAL

- A. Delivery of seed and fertilizer may begin only after samples and tests have been approved by the COR. Seed and fertilizer furnished shall not be different from the approved sample.
- B. Seeding shall not be performed at any time when it may be impaired by climatic conditions.

2.4 SOIL PREPARATION AND EXAMINATION

- A. The seeding shall not begin until the Contractor has repaired all areas of settlement, erosion, rutting, etc. and the soils have been placed, compacted to finish grade. The COR shall be notified of areas that prevent the planting work from being executed.
- B. Verify that prepared soil base is ready to receive the work of this section
- C. Revegetation of areas disturbed by construction, as determined by COR.

2.5 SEEDING SEASON

- A. The seeding season is from October 1st to May 15th. The Contractor shall obtain the COR's approval to seed outside this period.

2.6 PREPARATION OF SUBSOIL

- A. Finished graded areas shall be protected from damage by vehicular or pedestrian traffic and erosion.
- B. Remove debris such as large stones, tree branches, and large roots that will interfere with normal seeding operations
- C. Prepare soil using equipment that produces a rough-textured surface ready for seeding and mulching. Graded subsoil shall be ripped to a depth of 12-inches.

2.7 HYDROSEEDING AND HYDROMULCHING

- A. Application
 - 1. With agitation system operating at part speed, water shall be added to the tank and good recirculation shall be established. Materials shall be added in such a manner that they are uniformly blended into the mixture.
 - 2. When the tank is 1/3 filled with water, add the following materials in the sequence listed:

Sequence	Material
1	Stabilizer, 1/2 acre requirement

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2	Three 50 pounds bales mulch
3	Seed, 1/2 acre requirement
4	Fertilizer, 1/2 acre requirement

- a. Agitate mixture at full speed when the tank is half filled with water.
 - b. Add remainder of mulch requirement before tank is 3/4 full.
 - c. Slurry distribution shall begin immediately. Application of slurry shall be done only when rain is not anticipated for at least three days after slurry application.
 - d. The entire tank of each batch of slurry shall be emptied and the slurry evenly applied to areas to be hydro seeded within a 2 hour period following the mixing of each slurry batch. Slurry batches not applied during this time will be rejected.
3. Equipment: Mixing shall be performed in a tank-mounted truck equipped with a built-in continuous agitation and circulation system of sufficient operating capacity to produce a homogeneous slurry of mulch, stabilizer, seed, fertilizer, and water in the designated unit proportions for a minimum coverage of one-half acre. The tank shall have a discharge system which will permit attachment of at least 500-ft hose extensions a change of 150-ft in height from tank to discharge nozzle, and still retain enough pressure to apply the slurry to the areas at a continuous and uniform rate.
 4. Method: Water shall be added first and then the wood fiber, tackifier (if used), fertilizer (if used), and seeds. Any coated seed shall be loaded last. Legume seeds shall be pellet inoculated with a special bacteria to stimulate the fixing of nitrogen. Seed should not be added to the slurry until immediately prior to beginning of the operation, and not remain in the tank for more than 30 minutes. Single application hydro-seeding uses 1,500 to 2,000 pounds of wood fiber mulch per acre with the seed and fertilizer. Split application hydro-seeding and hydro-mulching uses 500 pounds of wood fiber mulch per acre with the seed and fertilizer in the first pass followed by an application of 1,500 to 2,000 pounds of wood fiber mulch per acre and tackifier (if used). Most tackifiers are applied at 100 pounds of dry ingredients per acre. Hydro-mulching using 500 to 1,000 pounds of wood fiber mulch per acre and tackifier is often applied over loose, blown straw to tack it down. Hydro-mulching using 2,000 to 3,000 pounds of wood fiber mulch per acre and tackifier can be used for temporary protection where landscaping will be planted after the rainy season. Wood fiber is usually dyed to aid in uniform distribution, but care should be taken to ensure that concrete or painted surfaces are not stained and that plants and animals are not injured. Wood fiber has natural tackifying properties but adding a tackifier should be considered on steep slopes.

B. Seed Mixtures and Time of Planting:

1. Spring seedings: Spring seedings will be completed by May 15. Seedings will be made after May 15 only when there is a minimum of two feet of moist soil. The soil must also be moist to within two inches of the surface. Where soil moisture allows spring seeding after May 15, seedings must be completed by August 15.

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2. Dormant seedings: Dormant seedings can be completed when soil temperatures 2 inches below the soil surface remain at 40°F. or less for ten or more days (approximately October 15). Species with high counts of dormant seed such as green needlegrass and Indian ricegrass must be planted as a dormant fall seeding unless germination by standard seed test is greater than 50%. If dormant species are a minor component of a mixture, spring seeding is acceptable.

C. Proportions: Proportions shall depend on each zone. Per acre proportions follows.

1. Zone 1: Dry, Warm Sites. Open grasslands and woodland benches, at low elevations on all aspects and on south- and west-facing slopes at higher elevations. This is dry Douglas fir, limber pine, and ponderosa pine habitat types with a significant bunch grass component in the understory.

a. *Seed Mix A:

- 1) Slender wheatgrass (Pryor)--4 lbs/ac
- 2) Bluebunch wheatgrass--3 lbs/ac
- 3) Thickspike wheatgrass--4 lbs/ac
- 4) Big bluegrass (Sherman)--1 lb/ac

b. *Seed Mix B:

- 1) Slender wheatgrass--2 lbs/ac
- 2) Pubescent wheatgrass--8 lbs/ac
- 3) Sheep fescue--4 lbs/ac

*All seed mixtures are in pure live seed.

2. Zone 2: Moist, Warm Sites. Moderate environments receiving more effective precipitation than the dry, warm sites. Found on north- and east-facing slopes on lower elevations, all aspects at mid-elevations, and on south- and west-facing aspects at higher elevations. Douglas fir and ponderosa pine habitat types.

a. *Seed Mix A:

- 1) Slender wheatgrass (Pryor)--4 lbs/ac
- 2) Mountain brome--4 lbs/ac
- 3) Streambank wheatgrass--3 lbs/ac
- 4) Big bluegrass (Sherman)--1 lb/ac

b. *Seed Mix B:

- 1) Perennial ryegrass--3 lbs/ac

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- 2) Orchardgrass--4 lbs/ac
- 3) Intermediate wheatgrass--8 lb/ac

*All seed mixtures are in pure live seed.

- 3. Zone 3: Moist, Cool Sites. Found predominantly on north and east-facing slopes at mid-elevations and on all aspects at high elevations. Douglas fir with blue huckleberry in the understory along with Grand fir, Western cedar, Western hemlock habitat types.

- a. *Seed Mix A:

- 1) Slender wheatgrass (Prior)--4 lbs/ac
- 2) Beardless wheatgrass--4 lbs/ac
- 3) Mountain brome--4 lbs/ac
- 4) Big bluegrass (Sherman)--1 lb/ac

- b. Seed Mix B:

- 1) Tall fescue--4 lb/ac
- 2) Timothy--4 lbs/ac
- 3) Canada bluegrass--2 lbs/ac

*All seed mixtures are in pure live seed.

- D. Safety: Steep, erosive slopes are often unstable, and a portion of soil material may move, or a more massive landslide movement may take place. Equipment shall be operated only from roads, bridges, and reasonably level areas where slopes are stable and risks of rollover are insignificant. Individual operators spreading hydro-mulch with hose applicators shall be particularly careful while working on steep slopes containing rocks or stumps

- 1. Temporary Cover:

Temporary cover that provides cover until perennial vegetation can be established shall consist of spring grains, winter grains, annual ryegrass, or other suitable quick establishing annual vegetation.

Annual ryegrass (not cereal rye) shall be planted at 10 pounds per acre. All small grains shall be planted at 30 pounds per acre.

The application rate per acre and date of planting shall be completed as shown in the ITEMS OF WORK AND CONSTRUCTION DETAILS. Seed quality shall conform to the current Montana rules and regulations and shall be from the latest crop available.

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2.8 EROSION CONTROL INSTALLATION

- A. Erosion control material is required on slopes greater than 4 to 1. Erosion control material shall be installed in accordance with manufacturer's instructions. Placement of the erosion control material shall be accomplished without damage to installed material or without deviation to finished grade.

- END OF SECTION 32 92 00 -

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