DIVISION 1

GENERAL REQUIRMENTS

SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. The project consists of the replacement of the Douglas Canal Headgate, installation of a sediment curb adjacent to the Douglas Canal Diversion Dam, installation of a concrete measurement section in the canal, and the installation of a stilling well adjacent to Nevada Creek. Work generally includes removal of the existing headgate, construction of a new headgate, construction of a concrete lined section of canal, installation of a concrete sediment curb, construction of a stilling well, installation of appurtenant metal structures, regrading a section of the canal and construction of fencing. The total length of the project area is approximately 400 feet. The project is located approximately 6.2 miles southeast of Helmville, Montana near Montana Highway 141. The project is owned by the DNRC and operated by the Nevada Creek Water Users Association (NCWUA).

1. Work to be completed includes, but is not limited to:

a. Diversion and dewatering of the work areas in Nevada Creek and Douglas Canal.
b. Removal and disposal of the existing Douglas Canal headgate.
c. Construction of a new headgate in Douglas Canal.
d. Construction of a sediment curb adjacent to the existing diversion in Nevada Creek.
e. Construction of a removable sluice gate.
f. Re-grading of the approximately 370 feet of Douglas Canal.
g. Construction of a concrete measurement section in Douglas Canal.
h. Installation of walkways, handrails, and other metal structures.
i. Construction of a stilling well adjacent to Nevada Creek
j. Installation of buried electrical conduit.
k. Installation of fencing.
l. Reclamation and seeding of all area disturbed by project activities.

1.02 OWNER PROVIDED WORK:

A. Owner will provide a single day of on-site construction staking to establish horizontal and vertical control for use by the selected contractor to construct the project. Anticipated staking will be limited to a single reference hub and two-line stakes for the diversion, measurement section, sediment curb, and stilling well.

B. Owner will provide Quality Assurance testing for project elements as specified and at Owner's discretion.

1.03 CONTRACTOR USE OF PREMISES:

A. The project is located on private property subject to an easement in benefit of the

Owner for operation and maintenance of the canal. Access routes and areas for equipment and material storage outside of the easement area have been approved by the land owner and are shown in the Drawings.

B. Access to the site is limited to the following:

1. Private driveway that provides access to the headgate and diversion areas.

C. It shall be understood that the responsibility for protection and safekeeping of equipment and materials on or near the site will be entirely that of the CONTRACTOR and that no claim shall be made against the OWNER by reason of any act of an employee or trespasser whether OWNER has paid CONTRACTOR for equipment or materials in storage or not. It shall be further understood that should any occasion arise necessitating access by the OWNER to the sites occupied by these stored materials and equipment, the CONTRACTOR owning or responsible for the stored materials or equipment shall immediately remove same. No materials or equipment may be placed upon the property of the OWNER until the OWNER has agreed to the location contemplated by the CONTRACTOR to be used for storage. The CONTRACTOR shall be solely responsible for obtaining and shall pay all costs in connection with any additional work area, storage sites, access to the site, or temporary right-of-way which may be required for proper completion of the Work.

D. No camping is allowed within access limits. No loose pets are allowed on site. No discharging of firearms is allowed on site.

E. The CONTRACTOR is required to abide by the conditions that the OWNER has negotiated with the Landowner for access to the project site. These conditions include the following:

1. Protection of all gates and cattleguards in the project area and all access routes to maintain function throughout construction duration. Contractor at their expense, shall repair or replace all impacts to gate, cattleguards, and the access road to equal to or better than pre-project conditions as determined by the Owner.

2. Limit appropriately sized construction equipment through access routes. Limit equipment on asphalt areas to rubber tired.

3. Allow only weed free equipment through the access routes.

4. Limit removal of existing vegetation, unless needed for equipment access clearance.

5. Provide best management practices to limit access route ground erosion including, but not limited to: installation of mud mats at asphalt connection areas.

6. Repair, restore, or replace any appurtenances damaged by the Contractor associated with these access routes to a condition and function satisfactory to the Landowner.

7. Upon completion of the project:

a. Remove all associated trash, debris from the access routes;
b. Remove all erosion control devices.
c. Restore all disturbed ground to as close to existing conditions prior to usage of access routes;
d. Reseed all disturbed ground with native seed mix;
e. Monitor the disturbed ground from Contractor access the following spring for noxious weeds and spray, if required.

8. Indemnify and hold the Landowner harmless from and against all claims, damages, losses and expenses, including reasonable attorneys' fees and costs of defense, arising from or in any way connected with injury to or the death of any person, or physical damage to any property, resulting from DNRC or its contractors' activities and work associated with this temporary construction access.

9. Participate in the final project walk through with the OWNER and the Landowner and address those items listed in 1 through 7 above that are found to need corrective action.

1.04 PROTECTION OF EXISTING UTILITIES:

A. CONTRACTOR shall be solely responsible for locating all existing underground installations, including service connections, in advance of excavating or trenching, by contacting 1-800-424-5555 or the owners thereof and prospecting. The CONTRACTOR shall use his own information and shall not rely solely upon information shown on the drawings concerning existing underground installations. The CONTRACTOR shall repair all damage to existing utilities or property at CONTRACTOR expense.

B. If any existing underground facility not shown on the drawings is located so that it interferes with the Work in either alignment or grade and has to be moved or otherwise modified, such work shall be done by the CONTRACTOR, and adjustment in payment will be made according to CHANGES IN WORK in Division 0. Except as stated above any delay, additional work or extra cost to the CONTRACTOR caused by existing underground installation shall not constitute a claim for extra work, additional payment, or damages.

1.05 PROTECTION OF EXISTING STRUCTURES:

A. Where excavation will be required adjacent to existing structures, the CONTRACTOR shall be solely responsible to maintain the structural integrity of the existing structures. The CONTRACTOR shall take whatever means necessary to ensure that the existing structures are not damaged. The CONTRACTOR shall repair all damage to the existing structures at CONTRACTOR's expense. Any fences destroyed during construction shall be repaired to the satisfaction of the property owner. Unless otherwise noted on the Construction Drawings, all existing ditches disturbed by construction shall be restored to their original size, line, and grade.

1.06 FIELD CHECK OF EXISTING STRUCTURES:

A. The dimensions and elevations of existing structures and locations of existing fences, pipelines, conduits, cables, and equipment shown on the drawings were

taken for the most part from available records and survey data and are not guaranteed for accuracy.

B. It shall be the responsibility of the CONTRACTOR to check all dimensions and elevations of existing structures, pipelines, conduits, cables, equipment, or other existing items, both above and below ground, affected by or affecting the Work under this contract, prior to the start of construction or ordering materials and equipment affected thereby.

C. The CONTRACTOR's attention is directed to the Instructions to Bidders, which requires that each BIDDER visit the site of the Work to familiarize itself with the arrangement and condition of existing construction that is to be connected to or that is to remain in place.

1.07 SITE ACCESS:

A. The CONTRACTOR shall be responsible for determining the adequacy of all roads, culverts, and bridges used in moving or gaining access for equipment and materials to the construction site. The CONTRACTOR shall provide alternative methods of access, such as a temporary crossing for any equipment that exceeds the structural limits of existing facilities.

1.08 EQUIPMENT CLEANING REQUIREMENTS:

A. The CONTRACTOR will wash all earthwork equipment to remove seeds, roots and rhizomes from the equipment prior to initial transport to the site in order to prevent the spread of noxious weeds to the site. This does not apply to service or employee vehicles that will stay on the roadway traveling frequently in and out of the project area. All earthwork equipment shall be pressure cleaned and completely free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds prior to the initial arrival at the construction site.

B. Equipment shall be considered free of soil, seeds and other such debris when a visual inspection by the OWNER or ENGINEER does not disclose such material. Visual inspection shall include the complete exterior including but not limited to undercarriages, tires, wheel wells and grill works. Disassembly of equipment components or specialized inspection tools are not required.

C. All CONTRACTOR equipment will arrive at the work site clean and weed-free. The CONTRACTOR will periodically inspect and verify that equipment is arriving free of soil and debris capable of transporting noxious weed seeds, roots or rhizomes. The CONTRACTOR shall maintain a log of vehicle inspections.

D. Equipment will not be sprayed with herbicide chemicals as a preventative measure. Many herbicides target a wide range of vegetation and using herbicides in this way may harm desirable vegetation.

E. The CONTRACTOR will also thoroughly inspect seeding equipment prior to conducting seeding activities.

1.09 EQUIPMENT CLEANING REQUIREMENTS (AQUATIC INVASIVE SPECIES)

A. In Addition to the Section 1.08 Equipment Cleaning Requirements, submit a Contractor Equipment Listing that includes any Contractor and/or Subcontractor

construction equipment mobilized to the project site that will enter a water body throughout the duration of the project. Specific requirements of the Contractor Equipment Listing include:

Equipment Name, Model #, Identification #(s)
Planned use of each equipment listed
Previous water body location of equipment listed (if applicable)
Planned re-mobilization of any equipment listed (if applicable)

The Contractor Equipment Listing does not apply to service or employee vehicles, or other construction equipment that will not enter a water body of the project area.

B. Contractor and Subcontractor(s) construction equipment planning to enter a water body (creek, stream, lake, reservoir) shall be subject to inspection by the Owner/Engineer, or Owner's representative, to control the spread of Aquatic Invasive Species. Construction equipment includes any tracked or wheeled equipment, boats, floating platforms, trailers, or portable equipment mobilized to the project site that plans to enter the water body.

C. Contractor and Subcontractor(s) field equipment planning to enter a water body (creek, stream, lake, reservoir) shall be subject to inspection by the Owner/Engineer, or Owner's representative, to control the spread of Aquatic Invasive Species. Field equipment may include, but not limited to, waders, wading boots, surveying rods, hand tools, or any other tools or equipment planning to enter the water body.

1.10 STANDARD SPECIFICATIONS

A. The specifications provided in this Project Manual shall be utilized in performing the Work. In instances where these specifications may not fully define a work element the specifications in The Montana Public Works Standard Specifications, latest edition including all addendums, shall be complied with.

PART 2 - PRODUCTS - NONE

PART 3 - EXECUTION - NONE

END OF SECTION 01010

SECTION 01041
PROJECT COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for coordinating and sequencing the work under the Contract, and requirements regarding existing site conditions.

B. Requirements for cutting and patching of new and existing work.

1.02 JOBSITE COORDINATION

A. Owner may perform additional work related to this project or Owner may let other direct contracts therefore which shall contain General Conditions and General Requirements similar to these. Contractor shall afford the other Contractors who are parties to such direct contracts, (or Owner if they are performing the additional work), reasonable opportunity for the introduction and storage of materials and equipment and execution of work, and shall properly coordinate his work with theirs.

B. If any part of Contractor's work depends on proper execution or results from the work of any such other Contractor (or Owner), Contractor shall inspect and promptly report to Owner and Engineer in writing any defect or deficiencies in such work that renders it unsuitable for such proper execution or results. His failure to so report shall constitute an acceptance of the other work as fit and proper for the execution of his work except as to defects and deficiencies that may appear in the other work after the execution of his work.

C. Contractor shall do all cutting, fitting, and patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of the Engineer and of the other Contractors whose work will be affected.

D. If the performance of additional work by other Contractors or Owner is not noted in the Contract Documents prior to the execution of the Contract, written notice thereof shall be given to Contractor prior to starting any such additional work. If Contractor believes that the performance of such additional work by Owner or others involved results in additional expense or requires an extension of the contract time, Contractor may make a claim therefore.

E. Contractor shall be responsible for all areas of the site used by him and all Subcontractors in performance of the work. He shall exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be specifically reserved to Owner or others.

F. Contractor and all Subcontractors shall cooperate in the coordination of their separate activities in a manner that will provide the least interference with the Owner's operations and utility companies working in the area, and in the interfacing and connection of the separate elements of the overall project work. If any difficulty or dispute should arise in the accomplishment of the above, the problem shall be brought immediately to the attention of the Owner and Engineer. All Contractors working on this site are subject to this requirement for cooperation, and all shall abide by the Engineer's decision in resolving project coordination problems without additional cost to the Owner.

G. The Contractor shall have a designated job superintendent on site at all times during construction operations. The superintendent shall be capable of project level decisions, manpower authorization and equipment utilization. Contractor will provide twenty-four (24) hour response through an after-hours phone number where some responsible local Contractor representative, foreman level or higher, can respond to after-hours complaints concerning the project during the course of the construction operations.

1.03 SUBMITTALS

A. Contractor shall submit the following information as applicable to coordination activities:

1. Construction Schedule

2. Contractor Contact List

3. Contractor Equipment List (meeting requirements of Section 01010)

1.04 SITE CONDITIONS

A. Information on Site Conditions:

1. General: Information obtained by the Owner regarding site conditions, topography, subsurface information, groundwater elevations, existing construction of site facilities as applicable, and similar data is included in the Contract Documents or will be available for inspection at the office of the Engineer or Owner upon request. Such information is offered as supplementary information only. Neither the Engineer nor the Owner assumes responsibility for its accuracy or completeness or for the Contractor's interpretation of such information.

2. Control Points: Contractor shall check existing vertical and horizontal survey control points on structures and improvements located in the vicinity of the work prior to beginning the work. He may establish new vertical and horizontal control points, if desired. Furnish Engineer with copies of survey notes for each survey and a copy of the layout of survey control points, within 48 hours of survey.

B. Existing Utilities: The Contractor is advised that there is one-call utilities locate number in use for utility locations requests within the State of Montana for buried gas, electrical and telecommunication lines. The one call number is 1-800-424-5555. It is mandatory to use this system before any excavation work in Montana.

2. Contractor's Responsibilities:

a. Where Contractor's operations could cause damage or inconvenience to telephone, television, power, oil, gas, water, sewer, or irrigation systems, the Contractor shall make arrangements necessary for the protection of these utilities and services. Replace existing utilities removed or damaged during construction with equal or better materials, unless otherwise provided for in these Contract Documents.

b. Notify utility offices that are affected by construction operations at least 48 hours in advance. Under no circumstances expose any utility without first obtaining permission from the appropriate agency. Once permission has been granted, locate, expose, and provide temporary support for the utilities.

c. Notify affected users, the Owner, and emergency services of planned service outages in writing (by door hanger) a minimum of twenty-four (24) hours in advance of planned outage. Provide details such as phone number of superintendent, date and times for outage.

d. Protect all utility poles from damage. If interfering utility poles will be encountered, notify the utility company at least 48 hours in advance of construction operations to permit necessary arrangements to protect or relocate the poles.

e. Contractor shall be solely and directly responsible to owner and operator of such properties for damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of injuries or damage that may result from construction operations under this Contract.

f. Neither Owner not its officers or agency shall be responsible to Contractor for damages as a result of Contractor's failure to protect utilities encountered in the work.

g. In event of interruption to domestic water, sewer, storm drain, or other utility services (public and private) as a result of accidental damage due to construction operations, promptly notify the Owner and/or proper authority. Cooperate with Owner and said authority in restoration as promptly as possible and pay for repair. Prevent interruption of utility service unless granted by the utility owner.

h. Drainage culverts at or near right angles to a pipeline, and removed by the Contractor, shall be replaced and/or restored to their original condition.

i. Maintain a legible log of all utility crossings showing type, depth, date of crossing. Location referenced to project stationing, and a notation if the utility was damaged, type of repair, and who made the repair. The Contractor will work with Engineer to maintain an accurate and complete log that will become part of the as- constructed contract drawings.

C. Interfering Structures:

1. Take necessary precautions to prevent damage to existing structures whether on the surface, above ground or underground.

2. Protect existing structures from damage, whether or not they lie within limits of easements obtained by the Owner. Where existing fences, gates, sheds, buildings or other structures must be removed to properly carry out the work, or are damaged during work, restore them to original condition and to the satisfaction of property owner.

3. Contractor may remove and replace in equal or better than original condition, small structures such as fences, mailboxes and signposts that interfere with Contractor's operations. Contractor shall obtain permission from the small structure owner prior to removal and replacement. Comply with all regulatory requirements.

D. Field Relocation:

1. During construction, it is expected that minor relocations of proposed facilities may be necessary. Make such relocations only by direction of the Owner or Engineer. If existing structures are shown that prevent construction as shown, Notify the Engineer before continuing the work so Engineer may make necessary field revisions.

2. Where shown or directed by and acceptable to the Engineer and Owner, provide relocation of existing facilities to include piping, utilities, equipment, structures, electrical conduit wiring, electrical duct bank, and other miscellaneous items. Use only new materials for relocation of existing facilities. Match materials of existing facilities unless otherwise shown or specified. Perform relocations to minimize downtime of existing facilities. Install new portions of existing facilities in their new position prior to removing existing facilities, unless otherwise accepted by Engineer.

E. Monuments and Markers:

1. Preserve and protect survey monuments and markers throughout construction. If damage occurs or removal becomes necessary, notify Engineer. Engineer will restore survey monuments at the expense of the Contractor.

2. Preserve private and public monuments that are found. If monument must be removed, it shall be replaced at its original location using a registered land surveyor. Notify Engineer when monuments are encountered. If government monuments are encountered, reference the monument for future replacement and provide 10-day advance notification to Engineer who will notify the proper authority.

F. Easements:

1. Where portions of work will be located on public or private property, easements and permits for rights-of-way will be obtained by the Owner, with the exception of the staging area lease agreement, which shall be the responsibility of the Contractor. Contractor shall inquire to owner of other property regarding lease requirements. Easements and permits for rights-of-way will provide for use of property for construction purposed only to the extent indicated on easements and permits. Copies of these easements and permits will be available from Owner for inspection. Contractor shall review the easements and permits obtained and abide by easement and permit provisions. Confine construction operations to within easement and permit limits or make special arrangements with property owners or appropriate public agency for additional area required.

2. Before final payment will be authorized, Contractor shall furnish the Owner written releases from property owners and/or public/private agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's property.

3. In the event Contractor is unable to secure written releases, inform the Owner of the reasons.

   a. Owner or its representatives will examine the site, and Owner will direct Contractor to complete work that may be necessary to satisfy terms of the easements.
   b. Should Contractor refuse to do this work, Owner reserves the right to have it done by separate contract and deduct the cost of same from Contract amount, or require the Contractor to furnish a satisfactory bond in a sum to cover legal claims for damages.
   c. When Owner is satisfied that work has been completed in agreement with the Contract Documents and terms of easements, the right is reserved to waive the requirement for written release if Contractor's failure to obtain such statement is due to grantor's refusal to sign, and this refusal is not based upon any legitimate claims that Contractor has failed to fulfill the terms of the easement or Contractor is unable to contact or has had undue hardship in contacting the grantor.

G. Connecting to Existing Facilities: Unless otherwise shown or specified, determine methods of connecting new work to existing facilities, and obtain Engineer's review and acceptance of connections.

1. Determine location, elevation, nature, materials, dimensions, and configurations of existing facilities where necessary for connecting new work.

2. Inspect existing record drawings and shop drawings, conduct exploratory excavations and field inspections, and conduct similar activities as needed.

3. Bypass pumping by Contractor if necessary.

H. Erosion and Dust Control On-Site:

1. The Contractor shall be responsible for reducing soil erosion and dust due to wind or water to a level meeting federal, state, and local regulations at the construction site. Control measures that may be required include, but may not be necessarily limited to, the following:

a. Suspension of excavation during high wind or rain.
b. Minimization of land exposure in area and time.
c. Covering erodible areas as quickly as possible with gravel or by compaction.
d. Stabilizing construction site soils.
e. Controlling dust during construction by use of water spray.
f. Water and/or chemically stabilize unpaved detours or any other fugitive dust emission sources resulting from construction of demolition. The fugitive dust can also be reduced by detouring traffic to paved approaches to the site.
g. On-site burning of waste materials is not allowed.

1.05 PROJECT MEETING OR REPORTS

A. Pre-construction Conference: A pre-construction conference will be scheduled after the Notice of Award.

B. Progress Meetings: The Owner will schedule weekly progress meetings to review work progress, schedules, and other matters needing discussion and resolution.

C. Progress Reports: A monthly progress report with an updated schedule shall be submitted by the Contractor prior to the submission of the application for progress payment. If the work falls behind the schedule, Contractor shall submit progress reports at such internals as the Owner or Engineer may request. Each progress report shall include sufficient narrative to describe current and anticipated delaying factors, their effect on the construction schedule, and proposed corrective actions. Any work reported complete, but which is not readily apparent to the Engineer must be substantiated with satisfactory evidence.

D. Purpose of Meetings and Reports: The purpose of the meetings or reports will be to review the progress of work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems that may develop. At a minimum, each meeting must be attended by the Contractor's project manager or field superintendent.

1.06 SCHEDULING OF WORK

A. Modifications to Existing Facilities:

1. Where existing facilities are to be modified during the course of work, obtain Owner's and Engineer's review and acceptance of submittals for temporary shutdown and bypass pumping, demolition, modification, corrections between new and existing work, and other related work. Conform to other sections as applicable.

2. Connections to existing service or utilities, or other work that requires the temporary shutdown and/or bypass pumping of any existing operations of utilities shall be planned in detail with appropriate scheduling of the work and coordinated with the Owner and Engineer. The schedule for shutdown or restart shall be given by written advance notice in order that the Owner or Engineer may witness the shutdown, tie-in, and startup.

3. All materials and equipment, including emergency equipment, necessary to expedite tie-ins shall be on hand prior to the shutdown of existing services or utilities.

4. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities including manholes, structures, pipelines, and utilities such as gas and electric. In each case, Contractor shall obtain permission from the Owner or the owning utility prior to undertaking connections. Contractors shall protect facilities against deleterious substances and damage.

5. Connections to existing facilities that are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. All equipment, materials, and labor that the Contractor plans to have available shall be coordinated with the Owner and Engineer in order to ensure the work is done in the minimum amount of time.

B. Notification of Residents, Tenants, and Property Owners: The Contractor shall notify residents, tenants, and property owners of upcoming construction at least five (5) days but no more than ten (10) days before construction is expected to begin adjacent to their property or in any location that will directly affect the use of their property. This notification shall be made by delivering a written notice to the residents, tenants, or property owners on a form approved by the Engineer. The notice form shall include the project name and address of the Contractor, along with a daytime and emergency contact person and phone number for the Contractor's representative and the Engineer's representative.

C. Time of Work:

1. Onsite construction observation by the Engineer or the Engineer's chosen representative will be required when items of work are being buried or otherwise concealed as well as during critical construction activities such as during concrete pours, special placement riprap, and gate installation. If any work performed by the contractor requires construction observation to be performed in excess of 40 hours per week, then the contractor will be responsible for the cost of the excess construction observation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 CUTTING AND PATCHING

A. General:

1. Execute cutting (including excavating), fitting, or patching of work, required to:

   a. Make the several parts fit properly.
   b. Uncover work to provide for installation of specified work.
   c. Remove and replace defective work or work not conforming to requirements of Contract Documents.
   d. Install specified work in existing construction.

2. Perform the following upon written instruction of Engineer:

   a. Uncover work to provide for Engineer's observation of covered work.
   b. Remove work to provide for alteration of existing work.

3. Contractor shall not, without written consent of Owner or Engineer:

   a. Cut or alter work of another Contractor.
   b. Cut structural or reinforcing steel.
   c. Endanger existing or new structures or facilities.
   d. Shut down or disrupt existing operations.

4. Materials for replacement of work removed shall comply with applicable sections of these Specifications for corresponding type of work to be done.

5. Provide all tools and equipment required to accomplish cutting and patching.

B. Inspection and Preparation:

1. Inspect existing conditions of work, including elements subject to movement or damage during cutting, patching, excavating, and backfilling.

2. After uncovering work, inspect conditions affecting installation of new products.

3. Prior to cutting, provide safety protection.

C. Procedures:

1. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances and finishes.

2. Execute excavating and backfilling as specified in Section 02220, EARTHWORK.

3. Restore work that has been cut or removed; install new products and provide completed work in accordance with specified requirements.

4. Restore structures and surfaces damaged that are to remain in the completed work including concrete, embedded piping, conduit, gates and other utilities.

5. Make restorations with new materials and appropriate methods as specified for new work of similar nature; if not specified, use best recommended practice of manufacturer or appropriate trade association.

6. Restore damaged work so there is a secure and intimate bond or fastening between new and old work. Finish restored surfaces to such planes, shapes, and textures that no transition between new and old work is evident in finished surfaces.

3.02 REMOVAL/RELOCATION/REPLACEMENT OF EXTRANEOUS ITEMS

A. Contractor shall be responsible to other items in conflict with construction. Contractor shall notify owner or utility company of such items prior to construction and shall coordinate with owner as to methodology required. Unless a specific bid item is identified and the removal is approved by the Engineer, the cost for this work will be considered incidental to all other items.

END OF SECTION 01041

SECTION 01050
FIELD ENGINEERING

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Owner has established survey control points in the project area. Contractor shall develop and make all detailed surveys needed for construction layout and staking. This includes alignment and grade layout stakes, slope stakes, batter boards, and other working points, lines, and elevations for all other work on this project.

1.02 PRESERVATION OF REFERENCE POINTS:

A. Carefully preserve bench marks, reference points, property corner pins, section corners, and stakes (other than those specifically designated for removal on the Drawings). In case of destruction, Contractor shall be charged for the resetting of such points and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

1.03 SURVEY NOTES:

A. Maintain standard survey notebooks in a neat and legible format. The Engineer reserves the right to monitor the work of survey crews as judged necessary to show conformance with this specification. However, such monitoring shall in no way relieve the Contractor of the responsibility for survey accuracy and adequacy to obtain a finished product fully conforming to the drawings and specifications. Failure to provide adequate notes in the time specified shall be justification for immediate suspension of all Work.

PART 2 - PRODUCTS NONE

PART 3 - EXECUTION

3.01 CONSTRUCTION STAKING:

A. Owner will provide construction staking as stated in Section 01010 – Summary of Work.

B. Contractor shall set additional layout stakes and/or hubs as needed by the Contractor to construct the project in compliance with the Drawings and specifications.

END OF SECTION 01050

SECTION 01060
PERMITS

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Except as otherwise noted, it is the Contractor's responsibility to identify, obtain, maintain, and proceed in conformity with all required permits for the Work. The mention of specific permits herein is not a representation that these are the only permits needed for the Work.

B. Contractor represents it will perform all work in strict accordance with all Permit requirements, and will fully cooperate and timely comply with all directions of the Owner or other responsible agencies related to the Permit requirements.

C. Contractor represents by submitting its Bid that it has familiarized itself with all Permit requirements and will strictly comply therewith. Any fines, penalties, or other costs incurred by the Owner arising out of or relating to the Work and/or the Permits therefore will be fully repaid to the Owner by the Contractor.

D. Contractor shall obtain all Permits necessary for the completion of the Work that have not been obtained by the Owner. Any costs associated with these Permits shall be included as part of the Contract Price and no change order will be issued to increase the Contract Price because of costs associated with Permits. Prior to proceeding with the work authorized by the Permit, the Contractor shall supply to the Owner a copy of all Permits obtained. Contractor must comply with all Permits regardless of whether or not the Permit is held in its name. Contractor shall perform all compliance testing required by project Permits.

1.02 PERMITS OBTAINED BY OWNER

A. Contractor shall adhere to all requirements of permits obtained by Owner. These permits include:

1. Montana Fish, Wildlife, and Parks Stream Protection Act 124

2. Montana Department of Environmental Quality 318 Authorization

1.03 SUBMITTALS:

A. Contractor Permits:

1. MPDES (Construction Dewatering and/or Storm Water Construction) Notice of Intent and SWPPP (see Section 01560)

PART 2 - PRODUCTS NONE

PART 3 - EXECUTION NONE

END OF SECTION 01060

SECTION 01090
REFERENCES

PART 1 - GENERAL

1.01 COORDINATION OF CONTRACT DOCUMENTS

1.02 DEFINITIONS

A. These specifications use "Article 1 - Definitions" of the Standard General Conditions of the Construction Contract, Form No. C-700 prepared and issued by the Engineer's Joint Contract Documents Committee (EJCDC), for the definition of terms herein. Changes to definitions are by either substitution for the article or in Supplementary Conditions.

1.03 REFERENCES

A. This section lists some of the construction industry organizations, professional and technical associations, societies and institutes, and government agencies issuing, promoting, or enforcing standards in the Contract Documents along with the abbreviations commonly used for those references. Also included are general requirements for using industry standards specified, and for applying quality control standards.

1.04 USE OF REFERENCE STANDARDS

A. Work specified by reference to a published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency, or other organization must meet or exceed the minimum quality standards for the material and workmanship in the designated standard or specification.

B. Where specified, assure products or workmanship meets the prescriptive or performance requirements in the Contract Documents when it is a more stringent standard than the referenced standard. Contract should reference only one specification to prevent argument as to which specification is most stringent.

C. Where the specific issue date of the standard is not identified in the standard, the edition and all published amendments available on the date of the Invitation to Bid applies.

D. If two or more standards are specified, provide the product and workmanship meeting or exceeding the requirements of the most stringent standard.

E. If a conflict exists between standards, meet the more stringent standard.

F. Where both a standard and a brand name are specified, assure the proprietary product names meet or exceed the specified reference standard. The listing of a trade name in a Contract Document does not warrant that the product meets the referenced standard.

G. Copies of Standards

1. Copies of applicable referenced standards are not bound in this Contract Document.

2. Where the contractor needs copies of standards for work superintendence and quality control, obtain a copy or copies directly from the publication sources and maintain copies at the job site, making them available to Contractor personnel, subcontractors, Owner, and Engineer.

1.05 ABBREVIATIONS

A. Abbreviations for Trade Organizations and Government Agencies: Following is a list of construction industry organizations and government agencies commonly referenced in the Contract Documents, with abbreviations used.

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers' Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers' Association
AGA	American Gas Association
AGMA	American Gear Manufacturers' Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALS	American Lumber Standards
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
AS SE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers' Association
AWPB	American Wood Preservers' Bureau
AWPI	American Wood Preservers' Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers' Association
CBMA	Certified Ballast Manufacturers' Association
CDA	Copper Development Association
CGA	Compressed Gas Association
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers' Association of America
CRSI	Concrete Reinforcing Steel Institute
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
Fed Spec.	Federal Specifications
FS	Federal Specification

GA	Gypsum Association
HI	Hydraulic Institute
HMI	Hoist Manufacturers' Institute
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers' Association
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IES	Illuminating Engineering Society of North America
ISA	Instrument Society of America
JIC	Joint Industry Conferences of Hydraulic Manufacturers
MIA	Marble Institute of America
Mil. Sp.	Military Specification
MS	Military Specifications
MMA	Monorail Manufacturers' Association
NAAMM	National Association of Architectural Metal Manufacturers
NBHA	National Builders' Hardware Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NHLA	National Hardwood Lumber Association
NLMMA	National Lumber Manufacturers' Association
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers' Association
OECI	Overhead Electrical Crane Institute
OSHA	Occupational Safety and Health Act (both Federal and State)
PEI	Porcelain Enamel Institute
PS	Product Standards Section - U.S. Department of Commerce
RLM	RLM Standards Institute, Inc.
RMA	Rubber Manufacturers' Association
SAE	Society of Automotive Engineers
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
SWI	Steel Window Institute
TEMA	Tubular Exchanger Manufacturers' Association
TCA	Tile Council of America
UBC	Uniform Building Code
UFC	Uniform Fire Code
UL	Underwriters' Laboratories, Inc
WCLIB	West Coast Lumber Inspection Bureau
WWPA	Western Wood Products Association

PART 2 - PRODUCT - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01090

SECTION 01150
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Method of Measurement

B. Basis of Payment

1.02 GENERAL:

A. The unit bid price for each item of the Contract shall cover all work shown on the Drawings and required by the specifications and other Contract Documents. All costs in connection with the Work, including furnishing all materials, equipment, supplies and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump-sum prices bid. No item that is required by the Contract Documents for the proper and successful completion of the Work will be paid for outside of or in addition to the prices submitted in the Bid. All work not specifically set forth as a pay item in the Bid Form is considered a subsidiary obligation of the Contractor, and all costs in connection therewith shall be included in the unit prices bid.

1.03 MATERIAL QUANTITIES:

A. The quantity to be paid is the quantity shown in the bid schedule. The contract quantity will be adjusted for authorized changes that affect the quantity or for errors made in computing this quantity. If there is evidence that a quantity specified as a contract quantity is incorrect, submit calculations, drawings, or other evidence indicating why the quantity is in error and request in writing, that the quantity be adjusted. Contract quantities will be adjusted only when there are errors in the original design of 15% or more.

B. Bid schedule quantities are calculated on neat line plan dimensions. Additionally, riprap quantities are based on the minimum thickness as shown on the Drawings. No additional payment will be made for thicker riprap mats or to fill in over excavated material.

C. Excavation quantities shown on the Drawings are approximate and are used for the comparison of bids. Excavation quantities are based on the existing ground elevation at the time of survey. The area of survey is an active river channel and existing ground elevations at the time of construction may be different than those at the time of survey.

D. The contractor shall be responsible for verifying all quantities prior to submittal of a bid, discrepancies shall be brought to the attention of the engineer for clarification.

E. The Contractor agrees to make no claim for damages, anticipated profits or otherwise on account of any difference between the amounts of work actually performed and materials

actually furnished and the estimated amounts herein except as follows. Either Owner or Contractor may make a claim for an adjustment in the Contract Unit Price for an item in accord with the Standard General Conditions of the Construction Contract and the Supplementary Conditions.

1.04 AUTHORITY:

A. The Engineer will perform all measurements and compute quantities for payment. The Engineer will verify measurements and quantities provided by the Contractor. The Contractor shall provide Engineer access to work areas for survey measurements, as required.

1.05 NON-PAYMENT ITEMS:

A. Payment will not be made for certain items, including but not limited to:

1. Wasted products.
2. Products that are wasted, disposed of, or otherwise handled in an unacceptable manner.
3. Products determined to be unacceptable in the opinion of the Engineer, before or after placement.
4. Products not completely unloaded from the transporting vehicle.
5. Products or materials placed beyond the lines and grades of the required work.
6. Products remaining on hand after completion of the work.
7. Loading, hauling, and disposing of rejected products.
8. Overly wet, overly dry, or frozen-earth material.
9. Excavation or fill made for the convenience of the Contractor.
10. Over excavation and backfill of over excavation.
11. Work performed that has been rejected and/or determined to be defective.

1.06 MEASURED QUANTITIES:

A. Measurement by Volume: Measurement for payment will be made if Contractor shows in writing a possible error in the contract quantity of greater than 15%. Additionally, measurements may be made to monitor work in progress. Measured by cubic dimension using mean length, width, and height or thickness.

1. Measurement for payment of excavations upon or against which concrete is not to be placed will be limited to the lines and grades shown on the Drawings

or to the most practical lines, grades, and dimensions established by the Engineer, in writing. No measurement will be made of over excavations beyond design lines and grades.

2. No measurement for payment will be made for additional concrete that results from subgrade surface irregularities. Such additional concrete is considered incidental and therefore included in the Contract price for the applicable item.

3. Fill quantities will be computed using the average-end-area method or other computation method approved of by the Engineer.

B. Measurement by Area: Measured by square dimension using mean length and width or radius. Items that are measured by area will be measured horizontally.

C. Linear Measurement: Measured by linear dimension at the item centerline or mean chord. Items that are measured by the lineal foot, such as pipe, will be measured parallel to the ground surface, unless otherwise specified.

D. Stipulated Sum/Price Items: Measured by weight, volume, area, or linear means, or combination, as appropriate, as completed items or units of the work.

E. Lump-Sum Items: Will not be measured for payment. However, measurements may be made to monitor work progress.

1.07 MEASUREMENT AND PAYMENT ITEMS:

NEVADA CREEK - DOUGLAS CANAL REHABILITATION PROJECT- HEADGATE REPLACMENT

Item 101 – Mobilization, Bonding, and General Requirements. This item shall include moving equipment and other necessary work items to and from the project site, coordination; scheduling; submittals; construction activity coordination; quality control; construction facilities and temporary controls; safety at the site; environmental quality control; product shipment, handling storage and protection; manufacturer's services; completed as-built drawings; final cleanup and restoration and contract closeout; complete. This item shall include any and all taxes, bonds, insurance costs in relation to this project together with any fees, applicable permits (except as noted in other bid items), licenses and or other incidental regulatory costs assessed by Local or Federal agencies as required for the successful completion of this project. Total amount of the mobilization and demobilization item shall not exceed 10% of the base bid amount. If bid exceeds the 10% limit, any amount above this threshold will be held for payment until the final payment is processed. Payment will be at the lump sum contract price based on the following schedule:

1. 25% of the amount bid for mobilization/demobilization when the Contractor has moved on-site and begun construction activities.
2. 50% of the amount bid for mobilization/demobilization when 25% of the contract amount (exclusive mobilization/demobilization) has been completed.

3. 75% of the amount bid for mobilization/demobilization when 50% of the contract amount (exclusive mobilization/demobilization) has been completed.
4. 100% of the amount bid for mobilization/demobilization when the contract amount (exclusive mobilization/demobilization) has been completed.

Item 102 – Water & Erosion Control. This item shall include furnishing all labor, equipment, and materials required to create and maintain a dry worksite for construction activities and controlling water quality as required by project permits. This item also includes all effort, coordination, and permits for any work the contractor elects to complete outside the temporary and permanent activities permitted by the Owner. This item includes permits to be obtained by the Contractor which may include MPDES permit for construction dewatering and/or storm water general construction. All dewatering costs are incidental to the item. Finish grading, seeding, and site restoration at project completion of all areas disturbed by contractor are included in this item as part of erosion control. Payment shall be prorated monthly over duration of the project at lump sum contract price.

Item 103 – Clearing, Grubbing, Demolition and Disposal. This item shall include furnishing all labor, equipment, and materials required to clear and grub within the project area as shown on the Drawings and to demolish and dispose of the existing headgate structure. This work includes clearing trees, brush, downed timber, and other vegetation as well as grubbing large rock, stumps, roots, buried logs, moss, turf, or other vegetative debris necessary to complete work identified in the project plans. Salvaging and stockpiling of onsite materials for use in construction such as topsoil, gravel, cobble, or boulders is incidental to this item. All debris shall be disposed of offsite. Removal and disposal of wood and metal on the existing intake structure is included as is structural backfill of the remaining concrete structure in place as shown on the Drawings. Payment shall be at lump sum contract price.

Item 104 – Site Reclamation. This item shall include furnishing all labor, equipment, and materials required to reclaim the project areas including but not limited to complete finish fine grading, temporary access routes, borrow pit, staging and stockpile areas as specified on the Drawings. All reclamation of the primary access routes including but not limited to repair or replacement of gates, cattleguards, and ditch crossings is incidental to this item. Work to include seeding/scarifying, re-shaping, and any other items to reclaim the site upon project completion. Payment shall be at lump sum contract price.

Item 201 – Concrete Headgate Structure. This item shall include furnishing all labor, equipment, and materials required to construct the new intake structure. Work to include all earthwork, shoring, foundation preparation, drain gravel installation, forming, reinforcement, concrete, finishing and curing to construct the intake structure as shown on the Drawings. The structure includes approximately 22.7 cubic yards of structural concrete. Payment shall be at lump sum contract price.

Item 202 – 4' x 5' Slide Gate. This item shall include furnishing all labor, equipment, and materials required to furnish and install the intake slide gates as shown on the Drawings. Measurement will be per occurrence. Payment shall be at the contract unit price.

Item 203 – Riprap Bank Protection (12" D50). This item shall include furnishing all labor, equipment, and materials required to install the riprap bank protection as shown on the Drawings and not included in other bid items. The headgate area includes approximately 55.0 cubic yards of rip rap and 28 cubic yards of bedding gravel. Payment shall be at lump sum contract price.

Item 204 – Headgate Walkway and Handrails. This item shall include furnishing all labor, equipment, and materials required to complete construction of the walkway and handrails on the headgate structure as shown on the Drawings. Work to include furnishing walkway and handrail meeting project requirements and attachment to the concrete structure. Payment shall be at lump sum contract price.

Item 301 – Concrete Sediment Curb. This item shall include furnishing all labor, equipment, and materials required to construct the sediment curb structure. Work to include all earthwork, shoring, foundation preparation, forming, reinforcement, concrete, finishing and curing to construct the intake structure as shown on the Drawings. The structure includes approximately 7.8 cubic yards of structural concrete. Payment shall be at lump sum contract price.

Item 302 – Remove and Replace Riprap Bank Protection. This item shall include furnishing all labor, equipment, and materials required to remove and replace existing riprap bank protection adjacent to the sediment curb as shown on the Drawings. The extent of the rip rap removal and replacement will be determined by the contractor's sediment curb excavation limits. Payment shall be at lump sum contract price.

Item 303 – 2' x 2' Sluice Gate and Mount. This item shall include furnishing all labor, equipment, and materials required to furnish, build, and install the sluice gate and associated mounting plate as shown on the Drawings. Payment shall be at lump sum contract price.

Item 401 – Canal Grading and Sediment Removal. This item shall include furnishing all labor, equipment, and materials required to re-grade the canal from the headgate structure to the measurement section as shown the Drawings. Work to include removal and disposal of sediment from the canal invert. Design volume based on a surface comparison is approximately 36 cubic yards of excavation spread over 370 linear feet of canal. Measurement shall be straight distance from the downstream end of the headgate structure to the upstream end of the measurement structure. Payment shall be at on a linear foot basis at contract price.

Item 501 – Concrete Water Measurement Structure. This item shall include furnishing all labor, equipment, and materials required to construct the new water measurement structure. Work to include all earthwork, shoring, foundation preparation, drain gravel installation, forming, reinforcement, concrete, finishing and curing to construct the water measurement structure as shown on the Drawings. The structure includes approximately 14 cubic yards of structural concrete.
Payment shall be at lump sum contract price.

Item 502 – Stilling Well and Piping. This item shall include furnishing all labor, equipment, and

materials required to complete construction of the canal measurement structure stilling well as shown on the Drawings. Work to include earthwork, connection of pipe to concrete structure, setting pipe, vertical installation of 12" diameter steel pipe, installation of concrete plug and installation of pipe cap. Payment shall be at lump sum contact price.

Item 503 – Measurement Structure Walkway and Handrails. This item shall include furnishing all labor, equipment, and materials required to complete construction of the walkway and handrails on the measurement structure as shown on the Drawings. Work to include furnishing walkway and handrail meeting project requirements and attachment to the concrete structure. Payment shall be at lump sum contract price.

Item 504 – Water Measurement Equipment Mount. This item shall include furnishing all labor, equipment, and materials required to complete construction of the water measurement equipment mount as shown on the Drawings. Work to include fabrication of the equipment mount and attachment to the walkway structure. Payment shall be at lump sum contract price.

Item 601 – Stilling Well and Piping. This item shall include furnishing all labor, equipment, and materials required to complete construction of the Nevada Creek stilling well as shown on the Drawings. Work to include earthwork, connection of pipe to structure, setting pipe, vertical installation of 12" diameter steel pipe, installation of concrete plug and installation of pipe cap. Payment shall be at lump sum contact price.

Item 701 – Electrical Conduit. This item shall include furnishing all labor, equipment, and materials required to complete construction of the electrical conduits as shown on the Drawings. Work to include furnishing electrical conduit, installation of conduit and all associate incidental materials, and excavation and backfill. The project includes approximately 160 linear feet of electrical conduit. Payment shall be per linear foot of conduit installed at the contract price.

Item 801 – Access Gate and Supports. This item shall include furnishing all labor, equipment, and materials required for installation of the access gate and associated brace panels as shown on the Drawings. Payment shall be at lump sum contract price.

Item 802 – Fencing. This item shall include furnishing all labor, equipment, and materials required for installation of fencing as shown on the Drawings. Payment shall be at lump sum contract price.

Item 803 – Diversion Handrail. This item shall include furnishing all labor, equipment, and materials required for installation of handrail as shown on the Drawings. Payment shall be at lump sum contract price.

PART 2 - PRODUCTS – NONE

PART 3 - EXECUTION – NONE

END OF SECTION 01150

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

1.01 CONSTRUCTION SCHEDULES:

A. Submit to the Engineer a progress schedule under Sections 2.05, 2.07, and 6.04 of the General Conditions.

B. Submit to the Engineer adjusted progress schedules under Section 6.04 of the General Conditions.

C. Submit to the Engineer, value schedules under Sections 2.05, 2.07 and 14.01 of the General Conditions.

1.02 SHOP DRAWINGS, PRODUCT DATE, AND SAMPLES:

A. Submit shop drawings to the Engineer under Sections 2.05 and 6.17 of the General Conditions. Submit all shop drawings for the Contractor, subcontractor(s) and supplier(s).

B. Review all shop drawings prior to submittal in accordance with Section 6.17 of the General Conditions.

C. Submit in writing any substitutions to previously approved items for review by the Engineer.

D. Within 15 days after Notice to Proceed, submit a complete list of products proposed for use, providing manufacturer's name, trade name, and model or catalog numbers, and manufacturer data. Submit the number of copies needed by the Contractor, plus three copies for Engineer use.

E. Where specified, submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Where specified, submit samples of finishes including colors, textures, and patterns.

1.03 SUBMITTAL SCHEDULE:

A. List of technical specification submittals (additional items required in General and Supplementary Conditions, this list may not be all inclusive and does not remove responsibility of Contractor to provide all submittals as required in the Contract Documents):

1. Construction Schedule (Section 01041)
2. Contractor Equipment List (Section 01041)
3. Diversion & Dewatering Plan (Section 02401 and Drawings)
4. Contractor obtained Permits (Section 01060)
5. Demolition Plan (Section 02112)

6. Riprap Bank Protection Materials (Section 02350)
7. Seed Mix (Section 02480)
8. Slide Gates (Section 15040 and Drawings)
9. Sediment Sluice Gate (Section 15040 and Drawings)
10. Shoring Plan (Section 02220)
11. Concrete Reinforcement (Section 03200)
12. Concrete Mix Design (Section 03300)
13. Concrete Load Slips (Section 03300)
14. Concrete Test Results (Section 03300)
15. Misc. Metal Shop Drawings (Section 05500 and Drawings)
16. Metals Product Data (Section 05120)
17. Walkway and Railing (Section 05520 and 05530)
18. Quality Control Testing (Section 01400)
19. Contract Closeout (Section 01700)
20. Site/Worker Safety Plan (Section 01560)

B. Contractor shall provide a submittal containing any testing results, field relocation drawings or sketches, or other information affecting the work not specifically listed under Item A of this Section.

PART 2: PRODUCT - NOT USED PART 3:

EXECUTION - NOT USED

END OF SECTION 01300

SECTION 01400
QUALITY CONTROL/QUALITY ASSURANCE

PART 1 - GENERAL

1.01 DEFINITIONS:

A. Quality Control - planned and specific actions or operations necessary to produce a product that complies with the contract documents. Quality control consists of actions, inspections, sampling and testing necessary to ensure the work is in compliance with the contract documents and to control production and construction processes. Quality control is keyed to the construction sequence to quickly determine when the work is out of compliance with the contract documents and to respond to correct the situation and bring the work into compliance. Quality control is the responsibility of the Contractor.

B. Quality Assurance - planned and systematic observations, testing and actions to verify that the work complies with the contract documents, provided by Owner. Quality assurance includes oversight of the contractor's quality control, verifying the results of the contractor's testing and additional assurance sampling and testing. Quality assurance will not be adequate for the contractor's production and placement needs. The Owner will provide quality assurance.

C. Verification/Compliance Testing - sampling and testing which is carried out independent of the Contractor's quality control testing to confirm/verify that the work complies with the contract documents. The frequency of verification/compliance testing will be determined by the Engineer and may not be adequate for the contractor's production and placement needs. Verification/compliance testing will not be used to determine construction procedures or operations (i.e. rolling patterns, lift thickness, etc.). Verification/compliance testing will be provided by the Engineer.

1.02 SUBMITTALS:

A. Quality Control Testing: Submit records of all Contractor tests to the Engineer within 24 hours of the testing. The Quality Control laboratory is to notify the Contractor and Engineer promptly of irregularities or deficiencies observed in the Work during performance of the Quality Control Testing.

PART 2 - PRODUCTS – NOT USED PART 3 -

EXECUTION

3.01 GENERAL:

A. Quality control testing frequency is at Contractor discretion, except where tests are specifically required for individual materials/products. Contractor is responsible to determine the type and quantity of testing necessary for adequate quality control to provide completed Work in compliance with these specifications.

3.02 COOPERATION WITH QUALITY ASSURANCE:

A. Assure that the Owner's personnel and Engineer have access to all work areas at all times work is in progress. Provide any special facilities or equipment to access work areas at Contractor expense.

B. Notify the Engineer when the work is ready for quality assurance testing. Establish and update the construction schedule to provide the Engineer estimated sampling/testing dates and times. Owner may choose to obtain a split and comparison test of any samples collected for quality control testing. Provide adequate notice (minimum of two working days) of testing plans to coordinate collection of samples.

END OF SECTION 01400

SECTION 01500
CONSTRUCTION & TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 CONSTRUCTION FACILITIES

A. Furnish temporary services and utilities, including use fees and operation costs for: potable and non-potable water; lighting and power; and, materials storage.

B. Furnish personnel support facilities including: sanitary facilities; drinking water; first aid supplies and facilities; and, trash removal.

C. Do not park vehicles or equipment or store materials on private property outside of the Project extents without written permission from the property owner.

1.02 SECURITY

A. Provide fencing, barricades, warning signs, and lights to secure all work areas, equipment, and materials as necessary.

1.03 DUST CONTROL

A. Be responsible for dust control, providing all equipment and personnel for the work. Furnish Engineer name(s) and telephone number(s) of the person(s) responsible for dust control during evenings and weekends. If this person cannot be contacted, Owner may at Contractor expense, perform the work or contract the work out.

1.04 ACCESS ROUTES

A. Contractor is provided access points to the project as shown on the Drawings. The access points cross private property and specific provisions and restrictions for use of the access routes exist. The Contractor shall abide by the terms of the agreement between the landowner and DNRC. All access routes shall be fully reclaimed and disturbed areas shall be returned to pre-project conditions, including re-seeding per Section 02480 FINISH GRADING, SEEDING, AND LANDSCAPING as appropriate. Improvements to access routes shall be considered incidental to the Project, and anticipated costs shall be included as described in Section 01150 MEASUREMENT AND PAYMENT under Item 101 – Mobilization, Bonding, and General Requirements. Reclamation and restoration of the access routes shall be considered incidental to the Project, and anticipated costs shall be included as described in Section 01150 MEASUREMENT AND PAYMENT under Item 104 – Site Reclamation.

1.05 SITE ACCESS

A. If desired for access and staging, the Contractor is allowed to temporarily fill the canal between the headgate and water measurement structure. A plan shall be submitted to the Engineer for review and approval prior to performing this work. The plan shall include a narrative stating the location of the fill areas, the borrow source, provisions for addressing storm runoff and snow melt conveyance, and a reclamation plan. Improvements for site access shall be considered incidental to the Project, and anticipated costs shall be included as described in Section 01150 MEASUREMENT AND PAYMENT under Item 101 – Mobilization, Bonding, and General Requirements. Reclamation and restoration of the access routes shall be considered incidental to the Project, and anticipated costs shall be included as described in Section 01150 MEASUREMENT AND PAYMENT under Item 104 – Site Reclamation.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 01500

SECTION 01560
ENVIRONMENTAL QUALITY CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work shall consist of installing measures or performing work to control and protect the environmental quality of the project site and to minimize the pollution of the water and air during the construction operations in accordance with these specifications.

1.02 RELATED WORK SPECIFIED UNDER OTHER SECTIONS

A. Section 01400 - QUALITY CONTROL.

B. Section 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

A. The erosion and sediment control work and measures shall include but not be limited to the following and as shown in the Contract Documents.

1. Erosion blankets if required to address areas that have erosion concerns.
2. Contractor shall implement all other required erosion and sediment measures needed to comply with state and federal laws, rules and regulations.

B. Control of Earthwork Activities:

1. The excavation and moving of soil materials shall be scheduled so that the smallest possible areas will be unprotected from erosion for the shortest time practical.

2. Excavated materials or other construction materials shall not be stockpiled or deposited 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 actual watercourse itself.

3. All surplus dredged or excavated materials shall be placed on an upland site above the ordinary high water line in a confined area, not classified as a wetland, to prevent the return of such materials to the waterway.

4. All earthwork operations on shore shall be carried out in such a manner that sediment runoff and soil erosion to the water are controlled.

C. Seeding: Seeding to protect disturbed areas shall be used as specified in the Contract Documents.

D. Mulching: Mulching shall be used to provide temporary protection to soil surfaces from erosion.

E. Vegetation Conservation: Except where clearing is required for the permanent works, approved construction roads, or excavation operations, all trees, native shrubbery, and vegetation shall be preserved and shall be protected from damage by the construction operations and equipment. The Contractor shall move equipment on access routes within the right-of-way in a manner which will prevent damage to crops, rangeland, or property.

1. Undisturbed buffer strips of natural vegetation shall be left on banks and bottoms of waterways and at road crossings until start of construction.

F. Diversions:

1. Diversions shall be used to divert water away from work areas and/or to collect runoff from work areas for water quality treatment and safe discharge.

2. Diversions or channel changes required by the Contractor to complete the work shall be completed in a manner to minimize erosion and to leave the stream course essentially unchanged.

3. The Contractor shall remove all diversions, culverts, bridges and other temporary work following completion of the work and shall restore the area disturbed to essentially the same configuration as it was prior to construction or to the final lines and grades as shown on the Contract Documents.

3.02 WATER POLLUTION CONTROL

A. The Contractor's construction activities shall be performed by methods that will prevent the entrance, or accidental spillage, of solid matter, contaminants, debris, and other objectionable pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. Such pollutants and wastes shall include, but are not restricted to, refuse, garbage, cement concrete, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution. Servicing and refueling of construction equipment shall be restricted to areas more than 250 feet away from a water body.

1. No herbicide shall be applied within 25 feet of water bodies unless specifically labeled for use in or next to water. Mechanical or biological control methods also can be used. Herbicide shall be applied in

compliance with federal, state, and local regulations. Use of coil carriers with herbicides shall be avoided.

B. Compliance with Applicable Laws and Regulations:

1. The Contractor shall comply with all applicable Federal, State and local laws, orders, and regulations concerning the control and abatement of water pollution.

2. Prior to the discharge of any wastewater or other pollutants, or any dredged or fill materials into navigable waters, the Contractor shall obtain the proper permits and provide a copy to the Engineer.

C. Other Provisions:

1. All construction debris shall be disposed of on land in such a manner that it cannot enter a waterway or wetland.

2. Equipment for handling and conveying materials during construction shall be operated to prevent dumping or spilling the materials into the water except as approved herein.

3. During construction and subsequent operation of this facility, no petroleum products, chemicals, or other deleterious materials shall be allowed to enter or be disposed of in such a manner so that they could enter the water and precautions shall be taken to prevent entry of these materials into the water.

4. All work in waterways shall be performed in such a manner so as to minimize increases in suspended solids and turbidity, which may degrade water quality and damage aquatic life outside the immediate area of operation.

5. Only clean riprap materials shall be utilized in order to avoid the percolation of fines which would result in excessive local turbidity and the riprap shall be placed in such a manner so as to provide a reasonably solid mass with no appreciable variation in thickness or slope.

6. The Contractor shall maintain close coordination with downstream water users, advising them of any water quality changes to be caused by the construction.

7. Measures shall be employed to prevent wet concrete from entering the waterway.

8. Concrete trucks shall be washed at a site and in such a manner that wash water cannot enter the waterway.

3.03 STORM WATER DISCHARGE PERMIT

A. Federal law requires an appropriate storm water discharge permit be obtained prior to the start of construction on any Work Delivery Order that will result in one

(1) or more acres of surface disturbance. The Contractor shall meet all requirements for storm water discharges from construction activities as administered by the U.S. Environmental Protection Agency (USEPA) and Montana Department of Environmental Quality (MDEQ).

The Contractor shall submit a Notice of Intent (EPA Form 3510-9 Rev. 6/03). Construction involving surface disturbance may begin upon submittal of the complete NOI Package and fees. The NOI shall be submitted to:

Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620-0901
Telephone: (406) 444-3080

Forms can be found online at
http://deq.mt.gov/water/StormWater/stormsystems

The Contractor shall also submit a Notice of Termination (EPA Form 3510-13) (Rev. 6/03). The NOT must be submitted to the MDEQ upon the completion of construction when all soil disturbing activities have ceased and the site has been stabilized according to permit requirements.

B. The Contractor shall also be responsible for developing a written site-specific Storm Water Pollution Prevention Plan (SWPPP) in accordance with the USEPA guidance document entitled *Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices.* A copy of the SWPPP may be requested for review by the USEPA. The SWPPP must:

1. Be in writing.
2. Be followed during construction of this project.
3. Be modified as may be necessary depending on changing site conditions.
4. Be maintained at the project site at all times.
5. Be available for review upon request by the regulatory authorities.

C. A copy of the Notice of Intent and SWPPP shall be submitted to the Owner and the Engineer prior to the start of construction. A copy of the Notice of Termination shall be submitted to the Owner and Engineering following completion of site stabilization.

3.04 CHEMICAL POLLUTION

A. The Contractor shall provide tanks or barrels to be used to dispose of chemical pollutants produced as a by-product of the project work such as drained lubricating or transmission oils, greases, soaps, asphalt, etc. At the completion of the construction work, storage tanks or barrels shall be removed from the site and properly disposed

of.

B. Sanitary facilities such as chemical toilets or septic tanks shall not be placed adjacent to live streams, wells, or springs. They shall be located 200 feet as required to prevent contamination of any well or watercourse.

C. The term pesticide as used in these Specifications shall include all herbicides, insecticides, fungicides, and rodenticides. Should the Contractor find it necessary to use pesticides in the areas of work under this contract, he shall submit his plan for such use to the Engineer for written approval. The Contractor shall not proceed prior to approval by the Engineer.

D. Pesticides used shall only be those registered with the Environmental Protection Agency in compliance with the Federal Environmental Pesticide Control Act of 1972 and other Federal pesticide acts. Pesticides names on the Department of the Interior's "Prohibited List" shall not be used.

3.05 AIR POLLUTION

A. The Contractor shall comply with applicable Federal, State, and local regulations concerning the prevention and control of air pollution and the burning of brush, slash or other materials. In no case shall unapproved materials, such as tires, plastics, rubber products, asphalt products, or other materials that create heavy black smoke or nuisance odors, be burned. Trash burning will not be permitted and smoke of any kind shall be minimized.

B. Fire prevention measures shall be taken to prevent the start or the spreading of fires resulting from the project work.

C. In the conduct of construction activities and operation of equipment, the Contractor shall utilize such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminates.

D. Equipment and vehicles that show excessive emissions of exhaust gases shall not be operated until corrective repairs or adjustments are made.

3.06 DUST ABATEMENT

A. The Contractor shall prevent dust that has originated from his operation from damaging crops, cultivated fields, rangeland, trees, and dwellings, or causing a nuisance. The Contractor shall be held liable for any damage resulting from dust originating from his operations under these Contract Documents.

3.07 NOISE POLLUTION

A. The Contractor shall comply with applicable Federal, State, and local laws, orders, and regulations concerning the prevention, control, and abatement of excessive noise.

B. The use of jackhammers, pile driving, or other operations producing high-intensity impact noise may not be performed at night unless the Contractor receives prior approval of the Owner and nearby property owners.

3.08 PRESERVATION OF HISTORICAL AND ARCHEOLOGICAL DATA

A. Federal legislation provides for the protection, preservation, and collection of scientific, prehistoric, historic, paleontologic, and archeologic data (including relics and specimens) that might otherwise be lost due to alteration of the terrain as a result of any Federal construction project.

B. The Contractor agrees that, should he or any of his employees in the performance of this contract discover evidence of possible scientific, prehistoric, historical, paleontologic, or archeologic data, he will cease work and notify the Owner or Engineer immediately giving the location and nature of the finding. Written confirmation shall be forwarded immediately. The Owner will issue stop- work orders should the Contractor encounter any of the above-mentioned resources. The Contractor shall exercise care so as not to damage artifacts or fossils uncovered during excavation operations and shall provide the cooperation and assistance necessary to preserve the findings for removal.

C. Where appropriate by reason of a discovery, the Engineer may order delays in the time of performance, or changes in the work, or both. If such delays, or changes, or both, are ordered, the time of performance and contract price shall be adjusted in accordance with the applicable clauses in the General Provisions.

D. The Contractor agrees to insert this paragraph 3.08 in all subcontracts which involve the performance of work on the project site.

3.09 WASTE MATERIAL DISPOSAL

A. Excess excavated material not required or suitable for backfill, and other waste material, must be disposed of in licensed landfills or at other sites for which local, county, or state approval is obtained.

B. Unacceptable disposal sites include, but are not limited to, sites within a wetland land or critical habitat and sites where disposal will have a detrimental effect on surface water or groundwater quality.

C. Contractor may make his own arrangements for disposal subject to submission of proof that the owner(s) of the proposed site(s) has(have) a valid fill permit issued by the appropriate governmental agency.

D. Maintain areas covered by the Contract and affected public properties free from accumulations of waste, debris, and rubbish caused by construction operations. Remove excavated materials from the site, or stockpile where shown or directed by Engineer.

E. Cleaning and disposal shall comply with local ordinances and pollution control laws. Do not burn or bury rubbish or waste materials on the project site. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner on-site or in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

3.10 MAINTENANCE, REMOVAL AND RESTORATION

A. The Contractor shall, at all times, keep the construction area, including storage areas used by him, free from accumulations of waste materials and rubbish.

B. Waste materials including, but not restricted to, refuse garbage, sanitary wastes, industrial wastes, and oil and other petroleum products, shall be disposed of by the Contractor. Materials must be disposed of by acceptable means such as an approved solid waste facility. It shall be the responsibility of the Contractor to make any necessary arrangements pertinent to the locations and regulations of such disposal. The Contractor shall pay any fees or charges required for disposal of materials.

3.11 SAFETY PLAN AND OSHA REGULATIONS

A. The Contractor shall prepare a job specific safety plan for submittal prior to performing work on the site. The safety plan shall, at a minimum, address general work site safety, worker training, work on and around elevated platforms, fall protection, falling object projection, job site safety weekly meetings, identification of Contractor's On-Site Safety Officer(s), fire prevention/protection, and incident protocol. The Contractor's On-Site Safety Officer shall be on site every day that work takes place.

B. OSHA Regulations General: Contractor will be required to comply with the Amendment to the Occupational Safety and Health Administration Construction Standards for Excavations, 29 CFR Part 1926, Subpart P printed Tuesday October 31, 1989 and effective January 2, 1990.

Any conflicting information between the OSHA document and these Contract Documents shall be revised to the OSHA document requirements supersede and take precedence over all other conflicting information. Contractor shall be required to obtain copies of the OSHA document and to complete review of the same to avoid misrepresentation of their regulations

3.12 FIRE PROTECTION

A. The Contractor shall complete all work in a manner as to minimize fire risk. This includes taking special precautions during any field welding or steel cutting operations. Muffler systems on construction equipment shall have spark arresters to reduce risk of fire. The Contractor shall maintain fire extinguishers and other firefighting equipment to quickly respond in the event of a fire.

3.13 THREATENED, ENDANGERED, CANDIDATE, AND SENSITIVE SPECIES AND HABITATS

A. The Contractor agrees that, should he or any of his employees in the performance of this contract, discover evidence of possible threatened, endangered, candidate, and sensitive species and habitats, Contractor will cease work and notify the Owner and Engineer immediately, giving the location and nature of the finding. Written confirmation shall be forwarded immediately. The Owner may issue stop-work orders if construction encounters threatened, endangered, candidate, and sensitive species and habitats. Construction will continue only after consultation with the U.S. Forest Service and U.S. Fish and Wildlife Service.

3.14 AQUATIC INVASIVE SPECIES

A. Contractor shall follow rules and guidelines established by the Montana Department of Natural Resources and the Montana Department of Fish, Wildlife, and Parks.

http://cleandraindry.mt.gov/

B. The Contractor agrees that, should he or any of his employees or subcontractors in the performance of this contract, discover evidence of possible AIS, Contractor will cease work and notify the Owner and Engineer immediately, giving the location and nature of the finding. Written confirmation by the Engineer shall be forwarded immediately to the Owner. The Owner may issue stop-work orders if AIS is confirmed by the appropriate regulatory Agency. Construction will continue only after consultation between Contractor and Owner/Engineer with the Montana Departments of Natural Resources and Conservation and/or Fish, Wildlife and Parks.

END OF SECTION 01560

SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Items required in final closeout of this project. Included are items such as post-construction inspection, acceptance of the Work, closeout records and project record drawings.

1.02 SUBMITTALS:

A. Contract Closeout: Submit all required closeout submittals to the Engineer and the Owner. The Engineer and Owner will review closeout submittals prior to final payment. Items to be submitted are:

1. Project Record Documents - See Item 3.02 for requirements.

2. Guarantees and Bonds - Provide guarantees and bonds as required herein and as provided by manufacturers of all products and equipment.

3. Consent of Surety to Final Payment

4. Contractor's Certificate of Completion certifying that work is complete in accordance with Contract Documents, and waiving claims not previously made in writing.

5. Name and Address of Contractor's representative for the one-year correction period who shall have the power and responsibility of correcting defects during this period.

6. Final pay request.

7. Contractor Affidavit (in lieu of release of liens of waivers).

8. Extended Commercial Liability Insurance Coverage (including product and completed operations coverage).

PART 2 - PRODUCTS

2.01 MISCELLANEOUS PRODUCTS:

A. Provide all maintenance materials, spare parts, tools, keys and other items either required in the Contract Documents or furnished by the suppliers of the various products.

PART 3 - EXECUTION

3.01 CLEANING:

A. Remove all tools, equipment, surplus materials, and rubbish. Repair all marred surfaces, and remove grease, dirt, stains and foreign materials from finished surfaces.

3.02 PROJECT RECORD DRAWINGS:

A. CONTRACTOR'S RESPONSIBILITY: Using red colored ink, neatly and legibly make changes on a set of clean prints. Indicate all changes and revisions to the original design which affect the permanent structures and will exist in the completed Work. Reference all underground facilities to permanent physical objects. Reference elevation of all existing lines on profile sheets or call out elevations in plan if no profile exists. Keep record drawings current. Certification of accuracy and completeness will be required on monthly submitted payment requisitions. Deliver project record drawings to the Engineer before closeout as part of the project record documents.

3.03 POST-CONSTRUCTION INSPECTION:

A. Prior to expiration of the one-year correction period, the Owner and Engineer will inspect the project to determine whether corrective work is required. The Contractor will be advised 14 days prior to inspection and notified in writing of all deficiencies. Contractor is required to attend the post-construction inspection.

END OF SECTION 01700

DIVISION 2

SITEWORK

SECTION 02112
REMOVAL OF EXISTING SRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

Section includes: demolition and removal of the existing concrete headgate, as required or shown on the Drawings. Existing metal and concrete shall be removed from the project.

1.02 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

B. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.03 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.04 CONDITION OF STRUCTURES

A. Owner and Engineer assume no responsibility for the condition of existing structures.

1.05 PRE-DEMOLITION MEETING

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review structural load limitations of existing structures.

3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

4. Review areas where existing construction is to remain and requires protection.

1.06 PROTECTION AND RESTORATION OF PROPERTY

A. Contractor is solely responsible for all methods and operations of demolition. Blasting is not permitted.

B. Promptly repair any damage caused to adjacent facilities and existing structures to the satisfaction of the Engineer and Owner at no additional cost to Owner and Engineer.

1.07 SUBMITTALS

A. Demolition Plan: Prior to any demolition, the following Contractor supplied information shall be submitted and approved:

1. Submit plan of area to be demolished

2. Submit demolition process which shall include sequencing, process, and means of demolition.

B. Concrete Repair Plan: If any existing concrete structures are damaged at any stage during construction, the contractor shall prepare a plan to repair the damaged concrete and provide to Engineer for review before repairing the damaged concrete.

PART 2 - PRODUCTS

2.01 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with all governing notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

B. Existing structure dimensions and assumed conditions are to be field verified and are the responsibility of the Contractor to verify prior to any demolition. The Contractor shall notify the Engineer, prior to demolition, of any and all discrepancies which may require significant change in the design and/or construction from that shown on the plans.

C. Survey of Existing Conditions: Record existing conditions by use of pre-construction photographs.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

3.02 PREPARATION

A. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished. It is the responsibility of the Contractor to provide adequate shoring and protection of the existing structure to maintain areas of existing structure used in the design.

1. Strengthen or add new supports when required during progress of selective demolition.

3.03 CONCRETE DEMOLITION

A. General Concrete Removal: Demolish and remove existing concrete only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. The Contractor shall check and coordinate all demolition with the civil and structural drawings. It is the responsibility of the contractor to maintain the existing conditions of areas and/or elements not included in the demolition plan.

2. Remove all pieces of concrete, soil and rock loosened by demolition unless otherwise directed by Engineer.

3. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.

3.04 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Transport demolished materials off Owner's property and legally dispose of them.

3.05 REPAIR OF DAMAGED CONCRETE

A. If any existing concrete structures are damaged during construction of this project, they shall be repaired to match the existing structure, except where modified by this proposed project, at no additional cost to the Owner. Concrete repairs shall be made according to the Specifications described in Section 03300, 3.06.

END OF SECTION 02112

SECTION 02115
MOVE IN AND SITE PREPERATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section covers the coordination and work necessary to move in personnel and equipment, set up all temporary facilities, utilities, and prepare the site for construction, complete.

1.02 GENERAL

A. The limits of the site are shown on the Drawings.

B. Approved locations for equipment staging and material storage are indicated in the drawings. If alternative locations are required, the contractor must obtain written permission from the Property Owner.

PART 2 PRODUCTS

2.01 TEMPORARY FACILITIES

A. The Contractor shall provide all temporary facilities as required for performing the work.

PART 3 EXECUTION

3.01 COORDINATION

A. The project site is located on private property. Before move in and site preparation, the Contractor shall notify and coordinate with the Engineer and Property Owner.

B. Protection of existing gates, cattleguards, and ditch crossings shall be coordinated with Property Owner. Any impacts to existing improvements shall be corrected as required to maintain existing operations at Contractor's sole expense.

3.02 LAYOUT

A. Set up construction facilities in a neat and orderly manner within Contractor- secured staging areas. Accomplish all required work in accordance with applicable portions of these Specifications. Confine operations to work area shown.

3.03 OBSTRUCTIONS

A. Some obstructions may not be shown. Contractors are advised to

carefully inspect the existing site before preparing their bids. The removal and replacement of minor obstructions such as fences, culverts, small piping, and similar items shall be anticipated and accomplished, even though not shown or specifically mentioned.

B. Major obstructions encountered that are not shown on the Drawings, or could not have been foreseen by visual inspection of the site prior to bidding, should immediately be brought to the attention of the Engineer. The Engineer will make a determination before proceeding with the work. If the Engineer finds the obstructions adversely affects the Contractor's costs or schedule of completion, a proper adjustment to the Contract will be made in accordance with the General Conditions.

END OF SECTION 02115

SECTION 02130
CLEARING AND GRUBBING

PART 1 GENERAL

1.01 WORK INCLUDED

A. The work of this section consists of the clearing, removal and disposal of vegetation, including stumps and roots; abandoned structures; fences and debris that will interfere with the construction of this project, and salvaging and stockpiling existing topsoil.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide all materials and equipment, suitable and in adequate quantity, required to accomplish the work as specified herein.

PART 3 EXECUTION

3.01 GENERAL

A. Clearing and Grubbing for the construction of the Project shall not extend beyond the construction limits except as accepted by the Property Owner or Engineer. Clearing for project construction shall not exceed any easement limits.

3.02 CLEARING

A. Clearing shall consist of the removal and disposal of trees, stumps, shrubs, brush, grass, vegetation, surface debris, abandoned structures, fences, and other objectionable matter from within the described clearing limits.

3.03 GRUBBING

A. Grubbing shall consist of the excavation, removal, and disposal of roots, matted roots, and buried and surface debris from within the described clearing limits. In areas of grading or excavation, remove stumps, roots, structures or foundations a minimum of 12 inches below finished grade. In areas of embankment remove stumps, roots, structures or foundations a minimum of 12 inches below original grade. Backfill all grubbing holes, with accepted material and compact to required specifications.

3.04 PRESERVATION OF TREES, SHRUBS, AND OTHER VEGETATION

A. Protect trees, shrubbery, and other vegetation not designated for removal from damage resulting from the work. Cut and remove tree branches only where, in the opinion of the Engineer, such cutting is necessary to effect construction operation. Remove branches other than those required to provide a balanced appearance of any tree, as accepted, prior to removal. Scars resulting from the removal of branches shall be treated with an accepted tree sealant.

3.05 SALVAGE AND PROTECTION

A. Merchantable timber, sod, or debris shall become the property of the Contractor for his disposal; unless such material is acceptable and required for landscaping as specified in later sections of these Contract Documents.

B. The Contractor shall protect plant growth and features remaining as final landscaping.

C. The Contractor shall protect survey benchmarks, control points, and existing work from damage or displacement.

D. The Contractor shall maintain a designated site access for vehicle traffic.

E. The Contractor shall salvage and protect existing fence wire, wood posts, metal posts and any other structures not to be removed from the project site.

3.06 TOPSOIL

A. Topsoil is required for backfill and shall be salvaged and stockpiled by the Contractor for future placement on all graded or otherwise disturbed areas.

3.07 DISPOSAL OF WASTE MATERIAL

A. No burning shall be permitted on the construction site. Noncombustible material shall become the property of the Contractor and shall be removed from the site of work.

B. It shall be the Contractor's responsibility to select an acceptable method of disposal for vegetation or debris not salvageable. The Contractor shall be responsible for obtaining the necessary authorization from State and local agencies for disposal if required; and any accidental loss or damage as a result of the chosen disposal method shall be the Contractor's responsibility and shall in no way involve the Owner or Engineer.

END OF SECTION 02130

SECTION 02220
EARTHWORK

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work of this section covers all excavation, backfill, embankment, and pipe bedding associated with the construction of the various structures.

1.02 GENERAL

A. See the GENERAL CONDITIONS and Division 1, GENERAL REQUIREMENTS, which contain information and requirements that apply to the work specified herein and are mandatory for this project.

1.03 CLASSIFICATION OF EXCAVATED MATERIAL

A. Unclassified Excavation: Materials encountered during the construction of the work regardless of their nature or the manner in which they are removed, will be considered unclassified excavation.

1.04 DEFINITIONS

A. Relative Compaction: The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D698. Corrections for oversize material may be applied to either the as-compacted field dry density or the maximum dry density, as determined by the Engineer.

B. Optimum Moisture Content: Determined by the ASTM standard specified to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.

C. Relative Density: As defined by ASTM D4253 and D4254.

D. Prepared Ground Surface: The ground surface after clearing, grubbing, stripping, excavation, and scarification and/or compaction.

E. Completed Course: A course or layer that is ready for the next layer or next phase of the work.

F. Well-Graded: A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes. Well-graded does not define any numerical value that must be placed on the coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters. Well-graded is used to define a material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

G. Influence Area: The area within planes sloped downward and outward at an angle of 45 degrees from the horizontal from (a) 1 foot outside the outermost edge at the base of foundations or slabs; or (b) 1 foot outside the outermost edge at the surface of

roadways or shoulder; or (c) 0.5 foot outside the exterior edge at the spring line of pipes and culverts.

H. Borrow: Material imported from borrow areas off the immediate project.

I. Selected Backfill Material: Material available onsite the Engineer determines to be suitable for a specific use.

J. Imported Material: Material obtained by the Contractor from sources off the immediate project site.

K. Structural Fill: Fill material as required under and/or adjacent to structures, paving, sidewalks, driveways, curb, etc.

L. Embankment: The fill material required to raise the existing grade in areas other than under structures.

M. Unsuitable Materials: Unsuitable materials shall consist of debris, rubble, trash, organics, and other deleterious materials as determined by the Engineer. Unsuitable materials shall include previously placed, non-engineered fills that were not placed in maximum 6-inch to 8-inch thick lifts and not compacted to the densities specified herein.

1.05 SUBMITTALS

A. Shoring Plan:

1. The Contractor's shoring or excavation sloping systems for the structures shall be designed by a Professional Engineer with drawings and calculations submitted with the Professional Engineer's stamp and signature. The Contractor shall submit plans, drawings, and calculations for the proposed systems. The submittals shall include information on scheduling and sequencing of construction and protection of new and/or existing structures and utilities. Design calculations shall address the sequence of excavation and placement of lateral support elements. Drawings shall show the locations of all system elements in plan and section. Design calculations should demonstrate the adequacy of the systems and selected components.

2. Review by the Engineer of submittals by the Contractor shall not in any way be considered to relieve the Contractor from full responsibility for errors therein or from the entire responsibility for complete and adequate design and performance of dewatering and shoring or excavation sloping systems. The Contractor shall be solely responsible for proper design, installation, operation, and maintenance, and any failure of any component of the dewatering and shoring or excavation sloping systems.

B. Imported Structural Fill: Contractor shall provide material gradations of all imported structural fill.

C. Road mix: Contractor shall provide material gradations of all road mix used for this project.

1.06 IMPORTED MATERIAL ACCEPTANCE

A. All imported materials specified in this section are subject to the following requirements:

1. All tests necessary for the Contractor to locate an acceptable source of imported material shall be made by the Contractor. Certification that the material conforms to the Specification requirements along with copies of the test results from a qualified commercial testing laboratory shall be submitted to the Engineer for approval at least 10 days before the material is required for use. All material samples shall be furnished by the Contractor at the Contractor's sole expense. Samples shall be representative and be clearly marked to show the source or the material and the intended use on the project. Sampling of the material source shall be done by the Contractor in accordance with ASTM D75. Notify the Engineer at least 24 hours prior to sampling. The Engineer may, at the Engineer's option, observe the sampling procedures. Tentative acceptance of the material source shall be based on an inspection of the source by the Engineer and/or the certified test results submitted by the Contractor to the Engineer, at the Engineer's discretion. No imported materials shall be delivered to the site until the proposed source and materials tests have been tentatively accepted in writing by the Engineer. Final acceptance will be based on tests made on samples of material taken from the completed and compacted course. All testing for final acceptance shall be performed by the Contractor.

2. Gradation tests and standard Proctor tests shall be made by the Contractor on samples taken at the place of production prior to shipment. Samples of the finished product for gradation and Proctor testing shall be taken from each 500 tons of prepared materials or more often as determined by the Engineer, if variation in gradation is occurring, or if the material appears to depart from the Specifications. Test results shall be forwarded to the Engineer within 48 hours after sampling.

3. If tests conducted by the Contractor or the Engineer indicate that the material does not meet Specification requirements, material placement will be terminated until corrective measures are taken. Material which does not conform to the Specification requirements and is placed in the work shall be removed and replaced at the Contractor's sole expense. Sampling and testing performed by the Contractor shall be done at the Contractor's sole expense.

1.07 SHORING, SHEETING, BRACING, AND SLOPING

A. Install and maintain shoring, sheeting, bracing, and sloping necessary to support the side of the excavation, to keep and to prevent any movement which may damage adjacent pavements, utilities, or structures, damage or delay the work, or endanger life and health. Install and maintain shoring, sheeting, bracing, and sloping as required by OSHA and other applicable governmental regulations and agencies.

1.08 EXCAVATION SAFETY

A. The Contractor shall be solely responsible for making all excavations in a safe manner. Provide appropriate measures to retain excavation side slopes and prevent rock falls to ensure that persons working in or near the excavation are protected. Any necessary trench excavation permits shall be the responsibility of the Contractor.

1.09 CODES, ORDINANCES, AND STATUTES

A. Contractors shall familiarize themselves with, and comply with, all applicable codes, ordinances statutes, and bear sole responsibility for the penalties imposed for non-compliance.

1.10 TOLERANCES

A. All material limits shall be excavated or constructed within a tolerance of 0.1 foot except where dimensions or grades are shown or specified as minimum. All grading shall be performed to maintain slopes and drainage as shown. No reverse slopes will be permitted.

1.11 QUALITY CONTROL

A. The Contractor shall perform earthwork operations in compliance with these specifications and within the applicable requirements of governing authorities having jurisdiction.

B. Over-excavation made by the Contractor in earth or rock beyond the specified line and grade shall be corrected, at the expense of the Contractor. In areas under slabs or footings, this shall be done by filling with structural fill meeting the requirements in this section and compacted to 95 percent of maximum density at optimum moisture as determined by ASTM D698. Any other costs incurred by the Owner, or the Engineer as a result of the over-excavation, such as professional engineering or construction inspection services or additional materials, shall be the responsibility of the Contractor. If the over-excavation is directed by the Engineer, the excavation will be paid at a price negotiated with the Contractor through a change order to the lines and grades specified by the Engineer.

C. Under-compacted soil placed by the Contractor shall, at the expense of the Contractor, be corrected by additional compaction effort or excavation, replacement, and compaction. Any costs incurred by the Owner or the Engineer as a result of the under-compaction, such as additional professional engineering services, materials testing, or construction inspection services, shall be the responsibility of the Contractor.

D. Field density testing will be the responsibility of the Contractor and all costs shall be included in the Contractor's bid price.

E. BRACING AND SHORING: Safe temporary cut slopes are the responsibility of the Contractor who shall meet all appropriate OSHA regulations including but not limited to; "Constructions Standards for Excavations" (29 CFR Part 1926.650-.652) Subpart P, effective on the date of the bid opening.

F. Quality Assurance testing will be provided by Owner as described in Section 01400.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. The Contractor may use any type of earthmoving and compacting equipment he may choose; except only walk behind hand compaction equipment will be utilized within 5 feet of structure walls and provided the equipment is in satisfactory condition and of such capacity as to fulfill the requirements of this section.

B. No embankment shall be started or continued without adequate compaction equipment on hand. If watering is required, tank wagons or tank trucks with a distributor capable of spreading the water evenly across the width of the distributor shall be used.

2.02 MATERIAL

A. MDT #1 Course Concrete Aggregate: This includes drainage material placed beneath the concrete slabs. Imported drain gravel shall be a washed gravel that meets the following gradation requirement:

Sieve or Screen Size	Percent Passing by Dry Weight
2-inch	100
1 1/2-inch	95-100
3/4-inch	35-70
3/8-inch	10-30
No. 4	0-5

B. Onsite Structural Fill and Backfill: Excavated native clean sandy gravel material may be used for structural fill and backfill if it is free of detrimental quantities of organic material, such as vegetation, roots, or peat. Rocks larger than 3-inches in average dimension shall not be used in backfill. In order to be used as backfill, native earth material shall be well graded from coarse to fine. Provide imported material of equivalent quality, if required to accomplish the work.

C. Bedding Gravel: Imported bedding gravel shall be clean sandy gravel that meets the following gradation requirements:

Sieve or Screen Size	Percent Passing by Dry Weight
1.5-inch	100
No. 4	26-60
No. 200*	10 (max)

D. Imported Structural Fill and Backfill: Imported structural fill shall be clean sandy gravel that meets the following gradation requirements:

Sieve or Screen Size	Percent Passing by Dry Weight
3-inch	100
No. 4	26-60

No. 200*	10 (max)

E. Rock: riprap shall be as specified in Section 02350, ROCK RIP RAP.

2.03 WATER FOR COMPACTION

A. Furnish as required. Contractor is responsible for any applicable permits required (local, state, or federal) for use of Nevada Creek or Douglas Canal water on the project.

2.04 COMPACTION EQUIPMENT

A. Compaction equipment shall be of suitable type and adequate to obtain the densities specified, and shall provide satisfactory breakdown of materials to form a dense fill.

B. Compaction equipment shall be operated in strict accordance with the manufacturer's instructions and recommendations. Equipment shall be maintained in such condition that it will deliver the manufacturer's rated compactive effort. If inadequate densities are obtained, larger and/or different types of additional equipment shall be provided by the Contractor. Hand-operated equipment shall be capable of achieving the specified densities.

2.05 MOISTURE CONTROL EQUIPMENT

A. Equipment for applying water shall be of a type and quality adequate for the work, shall not leak, and shall be equipped with a distributor bar or other approved device to assure uniform application. Equipment for mixing and drying out material shall consist of blades, discs, or other approved equipment.

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

A. Clearing and grubbing shall be done in accordance with Section 02130, CLEARING AND GRUBBING.

3.02 EXCAVATION

A. General: Dewater the ground prior to starting excavation. Excavation is unclassified. Excavation shall be performed to the lines, grades and elevations shown on the Drawings. The Engineer reserves the right to make minor adjustments or revisions in lines or grades. Perform all excavation regardless of the type, nature, or condition of the material encountered. The method of excavation used is optional. Existing and newly constructed structures shall be protected from damage during excavation. Excavation that cannot be accomplished without endangering present or new structures shall be done with hand tools. The Contractor is responsible for field staking the earthwork. No excavation shall be started until the staking is complete. Should the Contractor excavate below the designated lines through fault or negligence, the Contractor shall replace such unauthorized over-excavation with approved materials in an

approved manner at his own expense.

B. Classification: All excavation shall be considered unclassified. All material encountered of whatever nature shall be removed and placed in the areas indicated on the Drawings or disposed of. The presence of rock or frozen material shall not constitute a claim by the Contractor for extra work.

C. Limits of Excavation: Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal and inspection of forms. Temporary construction excavation side slopes shall be made as steep as safely possible. Undercutting will not be permitted. Where suitable bearing is not encountered at the specified elevation, the Engineer may direct that additional depth as required be excavated. Such over-excavation shall be compensated for on a supplemental agreement or work order basis, if not specifically provided for in the Bid Form. Unauthorized over-excavation by the Contractor shall be corrected by the Contractor using approved materials as specified hereinbefore at no cost to the Owner. Over-excavation shall be replaced with structural fill materials or imported structural fill, thoroughly compacted to not less than 95 percent of maximum density, (ASTM D 698), to the subgrade elevation.

D. Protection of Excavation: All necessary bailing, drainage, sheeting, and construction of cribs and cofferdams shall be included as part of the excavation. Excavations over four feet in depth shall be shored, sheeted and braced as may be necessary for the protection of the work and the safety of the personnel, or sloped to the angle of repose of the material when saturated per OSHA standards. When excavation is at the required depth, any water, if present, shall be pumped out for cleaning and foundation bed inspection.

E. Dewatering of Excavation:

1. Perform in accordance with Section 02401 Diversion and Care of Stream & Dewatering.

F. Structure Shoring:

1. Where necessary due to site limitations and to maintain steep side slopes, the Contractor shall shore the excavation for various structures. It shall be the Contractor's responsibility to provide and maintain a reasonable and safe excavation for all phases of construction. In no case shall any excavation be made in such a manner so as to endanger or damage adjacent facilities or property adjacent to the site.

2. The Contractor shall design, install, and maintain all shoring. The type of shoring shall be the Contractor's option. The shoring shall be designed and maintained so as to prevent any movement of soil which may cause damage to the adjacent facilities and property, damage or delay the work, or endanger life and health.

3. Shoring shall be designed and constructed to withstand soil and hydrostatic loadings, and appropriate equipment and surcharge loadings. Tie-backs and bracing shall be installed where required to

prevent movement. Design of shoring shall incorporate the Contractor's sequence of excavation and placement of lateral support elements. The Contractor shall repair, at his own expense, all damage resulting from failure to provide adequate support.

4. Shoring shall be removed in a manner which avoids damage to new or existing facilities or adjacent property. All voids left by removal of shoring shall be immediately filled.

G. Approval of Excavation by Engineer: Prior to the placing of concrete for footings, walls, or slabs the excavation shall be inspected and approved by the Engineer. No footing shall be placed until after the Engineer has approved the depth of the excavation and the character of the foundation material.

H. Blasting: Blasting for excavations will not be permitted.

I. Overbreak: Overbreak, including slides, is defined as that portion of any material displaced or loosened beyond the finished work as designed by the Engineer. The Contractor shall remove such overbreak and shall replace such overbreak with approved material in an approved manner. The additional work will be accomplished at no additional expense to the Owner.

3.03 BACKFILLING AT STRUCTURES AND EMBANKMENTS

A. General: Backfilling shall be performed where indicated or required, to the grades and elevations shown on the Drawings. No backfilling shall be commenced without approval of the Engineer. Prior to backfilling, all concrete forms shall be removed and the excavation cleaned of all trash and debris. Any paint, insulation, waterproofing or coating which has been applied to below grade surfaces shall be completely dried or cured. Backfill around concrete structures only after the concrete has reached the specified compressive strength indicated in Section 03300, CONCRETE. All material used for backfill shall be as specified and of a quality acceptable to the Engineer and shall be free of large and frozen lumps, wood, and other extraneous materials. In general, this material shall be structural fill material. No placement of fill or backfill shall be conducted over frozen subgrade.

B. Embankment: As directed by the Engineer, mix bentonite pellets into each lift of the backfill material placed in the canal embankment.

C. Compaction: Backfill material shall be placed in continuous horizontal layers not to exceed 8-inches in loose lift thickness. Each layer shall be compacted as specified hereinafter. Where backfill is placed on both sides of a wall, both sides shall be backfilled in such a manner so that the difference in compacted grade does not exceed 18 inches at any time. Care shall be taken when compacting around structure footings, slabs, and walls to prevent damage to the structure.

D. Watering: Water may be added only to bring the backfill material to the specified moisture content range (plus or minus 3 percent from optimum) for compaction. Jetting or ponding of the backfill material will not be permitted.

E. Backfill: Do not exceed loose lifts of 8 inches. Compact each lift to not less

than 95 percent of maximum ASTM D698 dry density at optimum moisture content, plus or minus 3 percentage points. Moisten material as required to aid compaction. Place material in horizontal lifts and in a manner which avoids segregation. Gravel fill shall be compacted with compactors, suitable for such material, to the satisfaction of the Engineer. Sand fills will not be permitted.

F. Structural Fill Below Structures: Where called for on the Drawings or as otherwise specified herein or directed by the Engineer, provide hereinbefore specified structural fill for foundation preparation. Place fill material in maximum 8-inch thick loose lifts and compact each lift to meet requirements of 3.03.D above.

G. Any subsequent damage to slabs, piping, concrete structures, facilities, or other structures caused by settlement of fill material shall be corrected and repaired by the Contractor at the Contractor's sole expense.

3.04 MOISTURE CONTROL

A. During all compacting operations, maintain at each lift of fill optimum practicable moisture content. Maintain moisture content uniform throughout the lift. Insofar as practicable, add water to the material at the site of excavation. Supplement, if required, by sprinkling and mixing the fill. At the time of compaction, the water content of the material shall be at optimum moisture content, plus or minus 3 percentage points.

B. Do not attempt to compact fill material that contains excessive moisture. Aerate material by blading, discing, harrowing, or other methods, to hasten the drying process.

3.05 FIELD DENSITY AND MOISTURE TESTS

A. The Contractor will determine in-place density and moisture content by any one or combination of the following methods: ASTM D2922, D1556, D2216, D3017, or other methods selected by the Engineer. Backfill test areas at Contractor's sole expense. The frequency and location of testing shall be determined by the Engineer and as defined in Section 01400, QUALITY CONTROL. The Engineer may require the Contractor to test any lift of fill at any time, location, or elevation. No areas will be accepted that have compacted densities less than specified hereinbefore.

3.06 WEATHER CONDITIONS

A. Earthwork operation shall be suspended at any time when satisfactory results cannot be obtained on account of rain, freezing weather, or other unsatisfactory field conditions.

3.07 DRAINAGE

A. During earthwork operations the grade shall be maintained in such a condition that it will be well drained at all times.

B. If necessary, temporary drains or diversion ditches shall be installed in order to intercept or divert surface water, which could affect the work.

3.08 SITE GRADING

A. Perform all earthwork to the lines and grades as shown and/or established by the Engineer, with proper allowance for ground or landscaping cover where specified or shown. Shape, trim, and finish slopes of channels to conform with the lines, grades, and cross sections shown. Make slopes free of all exposed roots and stones exceeding 3- inch diameter which are loose and liable to fall. Round tops of banks to circular curves, in general, not less than a 1-foot radius. Rounded surfaces shall be neatly and smoothly trimmed. Neatly blend all new grading into surrounding, existing terrain. Over-excavating and backfilling to the proper grade will not be acceptable. Finished site grading will be reviewed by the Engineer.

3.09 CLEANUP

A. All unsuitable material, waste sheeting or forming, and debris shall be removed from the site and disposed of in an appropriate manner by the Contactor. Topsoil stripped during clearing and stockpiled shall be spread in such a manner as to restore the area surface to its original condition.

END OF SECTION 02220

SECTION 02350
ROCK RIP RAP

PART 1 GENERAL

1.01 GENERAL

A. The work shall consist of providing rock and riprap and the placement of rock and riprap for the headgate; including filter, or bedding where specified.

1.02 SUBMITTALS

A. Submittals during construction shall be made in accordance with Division 1, GENERAL REQUIREMENTS. In addition, the following specific information shall be provided:

1. Riprap: The contractor shall designate in writing the source from which riprap material will be obtained, and the contractor shall provide information satisfactory to the Engineer that the material meets contract requirements.

2. Gravel Cushion: The contractor shall provide information satisfactory to the Engineer that the material meets contract requirements.

PART 2 PRODUCTS

2.01 ROCK RIPRAP FOR HEADGATE

A. Rock riprap adjacent to the headgate shall meet requirements of 1-foot D50, riprap as specified on the Drawings. Riprap gradations are summarized in the table below.

TABLE OF GRADATIONS - RANDOM RIPRAP

Riprap Class	Equivalent Stone Diameter	% Of Total Weight That Must Be Smaller Than Given Size
1-Foot D50	2.00 feet 1.00 feet 0.50 feet	100 40-60 0-10

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

C. Furnish stone that is hard, durable, and angular in shape, resistant to

weathering and water action, free from overburden, spoil, shale, structural defects, and organic material. Do not use rounded stone or boulders from a streambed source as riprap. Rock riprap shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock shall be angular to sub-rounded in shape with the greatest dimension not greater than 2 times the least dimension. Rock shall be free from dirt, clay, sand, rock fines, and other material not meeting the required gradation limits. Rock hardness shall be such that it will not dent when struck with the rounded end of a one pound ball peen hammer, or hardness shall be determined by other methods approved by the Engineer. The stone will be accepted based on visual analysis, inspection of the source rock, and the Engineer's evaluation of the riprap onsite.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. Prior to commencing work on rock placement, install water control measures as required to perform work in dry conditions. Water control measures shall be performed per Section 02401 Diversion and Care of Stream & Dewatering to allow for the installation of rock in dry conditions, and to divert surface water away from the work area. The Contractor is responsible for investigating and familiarizing himself with respect to all site conditions that may affect the work. By submitting a bid, the Contractor acknowledges that such investigations have been made, and consideration of such conditions is a part of this bid.

B. The subgrade surface on which the gravel bedding is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved native gravel fill material. Gravel fill shall be placed in lifts not exceeding 12 inches and vibratory compacted with a minimum of four passes of a compactor to achieve a firm and unyielding base suitable for the placement gravel bedding and rock riprap.

C. All loose material, debris, sediment, soil, and organic matter shall be completely removed from the canal bottom within the area of the footprint of the rock riprap.

D. Rock rip rap and gravel bedding shall not be placed until the foundation preparation is completed, and the subgrade surface has been inspected and approved by Engineer.

3.02 EQUIPMENT-PLACED ROCK RIPRAP

A. The rock riprap shall be placed by equipment on the surface and to the depth specified. It shall be installed to the full course thickness in one operation and in such a manner as to avoid significant displacement of the underlying material. The rock for riprap shall be delivered and placed in a manner that ensures the riprap in place is reasonably homogeneous with

the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.

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

C. Rock riprap shall be placed within a vertical tolerance of plus or minus 0.2 feet from the indicated slope, grade, and elevations shown on the Drawings.

3.03 HAND-PLACED ROCK RIPRAP

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

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

C. Rock riprap shall be placed within a vertical tolerance of plus or minus 0.2 feet from the indicated slope, grade, and elevations shown on the drawings.

3.04 FILTER OR BEDDING

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

END OF SECTION 02350

SECTION 02401
DIVERSION AND CARE OF STREAM & DEWATERING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work included under this section consists of furnishing all construction plans, labor, equipment, and incidentals necessary for the diversion of Nevada Creek flows, dewatering of the project site, and the diversion and care of the stream during construction of the Project. Note that dewatering and diversion and care of the stream may require a system of temporary coffer dams, channels, liner, pumping plants, pipelines and/or flumes. The work also includes complete removal of all diversion and dewatering equipment and structures from the project site and restoration of the project site following completion of the work.

B. The Contractor shall be responsible for coordination with the Owner and Engineer for any dewatering, diversion, and/or construction activity that may adversely affect the volume of water flowing through the project site, or would have the potential to increase sediment discharge and turbidity of Nevada Creek. Based on these factors the Contractor shall route the entire natural flow of Nevada Creek around and outside of the extents of the construction sites. The Contractor shall perform the work within the limits of Nevada Creek channel to resume conveyance of normal stream flows through the Project in the shortest duration within the performance period of the Contract.

C. Provide and operate equipment adequate to keep all excavations and trenches free of water. Remove all water a minimum of 3 feet below the lowest point of excavation during periods when concrete is being deposited, when pipe is being laid, during the placing of backfill, and at such other times as required for efficient and safe execution of the work. Avoid settlement or damage to adjacent property. Dispose of water in a manner that will not damage adjacent property or increase turbidity in Nevada Creek. Direct discharge from dewatering systems to Nevada Creek is prohibited. When dewatering open excavations, dewater from outside the structural limits and from a point below the bottom of the excavation when possible. Design dewatering system to prevent removal of fines from existing ground.

D. Adjacent areas shall be graded so that surface drainage is away from excavations. Any water accumulating within the excavation shall be promptly removed. Pumping from the interior of any enclosed foundation shall be done so the possibility of any portion of the concrete materials being carried away is eliminated. No pumping will be allowed during the placing of concrete and for 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work.

E. Positive dewatering systems shall be furnished and installed as necessary to maintain all excavations and trenches free of water at all times until the structure or facility is completely constructed, so that full dead load is applied, and backfill is in place. If necessary, such systems shall remove ground water from outside the limits of the excavation, and shall maintain the water level sufficiently far below the base of the excavations to prevent buoyancy conditions or softening of the base. The Contractor shall dewater the work area sufficiently to prevent water from seeping through the excavated side slopes. Provisions shall be made for removal of storm runoff and all other water that may enter the excavations. Open-sump pumping from the interior of excavations will be permitted only to dispose of surface runoff, and shall not be used as the primary means of dewatering.

F. The Contractor is responsible to satisfy themselves as to the extent and cost of all necessary diversion and dewatering in accordance with the drawings and this specification.

1.02 QUALITY ASSURANCE

A. The Contractor shall be responsible to research and satisfy themselves as to the size, type, and quality of the diversion and dewatering system. In the case of an event which exceeds the diversion and/or dewatering system's capacity; the Owner and Engineer shall not be held liable for the damages to the dewatering system, diversion system, and any portion of the completed work.

B. It shall be the Contractor's responsibility to comply with all requirements and regulations of all federal, state or local agencies that govern the work affecting construction in and adjacent to the stream.

1.03 SUBMITTALS

A. The Contractor shall submit to the Engineer prior to the start of any work, complete dewatering plans including: 1) a detailed description of the diversion system, and dewatering system; 2) proposed equipment, layout, and capacity of the systems; 3) proposed operational procedures; 4) proposed materials; and 5) proposed schedule or work with regards to the diversion, and dewatering. Review shall be made by both the Owner and Engineer as to the proposed system. The review shall only be with respect to the basic principles of the methods the Contractor intends to employ to assure protection of water volume, structures and water quality. The Contractor shall be solely responsible for all aspects of the diversion system, dewatering including the arrangement, location and depths of the system necessary to accomplish the work of dewatering and the protection of the stream, structures, and water quality.

PART 2 - PRODUCTS (NOT

USED) PART 3 - EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall furnish all necessary labor, equipment, and incidentals necessary for dewatering of the project site, and diversion and care of the river during the period of construction.

B. The Contractor shall keep the construction area free from water by diversion, pumping, berming, coffer-dams, sheet pile, or by other methods or combination thereof. In accordance with the approved dewatering submittal, any changes or modifications will need prior approval

3.02 UPSTREAM and DOWNSTREAM COFFERDAM

A. Upstream and downstream cofferdams may be constructed on existing grade above and below the Project as required for the Contractor's Diversion and Dewatering Plan(s). Fine graded material from the site excavation may be used for the cofferdam construction with appropriate materials used on the cofferdam's exposed faces and top to adequately protect the structure from erosion. At the Contractor's discretion, a liner may be added to the cofferdam to decrease permeability.

3.03 COORDINATION DURING CONSTRUCTION

A. If any adverse effects are observed or reported due to diversion and dewatering related to water quantity or quality, they shall be reported immediately to the Owner and Engineer. No work shall proceed prior to resolution of deficiency and flow past the site is approved by Owner.

3.04 REMOVAL

A. The Contractor shall, when no longer needed, or at the end of construction, completely remove all dewatering and stream diversion equipment from the project site and demolish any cofferdams or other dewatering structures constructed by the Contractor. Constructed cofferdam material must be completely removed from the work area to the pre-existing ground surface and the area reclaimed to pre-existing conditions as approved by the Engineer.

B. The diversion and care of the stream will no longer be needed when Project construction has reached substantial completion as determined by the Engineer.

3.05 PROTECTION

A. At all times the Contractor shall provide sufficient protection to ensure the safety to personnel, equipment, materials, and existing structures, and to the public for activities relating to dewatering, water supply, and diversion and care of the stream.

END OF SECTION 02401

SECTION 02480
FINISH GRADING, SEEDING AND LANDSCAPING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work included in this section consists of finish grading, reseeding all native grass areas disturbed during construction, and providing other landscaping feature.

B. Include any incidental work which can reasonably be inferred as part of the work and necessary to provide a complete landscape system. At a minimum, all disturbed areas shall be seeded with native grasses.

1.02 GENERAL

A. Topsoil unnecessarily removed shall be replaced and seeded at the Contractor's expense.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be used from onsite stockpiles by the Contractor as specified in Section 02130 CLEARING AND GRUBBING. Topsoil shall be considered to be natural surface soil capable of producing satisfactory agricultural crops and shall be free of matter that may be harmful to plant growth or a hindrance to grading, seeding, and maintenance. If more topsoil is needed than has been stockpiled, supply imported topsoil at Contractor's sole expense.

2.02 SEED

A. General: Seed shall be labeled in accordance with U.S.D.A. Rules and Regulations under the Federal Seed Act in effect on date of seed purchase. Seed which has become wet, moldy or otherwise damaged in transit or in storage will not be acceptable. Seed shall contain not less than eighty-five percent pure live seed and not more than 0.5 percent weed seed.

B. Seed Testing: All seed shall be tested within twelve months prior to the planting date. All testing shall be performed by a State Seed Lab, Commercial Seed Testing Lab, or a registered member of the Society of Commercial Seed Analysts (Registered Seed technologist). The Contractor shall furnish the Engineer a certified test report prior to the start of seed operations. Seed not planted within the 12-month period shall be retested for dormant seed, hard seed and germination and a new certified test report furnished to the Engineer. Testing shall be the responsibility of the Contractor.

C. Labeling: Before seeding begins, the Engineer shall verify that each bag of seed delivered to the project bears a tag which shows the following information:

1. Name and address of supplier.
2. County and project number for which seed is to be used.
3. Supplier's lot number for each kind of seed.
4. Origin (where grown) for each kind of seed.
5. Purity and germination for each kind of seed.
6. Pounds of bulk seed of each kind of seed in bag.
7. Pounds of pure live seed (PLS) in each bag.
8. Dormant Seed and Hard Seed.

D. Seed Mix

1. 20 percent Western wheatgrass (Pascopyrum smithii)
2. 15 percent Timothy (Phleum pratense)
3. 15 percent Canada bluegrass (Poa compressa)
4. 10 percent Orchard grass (Dactylis glomerata)
5. 10 percent Tall fescue (Schedonorus phoenix)
6. 10 percent Slender wheatgrass (Elymus trachycaulus)
7. 10 percent Thickspike wheatgrass (Elymus lanceolatus)
8. 10 percent Perennial ryegrass (Lolium perenne)

2.03 MULCH

A. Grass hay or straw mulching material shall be substantially free of noxious weed seeds and objectionable foreign matter. The mulch shall have been baled dry, in bales of approximately equal weight and shall be relatively dry when applied. Materials having characteristics making them unsuitable for the purpose intended will be rejected. Bromegrass is not acceptable mulch.

B. Hydroseeding Mulch: Mulch shall be a specially processed cellulose fiber containing no growth or germination-inhibiting factors. It shall be manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form homogeneous slurry. When sprayed on the ground, the material shall allow absorption and percolation of moisture. Each package of the cellulose

fiber shall be marked by the manufacturer to show the air-dry weight content.

2.04 EROSION CONTROL BLANKETS

A. General: Erosion Control Blankets shall be as specified on the Drawings.

PART 3 - EXECUTION

3.01 GENERAL SITE GRADING AND PREPARATION WORK

A. Preparation of Subgrade: After rough grading is completed and before topsoil is spread, thoroughly scarify ground to a minimum depth of 8 inches with a toothed ripping machine by running in two directions at right angles over the entire surface to be planted.

B. Topsoil for all areas with native grasses shall be stockpiled during site stripping. If additional topsoil is needed, the Contractor shall import topsoil at their sole expense.

C. Spreading of Topsoil: Spread topsoil and textural soil amendments over the prepared rough grade using a rubber-tired tractor with grader blade or equivalent not weighing more than 3-1/2 tons. Spread topsoil to a depth of 6 inches.

D. Fertilizing: Not required for this project.

E. Finish Grading:

1. Thoroughly mix the applied topsoil to a depth of 6 inches by running a rototiller over the entire area in two directions at right angles.

2. Rake the topsoiled area to a uniform grade so that all areas drain, as indicated on the grading plan.

3. Lightly compact with a cultipacker before planting grass.

4. Remove all trash and non-native materials from disturbed area prior to preparation and seeding.

3.02 SEEDING

A. Soil Preparation: All areas disturbed by construction shall be seeded. The Contractor shall also provide weed control on all disturbed areas until completion of all work.

B. Method of Seeding: Method of seeding may be varied at discretion of Contractor on his own responsibility to establish smooth, uniformly grassed areas.

C. Applications: The seed shall be broadcast seeded with a mechanical seeder

or hydroseeded in areas over 1,000 square-feet or hand broadcast in areas under 1,000 square feet. The anticipated field grass seed application rate shall be 50 pounds of pure live seed per acre if broadcast seeded or hydroseeded.

D. Seed Cover: After application, the seed shall be covered with 1/2 to 3/4-inch of soil. The seed may be covered by dragging or by other appropriate mechanical means.

E. Seeding shall be done at times of the year when climatic conditions including temperature and soil moisture are conducive to growth. These periods occur in the spring of the year after the frost leaves the ground and until May 31st; and in the period of approximately September 1 through October 15. These periods vary depending on the climatic conditions and are subject to final approval by the Owner or Engineer.

F. Maintenance: Any portion of the ground surface on which the expected stand of seed has not produced within the first year shall be restored to a satisfactory condition and reseeded with the same seed and procedures as originally specified. Begin maintenance immediately after each portion of grass is planted and continue for 8 weeks after all planting is completed. Apply water to keep surface soil moist. Repair washed out areas by filling with topsoil, liming, fertilizing, and seeding. Replace mulch on banks when washed or blown away.

3.03 MULCHING

A. Placing: The grass hay or straw mulch shall be placed within 48 hours after the seeding has been completed. Mulching operations shall not be performed during periods of high winds which preclude the proper placing of the mulch. The placing of mulch shall begin on the windward side of the areas to be covered. Mulch shall be placed uniformly over the seeded areas. Approximately 10 percent of the soil surface shall be visible through the mulch blanket. Excessive cover which will smother seedlings shall be avoided.

3.04 EROSION CONTROL BLANKETS

A. Installation shall be located and as shown on the Drawings. Seeding shall be complete prior on blanket placement.

3.05 RESTORATION

A. All areas disturbed by construction related activity shall be restored to pre-project conditions as approved by the Engineer.

END OF SECTION 02480

SECTION 02810
FENCING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work consists of furnishing, erection, and placement of new fencing per the drawings and specifications.

B. Include any incidental work which can reasonably be inferred as part of the work and necessary to provide a complete fencing system.

PART 2 - PRODUCTS

2.01 GENERAL

A. Barbed wire shall be zinc-coated, steel barbed wire meeting the requirements of ASTM A-121. Breaking strength of strand wire shall be not less than 950 pounds. Barbs shall be uniformly spaced from 4 to 5 inches apart. Minimum weight of zinc coating shall be Class I. Wire shall consist of two twisted strands of 12 ½ gauge wire. "Red Brand" and "OK Brand Premium" are examples of wire that meet ASTM A-121.

B. Barbless wire shall be two smooth twisted strands of 12 ½ gauge wire: zinc coated steel meeting requirements of ASTM A-121 or equal. Breaking strength of a strand of wire shall be not less than 950 pounds, minimum weight of zinc coating shall be Class I.

C. Woven wire shall have metallic coating Type Z, Class 1 and be No. 12 ½ Grade 60, or, have metallic coating Type Z, Class 3 and be No 14 Grade 125. All woven wire shall meet or exceed the requirements of ASTM A116.

D. Brace panel wire shall be barbless, smooth 9 gauge **soft** wire meeting requirements of ASTM A-641. It will be used for constructing braces and panels, tying to anchors, etc.

E. Staples. Wire staples of the barbed U-shaped type shall be used to fasten the wire fencing to the wooden posts. They shall be not less than 9 gauge galvanized, 1-3/4 inches long.

F. Nails. Shall be 40 d common galvanized.

G. Where designated, stays shall be 30" long twisted wire fence specifically manufactured for use as fence stays and made from #9 gauge galvanized smooth wire.

H. Wood Posts and Brace Rail. Posts and brace rail shall be made from western larch, lodgepole pine, ponderosa pine, or douglas-fir. They shall have the bark removed,

be well seasoned, sound, and straight-grained. They shall be finished round. Panel posts shall be 7 inch minimum diameter and 7 feet in length. Line posts shall be 5 inch minimum diameter and 7 feet in length, or as specified in the project drawings. All posts shall be treated with a solution conforming to AWPA standards. Penetration shall be at least ½ inch. Post shall be fully treated. Posts that are to be driven shall be tapered and treated. Brace rail shall be a minimum 4 inch diameter by 8 feet long, or as specified in the project drawings. All brace rail shall be fully treated conforming to AWPA standards. Certification of AWPA treatment shall be provided to the Project Manager.

I. Where designated, install pre-fabricated steel panel gates as shown on the project drawings. Panel gates shall be powder coated brown or green in color, with 6-Bar, 2" diameter tubing, 16 gauge high tensile steel. Provide 7"x7' treated posts for each single panel brace on each side of panel gate. Provide galvanized chain long enough to wrap around gate and adjacent brace panel for locking closure.

PART 3 - EXECUTION

3.01 FENCE INSTALLATION

A. Post holes and excavations for footings and anchors shall be excavated on the lines established by the Engineer to the depths and cross-sections shown on the standard drawings.

B. Wooden posts may be driven when so prepared and any damaged posts shall be repaired or rejected at the discretion of the Project Manager. In all cases where posts are repaired, the damaged area or split shall be given two coats of preservative material approved by the Project Manager. Posts shall be plumb when set. All posthole filling and backfilling work shall be in six-inch layers and each layer shall be solidly tamped and compacted as it is placed.

C. Posts that are cut or trimmed for any valid reason shall be given two coats of preservative material approved by the Engineer. Braces shall be securely nailed to terminal and brace posts. Brace to post joint shall be coped or notched. No square to round joint accepted.

D. Brace panels shall be installed at gates and other terminal points s needed. Brace wire shall be tight when twisted. Double wrap the wire at brace post tie-off. Cross the braces with the end of the wires to be tied off. Wire fence wire shall be tied off at each brace.

E. All posts shall be plumb and solidly set in place after backfilling or driving has been completed.

F. Stretching by a motor vehicle will not be permitted; the power must be by or through a mechanical stretcher or device designed for such use.

G. Fence line shall be straight and square between corner points.

H. Tension shall be applied in accordance with wire manufacturer's recommendations.

I. Fence wire shall be wrapped around terminal posts and fastened to itself with at least four turns. Fence wire, in general, shall be placed on the side of the post opposite the site but on curves shall be placed so the force is against the post. Fence wire and brace wire shall be installed without nicks or significant abrasions. Nicks or abrasions that may lead to pre-mature wire breaks shall be rejected by the Project Manager and replaced at no cost by the Contractor.

J. U-shaped staples shall be driven diagonally across the wood grain so that both points do not enter between the same grain. In depressions where wire up-lift occurs, staples shall be sloped slightly upward, against the pull of the wire. On level ground and over knolls, staples shall be sloped slightly downward. Wire shall be stapled tightly at corner, end, and pull posts. In no case shall staples be driven so tight to limit future wire tensioning, or as to damage the wire.

K. Upon completion, the fence shall be true to line and grade; all posts shall be vertical and firm and all wire shall be taut and the completed fence shall be completely acceptable in all respects. No openings shall be left that will permit stock to pass through the fence.

L. Weed Control: All equipment used during construction shall be thoroughly washed both inside, outside and underneath of all pickup boxes, trailers, trucks, etc. before entrance to the project area. Vehicles used to commute to and from job site shall be kept clean so as not to transport weed seed to project area. This cost shall be subsidiary to the project and shall not constitute a pay item and shall be considered incidental thereto and no payment shall be made for it.

END OF SECTION 02810

DIVISION 3

CONCRETE

SECTION 03100
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This item of work includes the formwork and shoring for cast-in-place concrete and the installation into formwork of items such as anchor bolts and other items to be embedded in concrete (but not including reinforcing steel - see Section 03200, CONCRETE REINFORCEMENT).

1.02 RELATED WORK

A. Submittals: Section 01300.

B. Quality Control: Section 01400.

C. Concrete Reinforcement: Section 03200

D. Concrete: Section 03300.

1.03 QUALITY ASSURANCE

A. Codes and Standards:

1. The Contractor shall design, construct, erect, maintain, and remove forms and related structures for cast-in-place concrete work in compliance with the American Concrete Institute Standard ACI 347, "Recommended Practice for Concrete Formwork."

2. ACI 117, "Specifications for Tolerances for Concrete."

3. ACI 318, "Building Code Requirements for Structural Concrete."

4. ACI 301, "Specifications for Structural Concrete."

B. Allowable Tolerances:

1. The Contractor shall construct formwork to provide complete finished cast-in-place concrete work within tolerances in accordance with ACI 117.

2. Before concrete placement, the Contractor must check the lines and levels of erected formwork. The Contractor shall make corrections and adjustments to ensure proper size and locations of concrete members and stability of forming systems.

3. During concrete placement, the Contractor must check

formwork and related supports to ensure that forms are not displaced and that completed work will be within the specified tolerances.

1.04 SEQUENCING AND SCHEDULING

A. Schedule work for embedded, buried, or other items of work that affects form layout before completing concrete formwork.

PART 2 - PRODUCTS

2.01 FORMS FOR EXPOSED FINISH CONCRETE

A. Unless otherwise shown, the Contractor shall construct formwork for exposed concrete surfaces with plywood, plywood-faced metal frames, steel or other panel-type materials, in new and undamaged condition, to provide continuous, straight and smooth as-cast surfaces. The Contractor shall furnish the forms in the largest practicable sizes to minimize the number of joints and to conform to the joint system shown on the construction documents. The Contractor shall provide form material with sufficient thickness to withstand the pressure of the newly placed concrete without bow or deflection.

2.02 FORM TIES

A. The Contractor shall provide factory-fabricated, adjustable-length, removable or snap-off metal form ties with conical or spherical type inserts, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal. Do not use wire ties.

B. The Contractor shall provide ties so that portion remaining within the concrete after removal of exterior parts is at least 1 ½ inches from the outer concrete surface except as otherwise specified. Form ties shall be provided which will not leave a hole larger than 1-inch diameter in the concrete surface. The holes shall be filled with non-shrink grout as per Section 03300, CONCRETE.

C. Form ties and wire ties fabricated on the project site are not acceptable. Do not use wire ties of any kind. Ties shall withstand form pressures and limit form deflection to specified tolerances. Flat bar ties for panel forms shall have plastic or rubber inserts with minimum 1-inch depth and sufficient dimensions to permit proper patching of tie hole.

2.03 FORM COATING

A. The Contractor shall provide commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, or impede the wetting of surfaces to be cured with water or curing compounds.

1. Formulate form reuse agent with rust inhibitor for steel form

facing materials.

B. Form coating (non-staining form oil) shall be equal to:

1. Nox-Crete Company, Omaha, Nebraska.
2. "Form-Guard", W.R. Grace and Company, Cambridge, Massachusetts.
3. "Rheofinish 211", Master Builders, Inc.
4. "Formcel", Lambert Corporation, Houston, Texas.

2.04 DESIGN OF FORMWORK

A. The design of forms, shores, and bracing is the responsibility of the Contractor.

B. The Contractor shall design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Formwork shall be constructed so that concrete members and structures are of correct size, shape, alignment, elevation, and position.

C. The Contractor shall provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof. Trussed supports shall be provided when adequate foundations for shores and struts cannot be secured.

D. The Contractor shall support form facing materials by structural members spaced sufficiently close to minimize deflection. Forms placed in successive units for continuous surfaces shall be fitted to accurate alignment, free from irregularities, and within allowable tolerances.

E. Design joints in forms to remain watertight and withstand placing pressures without bulging outward or creating surface patters. Do not use formwork that leaks mortar.

F. Where poor formwork is used and finish obtained is less than specified, upgrade finish to an acceptable finish at no additional cost to the Owner.

G. Panel Deflections: Limit as required to achieve construction tolerances specified herein.

H. For circular structures, forms shall conform to circular shape of structure. Straight panels may be substituted for circular forms if they do not exceed 2 feet in width and in addition to the requirement each panel does not provide an angular deflection more than 3 ½ degrees per joint, and do not conflict otherwise with these Specifications and/or Drawings.

I. Design shall account for tolerances, form ties, finishes, architectural features, rebar supports, construction joint locations, and other nonstructural formwork requirements specified.

J. Design formwork strong enough to hold high liquid heads without form distortion and to meet tolerances as specified herein. Coordinate form design with admixture company information and concrete slump.

K. Structurally design forms, falsework, shoring, and other structural formwork and meet applicable safety regulations, current OSHA regulations, and other applicable codes. Where noted or where formwork is of a critical nature (in terms of size, complexity, etc.), a licensed engineer shall prepare formwork, falsework, and shoring designs to meet these Specifications and to meet all federal and state requirements.

L. Meet applicable portions of ACI 347, ACI 318 current edition, and these Specifications.

2.05 REINFORCING SPACERS AND REBAR SUPPORTS

A. Walls:

1. Provide positive spacers or chairs specifically designed for wall forms to hold forms and reinforcing at correct dimensions and clearances.

2. Remove spacer or chair if not designed to remain in place as concrete is placed, consolidated, and proper support and spacing is achieved.

PART 3 - EXECUTION

3.01 FORM CONSTRUCTION

A. General: The Contractor shall construct forms complying with ACI Standards 301, 318, and 347, to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finish structures. All necessary detail work, construction aids, and embedded items shall be provided as required.

B. Design, erect, shore, brace and maintain formwork in accordance with ACI 301 to support vertical, lateral, static, and dynamic loads and construction loads that might be applied until concrete structure can support such loads.

C. The Contractor shall fabricate forms for easy removal without hammering or prying against concrete surfaces. Crush plates or wrecking plates shall be provided where stripping may damage cast concrete surfaces. Kerf wood inserts shall be provided for forming key-ways, reglets, recesses, chamfers and the like, to prevent swelling and assure ease of removal.

D. Forms for Exposed Concrete:

1. Construct formwork so concrete members and structures are of the size, shape, alignment, elevation, and position indicated, all within tolerance limits of ACI 117.

2. Limit concrete surface irregularities designated by ACI 347 as

Abrupt or Gradual as follows: Class B, ¼-inch.

3. The Contractor shall drill forms to suit the ties used and to prevent leakage of concrete mortar around the tie holes. The Contractor shall not splinter forms by driving ties through improperly prepared holes.

4. The Contractor shall not use metal cover slates for patching holes or defects in forms.

5. The Contractor shall provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections shall be provided.

6. The Contractor shall use extra studs, walers, and bracing to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Narrow strips of form material which will allow the forms to bow shall not be used.

7. The Contractor shall assemble forms so that they may be readily removed without damage to exposed concrete surfaces.

8. The Contractor shall place carefully and accurately all bracing to prevent sagging or misalignment.

9. All forms shall be new or in good condition free from holes, indentations, or irregular surfaces.

10. The exposed concrete joints shall be formed with special care to assure proper alignment and uniform cross section.

11. The Contractor shall form molding shapes, recesses and projections with smooth-finish materials, and install these in the forms with sealed joints to prevent displacement.

E. Cleaning and Tightening:

1. The Contractor shall thoroughly clean forms and adjacent surfaces to receive concrete. All chips, wood sawdust, dirt, or other debris shall be removed just before concrete is to be placed. All forms shall be retightened immediately after concrete placement as required to eliminate leaks.

3.02 FORM COATINGS

A. The Contractor shall coat the contact surfaces of forms with form-coating compound before steel reinforcement is placed. No form coating shall be allowed on steel reinforcement or on previously cast concrete sections which abut the new concrete pour.

B. The Contractor shall thin form-coating compounds only with the thinning agent of type and in amount and under the conditions recommended by the

coating compound manufacturer. Excess form-coating material shall not be allowed to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. All form coatings shall be applied in compliance with the manufacturer's instructions.

C. Steel forms shall be coated with a non-staining, rust-preventative form oil or otherwise to protect against rusting. Rust-stained steel formwork will not be accepted. Coat contact surfaces of forms with a light uniform film (a coverage rate of 1,200 square feet per gallon or higher) of the surface consolidation agent. Apply to steel forms as soon as they are cleaned to prevent discoloration of concrete from rust. Do not get surface consolidation agent on concrete surfaces or reinforcing steel against which fresh concrete will be placed.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of the items to be attached thereto. Securely anchor embedded items to prevent displacement during placement of concrete.

B. Edge Forms and Screed Strips for Slabs:

1. The edge forms or bulkheads and intermediate screed strips for slabs shall be set to obtain the required elevations and contours in the finished slab surface. The Contractor shall provide and secure units to support the types of screeds required.

3.04 REMOVAL OF FORMS

A. General: Formwork not supporting concrete, such as sides of walls, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees Fahrenheit for 24 hours after placing concrete, provided; (1) concrete strength is sufficient to withstand damage by form removal operation and the forces acting on it, and (2) that curing and protection operations are maintained.

B. Formwork supporting the weight of concrete, such as slabs and other structural elements, may not be removed until the concrete has achieved the following:

1. At least 70 percent of 28-day design compressive strength.

2. Determine compressive strength of in-place concrete by testing representative field-or laboratory-cured test specimens according to ACI 301.

3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

C. Contractor shall assume responsibility for damage resulting from improper

and premature removal of forms.

D. Satisfy applicable OSHA requirements with regard to safety of personnel and property.

E. Do not remove supports and reshore prior to obtaining adequate field cured cylinder results.

3.05 SHORES AND RESHORES

A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and re-shoring.

3.06 CONCRETE FINISHES

A. As specified in Section 03300, CONCRETE.

3.07 BACKFILL AGAINST WALLS

A. Do not backfill against walls until concrete has obtained compressive strength equal to specified 28-day compressive strength and all permanent supporting structure is in place.

B. Place backfill simultaneously on both sides of wall where required to prevent differential pressures.

3.08 FIELD TESTS

A. Wall Finish Tolerances: Test for compliance with tolerances as specified.

B. Slab Finish Tolerances and Slope Tolerances:

1. Floor flatness measurements will be made the day after floor is finished and before shoring is removed, to eliminate effect of shrinkage, curling, and deflection.

2. Support 10-foot long straightedge at each end with steel gauge blocks of thicknesses equal to specified tolerance.

3. Compliance with designated limits in four of five consecutive measurements is satisfactory unless obvious faults are observed.

4. A check for adequate slope and drainage will also be made to confirm compliance with these Specifications.

C. Finish Tolerance Failures: Repair or replace concrete as specified in Section 03300, CONCRETE.

3.09 RE-USE OF FORMS

A. All forms to be re-used in following work shall be clean and surfaces repaired to the satisfaction of the Engineer. Split, frayed, delaminated, or

otherwise damaged form-facing material will not be acceptable. The Contractor shall apply new form-coating compound material to concrete contact surfaces as specified for new formwork.

B. When forms are extended for successive concrete placement, the Contractor shall thoroughly clean all surfaces, remove fins and laitance, and tighten forms to close all joints. All joints shall be secured and tightened to avoid offsets.

END OF SECTION 03100

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section includes the fabrication and placement of steel reinforcement for cast-in-place concrete structures, including bars, ties, and supports.

1.02 RELATED SECTIONS

A. Submittals: Section 01300.

B. Concrete Formwork: Section 03100

C. Concrete: Section 03300.

1.03 QUALITY ASSURANCE

A. Codes and Standards: The Contractor shall comply with all requirements of the following codes and standards (most recent edition), except as modified herein:

1. American Welding Society, AWS D12.1 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction."

2. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

3. American Concrete Institute, ACI 318 "Building Code Requirements for Reinforced Concrete."

4. American Concrete Institute, ACI 301 “Specifications for Structural Concrete.”

5. American Concrete Institute, ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structure."

1.04 DELIVERY, HANDLING, AND STORAGE

A. All steel reinforcement delivered to the project site shall be bundled, tagged, and marked. Metal tags shall be used indicating the bar size, lengths, and other information corresponding to markings shown on placement diagrams in accordance with ACI 315.

B. The Contractor shall store concrete reinforcement materials at the site in a

manner that will prevent damage and accumulation of dirt or excessive rust. Store to prevent contact with the ground. Protect all reinforcement from any contact with oil, grease, or petroleum based products of any kind.

PART 2 - PRODUCTS

2.01 REINFORCING STEEL GRADE

A. Unless otherwise called for on the Drawings, all reinforcing steel for this project shall conform to ASTM A615 Grade 60. Reinforcing which is welded shall conform to ASTM A706.

2.02 ACCESSORIES

A. Chairs and spacers shall be epoxy or polymer coated metal stock or plastic designed for the purpose intended.

B. All accessories shall comply with CRSI "Recommended Practice for Placing Bar Supports, Specifications and Nomenclature."

C. Wire-bar type supports shall complying with CRSI recommendations. Wood, brick, or other materials will not be accepted.

D. Tie wire shall be 16-gauge, black, soft-annealed wire. Tie wire shall not be closer than 1-inch from surface of wall or slab after tying in place.

PART 3 - EXECUTION

3.01 FABRICATION

A. General: The Contractor shall fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI "Manual of Standard Practice" and ACI 301. In case of fabricating errors, the heating, rebending or straightening of reinforcement will not be permitted.

3.02 GENERAL

A. Meet requirements in the manual titled, "Placing Reinforcing Bars", published by Concrete Reinforcing Steel Institute (CRSI).

B. Steel reinforcement shall be protected at all times from injury. When placed in the work, it shall be free from dirt, detrimental scale, paint, oil and other foreign substance. When steel reinforcement has detrimental rust, loose scale and dust which is easily removable, it shall be cleaned by a satisfactory method, if approved.

C. All bars shall be bent cold, unless otherwise permitted. No bars partially embedded in concrete shall be field bent except as shown on the Drawings or otherwise permitted.

D. Details of concrete reinforcement and accessories not covered herein or

on the Drawings shall be in accordance with ACI 315.

E. Notify Engineer when reinforcing is ready for inspection and allow sufficient time for this inspection prior to close-up of the forming system or placing concrete.

3.03 INSTALLATION

A. The Contractor shall clean reinforcement to remove all loose rust and mill scale, earth, ice, oil or grease, and other materials which reduce or destroy the bond between the concrete and reinforcing steel.

B. The Contractor shall position, support, and secure all reinforcement to prevent displacement by formwork, construction loadings, or concrete placement operations. Steel reinforcing shall be located and supported by chairs, runners, bolsters, spacers and hangers, as required. The reinforcement shall be placed to obtain the coverage for concrete protection noted on the Drawings. Where the coverage is not shown, the reinforcement shall be placed to obtain at least the minimum coverage specified hereinafter. The Contractor shall arrange, space, and securely tie bars and bar supports together with 16-gauge wire to hold reinforcement accurately and solidly in position during concrete placement operations. Wire ties shall be set so that the twisted ends are directed away from the exposed concrete surfaces. All reinforcement will be tied and secured in the correct position in the forms before placing concrete. Do not stab reinforcing into fresh placed concrete.

C. The Contractor shall provide a sufficient number of supports of adequate strength to carry the reinforcement. Reinforcing bars shall not be placed more than 2 inches beyond the last leg of any continuous bar support. Supports shall not be
used as bases for runways for concrete conveying equipment and similar construction loads.

D. Supports or spacers of pebbles, pieces of broken stone, concrete rubble, broken brick or building blocks, metal pipe or wooden blocks will not be permitted.

E. Splices:

1. Standard reinforcement splices shall be done by lapping the ends, placing the bars in contact, and tightly wiring the splice together. The requirements of ACI 318 for minimum lap of spliced bars shall be provided. Use lap splices unless otherwise shown on the Drawings or permitted in writing by the Engineer. Stagger splices in adjacent bars.

2. No field welding or tacking of reinforcement will be permitted.

F. Unless otherwise shown on the detail Drawings, the Contractor shall provide cover as shown in the General Structural Notes in the Drawings.

G. The Contractor shall provide extra reinforcing at all openings in structural walls as shown on the Drawings.

H. The Contractor shall notify the Engineer when reinforcing is in place so that an inspection of reinforcement placement can be made prior to the close-up of formwork or the placement of concrete. Specifically, no concrete placement can take place until all rebar is in place and the rebar inspection has been completed by the Engineer (for the formwork area inspection requested by the Contractor).

I. Conform to ACI 301 for all placing tolerances.

J. Bars may be moved to avoid interference with other reinforcing steel, conduits, or embedded items. If moved more than one bar diameter or the stipulated tolerance, the Contractor shall consult with the Engineer to determine final placement.

K. At construction joints and before constructing concrete form work for next stage of construction, the Contractor shall clean all dowels, reinforcing bars and concrete surfaces. All loose material and foreign objects shall be cleaned out of forming before placement of concrete.

L. Field Bending:

1. Straightening and Rebending: Do not straighten or rebend metal reinforcement. Field bending of reinforcing steel bars is not permitted.

2. Unless permitted by Engineer, do not cut reinforcing bars in thefield.

END OF SECTION 03200

SECTION 03300
CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section shall include constructing the cast-in-place concrete structures consisting of Portland cement, fine and coarse aggregate, water and selected admixtures, combined, mixed, transported, placed, finished, and cured as herein specified.

B. Contractor is responsible to repair all cracks in concrete structures as specified herein. The work shall be done by an experienced and certified applicator as specified herein.

1.02 RELATED WORK

A. Submittals: Section 01300.

B. Quality Control: Section 01400.

C. Concrete Formwork: Section 03100.

D. Concrete Reinforcement: Section 03200.

1.03 QUALITY ASSURANCE

A. The Contractor shall have available on-site a copy of ACI SP-15 "Specifications for Structural Concrete for Buildings with Selected ACI and ASTM References."

B. The Contractor shall comply with all requirements of the latest editions of the following codes and standards, except as modified herein:

1. ACI 301 "Recommended Practice for Concrete Inspection."
2. ACI 318 "Building Code Requirements for Reinforced Concrete."
3. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
4. ACI 305 "Recommended Practice for Hot Weather Concreting."
5. ACI 306 "Recommended Practice for Cold Weather Concreting."
6. ACI 308 "Recommended Practice for Curing Concrete."

C. Other references:

1. ACI 302 - Concrete Floor and Slab Construction.

1.04 SUBMITTALS

A. Concrete Mix Design.

1. The Contractor shall submit copies of the manufacturer's data with the application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, bonding and patching compounds, joint systems, curing compounds, floor hardeners, grout, and others as requested by the Engineer.

2. Concrete Mix Design Proposals: Submit each mix design to the Engineer for review at least 14 days before first use is planned. Include substantiating test data and mix design details, including aggregate gradation and source, water/cement ratio, mix proportions, air content, slump, and strength. Substantiating data must include tests by an independent testing laboratory verifying the requirements specified under "Section 2.01 PROPORTIONING AND DESIGN OF MIXES" and "PART 4 TESTING". Submit complete information for each mix design which has different strength, different aggregate size or gradation, different proportions or is to be transported differently. For previously used mix submit copies of at least 10 tests meeting these specifications. Do not use any concrete until the mix design and substantiating data for that concrete has been reviewed.

B. Concrete Load Slips: The Contractor shall furnish copies of the delivery tickets for each load of concrete delivered to the site and other information as specified under ASTM C94, Certification. A specific batched quantity for each load shall be included.

C. Concrete Test Results: To demonstrate their capabilities and experience, provide qualification data for proposed independent testing agency that will provide the testing services specified under **PART 4 TESTING.** To qualify for acceptance, the independent testing agency must demonstrate, based on the evaluation criteria in ASTM C1093 that it has the experience and capability to satisfactorily conduct the testing indicated.

PART 2 - PRODUCTS

2.01 PROPORTIONING AND DESIGN OF MIXES

A. The following mix properties are required for all concrete placement within forms:

1. Proportion and design concrete mixes shall meet the following requirements:

Strength @ 7 days	3000 psi
Strength @ 28 days	4000 psi
Maximum water/cementitious ratio	0.45 by weight
Slump @ point of placement	
Without superplasticizer	4 inches maximum
With superplasticizer	8 inches
Minimum Cement Content (*)	6 sacks/yard or 470 pounds per cubic yard

Fly Ash	15-25% of Cementitious Material
Entrained Air	5-7%
Maximum Aggregate Size	¾-inch, as defined herein, unless shown otherwise on the Drawings.

(*) Contractor Note: Fly Ash will affect set times. Make appropriate adjustments.

2. A previously used mix design may be used provided aggregate source is the same, the mixing equipment is the same, and provided at least 10 tests were made by an independent laboratory with results meeting these specifications.

3. If any of the 7-day cylinder tests fail to meet the specified 7-day strength, the mix shall be modified for more strength. Submit modified mix for review before use.

4. Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to the Owner. Test data for revised mix designs and strength results must be submitted and accepted before using the mix adjustments.

5. Entrained Air: Air-entraining admixture shall be used unless otherwise shown or specified. Air-entraining admixture shall be added at the manufacturer's prescribed rate to result in concrete at the point of placement with an air content as specified herein (volume basis).

6. Concrete shall be mixed in conformance with ASTM C94.

B. Entrained air admixtures shall be used according to the manufacturer's prescribed rate. Test in accordance with ASTM C231.

C. The use of an accelerating agent is not permitted unless specifically authorized by the Engineer.

D. Combined Aggregate Gradings:

1. Aggregate size shall be ¾-inches maximum for all areas or sections, unless otherwise indicated on the Drawings.

2. Grading limits for coarse aggregate shall be as follows:

	Percentage Passing
	¾" Max.
2"	--
1-1/2"	--
1"	-100
3/4"	90-100
1/2"	--
3/8"	40-90
No. 4	5-20
No. 8	0-5

3. Grading limits for fine aggregate shall be as follows:

Sieve Size	Percentage Passing
3/8"	-100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10
No. 200	0-4

4. The combined mixture of fine and coarse aggregate shall be such that not more than 1.5 percent passes the No. 200 sieve.

2.02 PORTLAND CEMENT

A. Meet ASTM C150, Type I or Type II, or Type I-II (sulfate resistant) or Type V.

B. Non-hydraulic Above grade Structures: Use either Type I or Type II cement.

C. Hydraulic and Below grade Structures: Use Type I-II (sulfate resistant) or Type V cement.

2.03 AGGREGATES

A. Fine: Clean, sharp, natural sand, ASTM C 33. Fineness modulus shall not be less than 2.5 nor more than 3.0. Materials passing 200 sieve shall be 4 percent maximum.

B. Coarse: Crushed stone or gravel, ASTM C 33. Maximum size of coarse aggregate shall be 1 ½-inches as defined hereinbefore, unless otherwise indicated on the Drawings. Materials passing 200 sieve shall be 0.5 percent maximum.

C. Aggregates shall be natural, free from deleterious coatings, meeting ASTM C33, nonreactive. Aggregate soundness testing for fine and coarse aggregates shall be in accordance with ASTM C 88 using a sodium sulfate solution. Thoroughly and uniformly wash before use. In accordance with ASTM C33, Appendix XI, paragraph X1.1, evidence of reactive problems on existing structures in the project area will be used to prove sources of aggregates are reactive and are unsuitable for use in the work. Import nonreactive aggregates if local aggregates are reactive.

D. Local aggregates not in compliance with the soundness and durability requirements of this standard shall not be used except with prior written approval of the Engineer and provided it can be shown by special testing or a record of

past performance that these aggregates produce concrete of adequate strength and durability.

2.04 WATER

A. All water for concrete mixtures shall be clean, potable, and free from injurious substances and conforming to ASTM C 94. Water containing 2 percent ormore common salt shall not be used and chloride levels shall be less than 500 parts per million.

2.05 AIR ENTRAINING ADMIXTURES

A. Air entraining admixtures shall be used in all concrete exposed to the weather and as specified for quality of concrete used, ASTM C 260, except thatadmixture shall be non-toxic after 30 days and contain no chlorides or other chemicals causing corrosion:

1. "Aerolith," Sonneborn Building Products, Inc.

2. "MB-VR," Master Builders Company.

3. "Sika-AER," Sika Chemical Corp.

4. "Dara Vair AT 60," W.R. Grace and Company.

5. "Protex," Protex Industries, Inc.

B. Must be compatible with water-reducing admixture. Concrete withair-entrainment admixture added shall maintain air percentage as batched, within 2 percent for minimum 1 ½ hours after addition to concrete mix and through concrete pump-up.

2.06 WATER-REDUCING ADMIXTURES

A. Water-reducing admixtures shall conform to ASTM C 494, Type A or Type D.

B. Complex, multi-component, nonchloride, noncorrosive admixture providing unique performance qualities unobtainable from conventional water-reducing admixtures.

C. Manufacturer and Product:

1. Master Builders, Inc., Cleveland, OH, Pozzolith or Pozzolith Polyheed.

2. W.R. Grace & Co., Cambridge, MA, WRDA-27, or WRDA-64.

D. Must be compatible with air entraining admixture.

2.07 SUPERPLASTICIZERS (HIGH RANGE WATER REDUCERS)

A. Meet ASTM C494 and use only Type F or G, of second or third generationtype.

B. Hold slump of 5 inches or greater for the time required for placement into the structure, or 2 hours minimum.

C. Type F Superplasticizer: Batch plant added to extend plasticity time, control temperature of fresh concrete, reduce water 20 to 30 percent, and give higher strengths at all ages.

D. Type G Superplasticizer: Batch plant added to extend plasticity time, maintain setting characteristics similar to normal concrete throughout its recommended dosage range and at varying concrete temperatures, reduce water 30 to 40 percent, and give high-early and ultimate strengths.

E. Superplasticizers for Hot Weather Placements:

1. A synthesized sulfonated complex polymer type superplasticizer containing no chlorides or alkalines.

2. Add to concrete mix at manufacturer's recommended dosage to allow placement with concrete temperatures up to 90 degrees F.

F. Manufacturer and Product:

1. Master Builders, Inc., Cleveland, OH, Rheobuild or Pozzolith Polyheed at a dosage greater than 10 ounces per 100 pounds of cement.

2. W.R. Grace & Co., Cambridge, MA, Daracem 19.

3. Euclid Chemical Co., Cleveland, OH, Eucon Super F or 537G.

2.08 FLY ASH

A. Fly ash shall be used with Cement Type V or Type I-II. Submit complete manufacturer's literature. If used conform to ASTM C618, Type C or F modified to allow $SiO_2+Al_2O_3+FeO_3$ minimum 66 percent and SiO_2 minimum 40 percent and to require a maximum loss on ignition of 2 percent. Do not use to replace more than 25 percent by weight. Maximum water to cement plus fly ash ratio shall not exceed w/c ratio as indicated in the Drawings.

2.09 CALCIUM CHLORIDE

A. Calcium chloride and products containing more than 0.1% chloride ions are not permitted. Provide admixture manufacturer's written certification that chloride ion content complies with specified requirements.

2.10 CONCRETE CURING MATERIALS

A. Do not use curing compound where additional finishes such as hardeners, paintings, and other special coatings are required. Use water curing as specified instead.

B. Absorptive cover shall be provided by burlap cloth made from jute or kenaf, weighing approximately 9 ounces per square yard and complying with AASHTO M 182, Class 2.

C. A moisture retaining cover shall comply with one of the following:

1. Waterproof paper, ASTM C 171.

2. Polyethylene film, ASTM C 171.

3. Curing Compound: Resin based compound conforming to ASTM C 309, with additional requirement that the moisture loss shall not exceed 0.030 gm/square cm/72 hours.

D. Manufacturer's certification shall state that curing compound can be applied in one coat and shall show the quantity or coverage required to meet or exceed that above moisture retention.

E. Provide manufacturer's certification that curing compound is acceptable to the appropriate state agency or health department.

2.11 CRACK REPAIR MATERIALS

A. One hundred percent solids, two-component low viscosity epoxy resin for injection, Sikadur 52 or Sikadur 35 HMLV, by Sika Chemical Corp., Lyndhurst, NJ, or approved equivalent. Epoxy cap seal for sealing cracks and mounting injection ports, Sikadur 31 HMGEL, or approved equivalent.

B. In special applications, an expanding polyurethane chemical hydrophobic grout such as Sika Fix HH by Sika Chemical Corp. may also be considered, as approved by the Engineer.

2.12 JOINT SEALANT

A. Joint sealant used shall be specifically intended for exterior, submerged control joint applications.

2.13 NON-SHRINK GROUT

A. Non-shrink Grout Category I:

1. Non-shrink, nonmetallic, non-gas-liberating grout for use in filling tie holes in concrete, blockouts for gate guides, joints of precast components or members, and grouting baseplates of columns that do not exceed one story in height shall be one of the following:

a. SIKA Grout 212, Sika Chemical Corp., Lyndhurst, NJ
b. GP Grout, US. Spec, Denver, CO
c. EUCO NS grout, Euclid Chemical Co., Cleveland, OH
d. Five Star Special 100, U.S. Grout Corp., Fairfield, CT
e. SET non-shrink grout, Master Builders Co., Cleveland, OH
f. Supreme grout, Gifford Hill & Co., Dallas, TX
g. UPCON "Super Flow", UPCO Co., Cleveland, OH

2. All grout shall be a fluid consistency in use except that for formwork tie holes the grout shall be dry pack consistency and shall fill the conical section with dense grout hammered in with steel tool and steel hammer.

3. Use Category II grouts for patching defects in walls and slabs after form removal, or structural repair mortars such as Sika Top 123 Plus and Sika Top 122 Plus, by Sika Corporation, or equal.

PART 3 - EXECUTION

3.01 CONCRETE MIXING

A. The materials for concrete shall be mixed at an acceptable concrete batch plant. Meet ACI 304 current edition and other requirements as specified for mix design, testing, and quality control. Each concrete truck delivering concrete to the site shall deliver a copy of the batch ticket to the Contractor and the Engineer.

B. Ready-mix concrete shall comply with the requirements of ASTM C94 and as herein specified:

1. The addition of water to the mix at project site must be approved by the Engineer and the maximum water-cement ratio shall not be exceeded. The delivery ticket shall be noted with amount of additional water added and submitted to the Engineer.

2. Concrete shall be discharged at the job within 1-1/2 hours after water has been added to the cement and aggregates or cement batched with the aggregates, unless a longer time is specifically authorized by the Engineer.

3. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required:

a. When the air temperature is between 85 degrees Fahrenheit and 90 degrees Fahrenheit, the mixing and delivery time shall be reduced from a maximum of 1-1/2 hours to 75 minutes and when the air temperature is above 90 degrees Fahrenheit, the mixing and delivery time shall be reduced to no more than 60 minutes.

C. Truck Mixers:

1. Equip with electrically actuated counters to readily verify the number of revolutions of the drum or blades.

2. Counter:

a. Resettable, recording type, mounted in driver's cab.
b. Actuated at time of starting mixers at mixing speeds.

3. Performance Requirements:

a. Truck mixer operation shall provide a concrete batch as discharged within acceptable limits of uniformity with respect to consistency, mix and grading.
b. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than 1 inch

when specified slump is 3 inches or less, or differing by more than 2 inches when specified slump is more than 3 inches, discontinue use of truck mixer unless causing condition is corrected and satisfactory performance is verified by additional slump tests.

c. Check mechanical details of mixer, such as water measuring, and discharge apparatus, condition of blades, speed of rotation, general mechanical condition of unit, and clearance of drum before attempting to reuse unit.

4. Do not use non-agitating or combination truck and trailer equipment for transporting ready-mixed concrete.

D. Mixing Process:

1. Concrete Volume in Truck:

a. Limit to 63 percent of total volume capacity per ASTM C94 when truck mixed.
b. Limit to 80 percent of total volume capacity when central mixed.

2. Mix each batch of concrete in truck mixer for minimum 70 revolutions of drum or blades at rate of rotation designated by equipment manufacturer as mixing speed.

3. Perform additional mixing, if required, at speed designated by equipment manufacturer as agitating speed.

4. Place materials, including mixing water, in mixer drum before actuating the revolution counter for determining the number of mixing revolutions.

3.02 PREPARATION

A. Pre-Placement Inspection:

1. Before placing concrete, the Contractor will inspect and complete the formwork installation, placement of reinforcing steel, and items to be embedded or cast-in. Reinforcing shall not be stabbed into freshly placed concrete.

2. The wood forms shall be wetted immediately before placing the concrete when form coatings are not used. Dampen subgrade before placing concrete for slabs on grade unless a vapor barrier is used.

3. The installation of joint materials shall be coordinated with the placement of forms and reinforcing steel.

4. Secure reinforcement in position and allow Engineer to review acceptability before placing concrete.

B. Sleeves, Anchors and Inserts: All sleeves, anchors, and inserts required shall be properly placed, as detailed in the Drawings, in the concrete formwork and securely anchored to prevent displacement during the placing of the concrete.

3.03 CONCRETE PLACEMENT

A. Concrete shall be placed in compliance with the practices and recommendations of ACI Standards 304, 318, and 614, and as herein specified:

1. Concrete shall be placed continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. The placement of concrete shall be done at such a rate that concrete is still workable. Concrete shall be placed as near as practicable to its final location to prevent segregation due to rehandling or flowing. Do not subject concrete to any procedure which will cause segregation.

2. In no case shall concrete be allowed to freely drop more than eight feet, or as specified hereinafter for super plasticized concrete.

3. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.

4. Concrete which has become non-plastic and unworkable, or does not meet the required quality control limits, or which has been contaminated by foreign material shall not be used. Do not use retempered concrete. Remove rejected concrete from the project site and dispose of it at an approved location.

5. Concrete discharge time shall be less than 90 minutes after adding cement to water and aggregate.

B. Placing Concrete into Forms:

1. Concrete shall be placed in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined or unplanned cold construction joints. Where placement consists of several layers, place each layer while the preceding layer is still workable to avoid cold joints.

2. Temporary spreaders in forms shall be removed when concrete placement has reached the elevation of such spreaders.

3. Concrete placed in forms shall be consolidated by mechanical vibrating equipment supplemented by hand-spading, rodding, and tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 309, to suit the type of concrete and project conditions. Vibration of forms and reinforcing will not be permitted.

4. Vibrators shall not be used to transport concrete inside of the forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the layer of concrete and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of the vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation

of the mix. Generally, this will be from 5 to 15 seconds in accordance with ACI 301.

5. Allowable Vertical Free Fall Drop to Final Placement:

   a. 5 feet in forms 8-inch or less wide and 8 feet in forms wider than 8 inches, except as hereinafter specified.
   b. Super plasticized Mixes: Up to 15 feet if slump is over 6 inches.

6. Do not use aluminum pipe or other aluminum conveying devices.

7. Provide sufficient illumination for interior of forms so concrete at places of deposit is visible to permit confirmation of consolidation quality.

C. Conveyor Belts and Chutes:

1. Design and arrange ends of chutes, hopper gates, and other points of concrete discharge throughout conveying, hoisting, and placing system such that concrete passing from them will not become segregated.

2. Do not use chutes longer than 50 feet.

3. Minimum Slopes of Chutes: Angled to allow concrete of specified consistency to readily flow without segregation.

4. Conveyor Belts:

   a. Must be approved by Engineer.
   b. Wipe clean with a device which does not allow mortar adhering to the belt to be wasted.
   c. Cover conveyor belts and chutes.

D. Retempering: For concrete or mortar in which cement has partially hydrated, retempering is not permitted.

E. Pumping of Concrete:

1. General:

   a. Pumping is the preferred method of placing concrete.
   b. If pumped concrete does not produce satisfactory end results, discontinue pumping operation until the problem is corrected.
   c. At Contractor's option, other approved methods of placement may be used.

2. Equipment:

   a. Provide standby pump, conveyor system, crane and concrete bucket, or other system acceptable to Engineer, on site during pumping, for adequate redundancy to assure completion of concrete placement without cold joints in case of a primary placing equipment breakdown.
   b. Minimum Pump Hose (Conduit) Diameter: 4 inches.
   c. Replace pumping equipment and hoses (conduits) that are not

functioning properly.

d. Do not use aluminum conduits for conveying concrete.

3. Field Control (For Pumped Concrete): Take concrete samples for air content, for slump (ASTM C143), and for test cylinders (ASTM C31 and C39) at placement (discharge) end of line.

F. Maximum Size of Concrete Placements:

1. Limit size of each pour regardless whether slabs or walls, to allow for strength gain and some volume change due to shrinkage to take place. Size shall be as specified hereinafter.

G. Removal of Water: Remove all water from space to be occupied by concrete.

H. Consolidation and Visual Observation:

1. Consolidate concrete with internal vibrators with minimum frequency of 8,000 vpm and amplitude required to consolidate concrete in section being placed.

2. Provide at least one standby vibrator in operable condition at placement site prior to placing concrete.

3. Consolidation equipment and methods shall meet ACI 309.

4. Provide sufficient windows in the forms or limit form height to allow visual observation of concrete.

5. Vibrator operator shall be required to see concrete being consolidated to ensure good quality workmanship, or an individual shall actually observe the vibration of concrete at all times and advise vibrator operator of any changes needed to ensure complete consolidation.

6. Consolidation and placement locations shall be planned and accomplished so that vibrators shall be inserted in the concrete as it is placed and in locations not to exceed a distance of 5 feet from point of placement.

I. Placing Concrete Slabs on Grade:

1. Prior to concrete placing, any area of subgrade on which concrete is to be placed shall be properly wetted. Concrete slabs shall be placed in a continuous operation, within the limits of construction joints, until the placement of a panel or section is completed. When in-place concrete has sufficiently set up (at least 36 hours), an alternate section shall be placed. All joints between sections shall be properly keyed. The edges of all sections shall be tooled with a minimum radius or chamfer edging tool.

2. Concrete shall be consolidated during placement operations using vibrating equipment, so that the concrete is thoroughly worked around reinforcement and other embedded items and into the corners.

3. Reinforcing steel shall be continuously maintained in the proper position during concrete placement operations.

J. Bonding:

1. Surfaces of set concrete at all joints shall be roughened, except where bonding is obtained by use of an approved concrete bonding agent, and the surfaces shall be cleaned of laitance coating, loose particles, and foreign matter. Surfaces shall be roughened in a manner to expose bonded aggregate uniformly and laitance, loose particles of aggregates, or damaged concrete at the surface shall be removed.

2. Bonding of fresh concrete to new concrete that has set, but is less than 60 days old or is not fully cured shall be done as follows:

   a. At joints between a footing and walls or columns, and between walls or columns and beams or slabs that they support, and elsewhere unless otherwise specified herein, dampen, but do not saturate, the roughened and cleaned surface of set concrete immediately before placing the fresh concrete.
   b. At horizontal joints in exposed work, and at joints designed to contain liquids, dampen, but do not saturate, the roughened and cleaned surface of set concrete immediately before placing the fresh concrete.
   c. An approved commercial bonding agent shall be used for water holding structures. The agent shall be applied to cleaned concrete surfaces in accordance with the printed instruction of the bonding agent manufacturer.

3. Epoxy bonding agent shall be applied in accordance with the manufacturer's recommendations for bonding to old concrete (more than 60 days old). Coat contact surfaces with bonding agent after mechanically roughening surface to a clean, rough surface.

K. Cold Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 degrees F within 3 days, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

L. Hot Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.04 FINISH OF FORMED SURFACES

A. Rough Form Finish:

1. This finish shall include formed concrete surfaces buried from view by backfill in the finish work or covered by other construction, unless otherwise shown or specified. Any surface which will be exposed to the air or water in the completed structure shall be a smooth form finish.

2. The standard rough form finish shall leave the concrete surface with the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched and all fins and other projections exceeding ¼-inch in height rubbed down or chipped off.

3. Fill snap-tie holes with nonshrink, non-metallic grout as specified herein. Patch honeycomb areas and rock pockets with grout as specified herein. Small air holes do not require patching.

B. Smooth Form Finish (Trowel Finish):

1. This finish includes formed concrete surfaces which will be exposed to the air or water in the completed structure or to be covered with a coating material applied directly to the concrete, or a covering material bonded to the concrete, such as water proofing, damp-proofing, painting, or other similar system.

2. A smooth form finish shall be provided by selecting form materials that will impart a smooth, hard, uniform texture and arranging them orderly and symmetrically with a minimum of seams. All defective areas shall be patched and repaired with all fins or other projections completely removed and smoothed.

3. For smooth form finish walls:

   a. Fill snap-tie holes with approved nonshrink, nonmetallic color matched grout as specified herein.
   b. Grind off projections, fins, and rough spots.

c. Repair other defects such as honeycomb areas, rock pockets, and rough spots resulting from form release agent failure or other reason with color matched nonshrink grout as specified herein.

4. For smooth form trowel finish slabs:

a. Finish by screeding and floating with straight-edges to bring surface to required finish elevation shown.
b. While concrete is still green, but sufficiently hardened to bear a person' weight without deep imprint, wood float to true, even plane with no coarse aggregate visible.
c. Use sufficient pressure on wood floats to bring moisture to surface.
d. After surface moisture has disappeared, hand trowel concrete to produce smooth, impervious surface, free from trowel marks.
e. Burnish surface with an additional troweling. Final troweling shall produce a ringing sound from trowel.
f. Do not use dry cement or additional water during troweling. No excessive troweling will be permitted.

C. Related Unformed Surfaces: At horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, the placed concrete shall be struck off smooth and finished with a texture matching the adjacent formed surfaces. Continue the final surface treatment of the formed surfaces uniformly across the adjacent unformed surfaces, unless otherwise shown on the Drawings.

3.05 CONSTRUCTION AND CONTROL JOINTS

A. Construction Joints

1. Locate construction joints as shown on the Drawings or at locations approved by the Engineer
2. Construction joints are purposely placed to facilitate construction, to reduce initial shrinkage stresses and cracks, and to facilitate subsequent concrete placement.
3. Reinforcing steel is continuous across the joint
4. Relocation, addition, or elimination of construction joints must be approved by the Engineer.

B. Control Joints

1. Locate Control Joints as shown on the Drawings or at locations approved by the Engineer
2. Control joints are placed to provide for initial control of shrinkage stresses and cracks of monolithic units.

3. Reinforcing steel is continuous across the joint
4. Control Joints are formed by saw cutting a minimum of 2-inches into the concrete slab or by installing a block out in wall formwork.
5. Saw cut joints as soon as concrete is hard enough that abutting edges do not chip. Saw cutting must be completed within 24 hours after concrete finishing.
6. Relocation, addition, or elimination of control joints must be approved by the Engineer

3.02 CONCRETE CURING AND PROTECTION

A. General:

1. Freshly placed concrete shall be protected from premature drying and excessive cold or hot temperature, and maintained without drying at a relatively constant temperature for the 7 day period of time necessary for the proper hydration of the cement. Concrete damaged by improper curing or placement methods shall be replaced by the Contractor and at no additional expense to the Owner.

2. Curing procedures shall begin immediately after placement of the concrete and continue for at least seven days or until concrete has attained 75 percent of its compressive strength in accordance with ACI 308.

B. Curing Method:

1. Liquid membrane curing shall be provided as follows:

   a. The Contractor shall use a commercially produced liquid membrane forming curing compound for curing concrete which meets the requirements of ASTM C309.

   b. Apply the specified membrane-forming curing compound to damp concrete surfaces as soon as the water film has disappeared. Apply uniformly in a 2-coat continuous operation by power spray equipment in accordance with the manufacturer's directions. Recoat all areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain the continuity of the coating and repair any damage to the coat during the entire 7 day curing period.

   c. Membrane compounds shall not be used on surfaces which are to be covered with a coating material applied directly to the concrete or with a covering material bonded to the concrete, such as other concrete, liquid floor hardener, water-proofing, damp-proofing, flooring, paintings, and other coatings and finish materials.

2. Use approved water curing method where membrane compounds are not allowed.

3. For walls, use one of the following curing methods:

   a. Method 1: Leave concrete forms in place and keep entire exposed surfaces wet at all times.
   b. Method 2: Apply specified curing compound as specified, where allowed, immediately after removal of forms. Apply curing compound in two coats. Each coat shall be applied at the manufacturers recommended rate for one coat application.
   c. Method 3: Continuously sprinkle 100 percent of all exposed surfaces.

C. Unformed surfaces shall be cured after finishing operations have been completed and as soon as marring of the concrete will not occur. The curing procedures shall continue for 7 days or until the concrete has attained 70 percent of its compressive strength in accordance with ACI 308.

D. Temperature of Concrete during Curing:

1. When the atmospheric temperature is 40 degrees Fahrenheit and below, the concrete temperature shall be maintained between 50 and 70 degrees Fahrenheit continuously throughout the 7 day curing period. When necessary, the Contractor shall make arrangements before the placement of concrete for heating, covering, insulation or housing as required to maintain the specified temperature and moisture conditions continuously throughout the concrete curing period. Cold weather protections shall comply with the requirements of ACI 306.

   a. Where water curing as specified herein for slabs is not possible, use an approved curing compound as herein specified at twice the manufacturer's recommended coverage per gallon.
   b. Where specified curing compound cannot be used, special methods using moisture shall be agreed upon prior to pouring the concrete slabs.
   c. Protect slabs during cold weather with polyethylene sheeting or other material inside required heated enclosure if foot traffic is permitted on slabs.

2. When the atmospheric temperature is 80 degrees Fahrenheit and above, or during other climatic conditions which will cause a rapid drying of the concrete, the Contractor shall make arrangements before the start of concrete placement for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or a moisture-retaining covering. The concrete shall be protected continuously for the 7 day concrete-curing period. Hot weather concrete protection shall comply with the requirements of ACI 305.

3. The concrete temperature shall be maintained as uniformly as possible and protected from rapid atmospheric temperature

changes. Temperature changes in concrete which exceed 5 degrees Fahrenheit in any one hour and 50 degrees Fahrenheit in any 24-hour period shall be avoided and protected against.

E. During the curing period the concrete shall be protected from damaging mechanical disturbances including load stresses, excessive vibration and from damage caused by rain or flowing water. All finished concrete surfaces shall be protected from damage by subsequent construction operations. Any damage incurred shall be repaired by the Contractor at no additional expense to the Owner.

3.03 CONCRETE REPAIRS

A. The following section shall be used for repair of damage to the existing concrete structure during the demolition process and for new poured in place concrete structures.

B. Cracks in structures that are determined to have caused excessive leakage on exposed surfaces:

1. Inject all cracks with crack repair materials as specified hereinbefore. Crack repairs shall be performed by a licensed applicator as specified hereinbefore and in accordance with the crack repair material manufacturer's recommendations, unless approved otherwise. Repair of all cracks shall be by the Contractor at no extra cost to the Owner.

C. Defective surface areas shall be repaired and patched with grout or specialized mortar as specified hereinbefore immediately after removal of forms and as directed by the Engineer. All repairs shall be made by the Contractor at no extra cost to the Owner.

D. Repair of Formed Surfaces:

1. Formed surfaces which will be exposed-to-view or air in the completed structure and contain defects which adversely affect the appearance of the finish shall be repaired. The concrete with the defective surfaces shall be removed and replaced at no additional expense to the Owner if the defects cannot be repaired to the satisfaction of the Engineer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, and holes left by rods and bolts, fins, and other discolorations that cannot be removed by cleaning.

2. Concealed formed concrete surfaces that contain defects that adversely affect the durability of the concrete shall be repaired. If defects cannot be repaired, the defective concrete shall be removed and replaced at no additional expense to the Owner.

E. Repair of Unformed Surfaces:

1. Unformed surfaces such as monolithic slabs may be tested by the

Engineer for smoothness and to verify that the surface planeness meets the tolerances specified for each surface and finish. Any low and high areas shall be repaired by the Contractor at no additional expense to the Owner as specified herein.

2. Unformed surfaces that contain defects which adversely affect the durability of the concrete shall be repaired. Surface defects include crazing, cracks in excess of 0.01-inch in width or which penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.

3. High areas in unformed surfaces shall be repaired by grinding after the concrete has cured sufficiently so that repairs can be made without any damage to adjacent areas.

4. Low areas in unformed surfaces shall be repaired during, or immediately after, completion of surface finishing operations by cutting out the low areas and replacing with fresh concrete. The repaired areas shall be finished to blend into adjacent concrete. Proprietary patching compounds may be used when approved by the Engineer.

5. Defective areas, except random cracks and single holes not exceeding 1- inch diameter shall be repaired, by cutting the area out and placing fresh concrete. Defective areas shall be removed to sound concrete with clean, square cuts, and shall expose reinforcing steel with at least 3/4- inch clearance all around. Concrete surfaces in contact with patching concrete shall be dampened and brushed with a neat cement grout coating or approved epoxy adhesive, or a concrete of the same type or class as the original adjacent concrete. Place, compact, and finish as required to blend with the adjacent finished concrete. The repaired area shall be cured in the same manner as adjacent concrete.

6. Isolated random cracks in non-water holding structures and single holes not over 1-inch in diameter shall be repaired by the dry-pack method. Groove the top of cracks, and cut out holes to sound concrete. Clean off all dust, dirt, and loose particles. Dampen all cleaned concrete surfaces and apply by brush a neat grout coating. Place dry-pack before the cement grout takes its initial set. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact the dry-pack mixture in place and finish to match the adjacent concrete. Keep the patched areas continuously moist for not less than 72 hours.

7. Repair methods not specified above may only be used if approved by the Engineer.

3.04 REJECTIONS

A. Concrete Strength: Concrete strength shall be considered satisfactory if the average test of the two 28-day specimens exceeds the specified strength and neither specimen test falls below 95% of the specified strength. If the average strength of the two test specimens is less than specified or either specimen test is less than 95% of the specified strength, the concrete represented bythe tests is rejected and must be removed and replaced at the Contractor's expense.

B. Alignment: Where concrete slabs or walls do not meet the alignment requirements, the Contractor must grind off irregularities until they comply. However, if such removal leaves less concrete section than indicated, the Engineer may reject concrete if he feels the remaining section would notbe adequate.

C. Appearance: Concrete exposed to view with defects which adversely affect the appearance of the specified finish may be repaired, if possible in accordancewith paragraph 3.07. If, in the opinion of the Engineer, the defects cannot be repaired to equal the specified finish, the concrete shall be rejected.

D. Misplaced Members: Concrete members cast in the wrong location may be rejected if the strength, appearance, or function of the structure isadversely affected or misplaced items interfere with other construction.

E. Rejected Concrete: Rejected concrete shall be removed and replaced. Limits of removal shall be as directed by the Engineer to accomplish a structure equal in strength,serviceability, and appearance, to that which would have been achieved by acceptable concrete.

F. Expense of Repairs: The cost of all repairs, removal, replacement, etc., required by the provisions of this Article shall be borne by the Contractor.

PART 4 - TESTING

4.01 TESTS OF AGGREGATE

A. Provide tests of aggregate before concreting per ASTM C33. Tests may be waived by Engineer if aggregates to be used have shown actual use to produce concrete or required strength, durability, water-tightness, fire resistance, and wearing qualities.

4.02 STRENGTH TEST OF CYLINDERS DURING WORK

A. Provide for test purposes, sets of four cylinders each, taken for each portion placed each day. Test one cylinder per set at 7 days, two at 28 days, and retain one for backup.

B. Evaluation will be in accordance with ACI Standard Building Code Requirements for Reinforced Concrete (ACI 318 latest edition), Section 4.7, "Evaluation and Acceptance of Concrete", and these Specifications. Where

the term "building official" is used in Section 5.6 of ACI 318, term shall be redefined to "the Owner's representative".

C. Specimens will be made, cured, and tested by the Owner's independent testing firm in accordance with ASTM C31 and ASTM C39. The Engineer shall determine which concrete trucks are to be tested in any pour and shall directthe independent testing firm. Only the Engineer or the testing firm may transport specimens or cylinders from the site to the laboratory.

D. Frequency of testing may be increased at discretion of Engineer.

4.03 SLUMP TESTS

A. Owner's independent testing firm will take slump tests with each strength test and as directed by the Engineer in accordance with ASTM C143.

4.04 AIR CONTENT

A. ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete or one with each strength test. Test by Owner's independent firm.

4.05 CONCRETE TEMPERATURE

A. ASTM C1064; one test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test for each set of compressive strength specimens. Test by Owner's independent testing firm.

4.06 TEST OF HARDENED CONCRETE

A. Acceptance shall be based on concrete cylinder tests in accordance with Paragraph 3.11. Contractor may provide additional test by coring per ASTM C42 or load tests for that portion of job where questionable concrete has beenplaced. Such additional testing will be accepted in lieu of cylinder tests. Results of rebound hammer tests will not be accepted except in defining problem areas.

4.07 TESTING AGENCY

A. All tests shall be made by an independent testing laboratory approved by the Owner. Contractor is responsible for scheduling all quality control testing described herein and submitting results to the Owner. The Owner may provide additional quality assurance testing as necessary.

4.08 COST OF TESTING

A. The Owner shall bear all costs of testing required by this section including tests of hardened concrete where cylinder strengths indicate high or low strength concrete.

4.09 TEST RESULTS

A. Submit two (2) copies of all tests to Engineer within 24 hours of testing.

4.10 CURE BOX

A. Provide a cure box at the project site for initial cure of test cylinders. Construct and equip box to provide initial cure in accordance with ASTM C31.

4.11 SPECIAL INSPECTION

A. Special Inspection shall be in accordance with the 2012 International Building Code, Chapter 17 for items as follows:

1. Concrete: Concrete which is part of the structure(s).

END OF SECTION 03300

DIVISION 5

METALS

SECTION 05120
STRUCTURAL STEEL

PART 1 – GENERAL

1.01 WORK INCLUDED

A. This section includes work necessary to furnish and install, complete, structural steel.

1.02 SUBMITTALS

A. General: Submit each item in this section according to the Conditions of the Contract and Section 01300, SUBMITTALS.

B. Product data for each type of product specified.

C. Shop drawings detailing fabrication of structural steel components:

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.

D. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements:

1. Structural steel, including chemical and physical properties.

2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.

3. Non-shrink grout

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed structural steel work similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production

capacity to fabricate structural steel without delaying the work.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Manual of Steel Construction" – Load and Resistance Factor Design, Current Edition.

2. ASTM A 6 (ASTM A 6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use".

3. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".

D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code—Steel", latest edition.

1.04 STEEL DELIVERY, STORAGE, AND HANDLING

A. Deliver structural steel to project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.

2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.05 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wide Flange Sections: ASTM A992.

B. Angles, Channels, Plates, Bars and Other Structural Steel Shapes (as indicated on the Drawings): ASTM A36 (ASTM A36M). Dual 36 ksi / 50 ksi; certified grade is acceptable.

C. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

D. Anchor Rods, Bolts, Nuts, and Washers:

1. Unheaded Rods: ASTM A 36 (ASTM A 36M).

2. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and carbon-steel nuts.

3. Washers: ASTM A 36 (ASTM A 36M).

4. Finish: Mechanically deposited zinc-coating, ASTM B 695, Class 50.

E. Non-high Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Mechanically deposited zinc-coating, ASTM B 695, Class 50.

F. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Mechanically deposited zinc-coating, ASTM B 695, Class 50.

G. Welding Electrodes: Use E70XX electrodes. Comply with AWS requirements.

2.02 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this section and in shop drawings.

1. Identify high-strength structural steel according to ASTM A 6 (ASTM A 6M) and maintain markings until steel has been erected.

2. Mark and match-mark materials for field assembly.

3. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.

4. Complete structural steel assemblies, including welding of units, before hot-dip galvanizing.

5. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded.

C. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on shop drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.03 SHOP CONNECTIONS

A. Shop install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.

B. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Bolts: ASTM A 325 (ASTM A 325M) high-strength bolts, unless otherwise indicated.

2. Connection Type: Snug tightened, unless noted as slip critical.

C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds ½-inch and larger. Grind flush butt welds. Dress exposed welds.

2.04 SHOP FINISH

A. Hot-dip galvanize steel after fabrication in accordance with ASTM A123.

2.05 SOURCE QUALITY CONTROL

A. Correct deficiencies in or remove and replace structural steel that inspections indicate do not comply with specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

C. In addition to visual inspection, shop-welded connections may be inspected and tested according to AWS D1.1.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of

anchorages for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. Comply with manufacturer's instructions for proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

E. Splice members only where indicated.

F. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. Install and tighten bolts

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.05 FIELD QUALITY CONTROL

A. Correct deficiencies in or remove and replace structural steel that inspections indicate do not comply with specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

C. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. In addition to visual inspection, field-welded connections may be inspected and tested according to AWS D1.1.

END OF SECTION 05120

SECTION 05500
MISCELLANEOUS METAL ITEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section includes the work necessary to furnish and install, complete, fabricated metalwork as shown or as required to secure various parts together and provide a complete installation.

1.02 GENERAL

A. Like items of materials provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

1.03 SUBMITTALS

A. Shop Drawings:

1. Shop drawings, including calculations where required, showing the details of fabrication and installation for miscellaneous metalwork.

1.04 STANDARDS

A. "Code for Welding in Building Construction," American Welding Society.

B. "Fastener Standards," Industrial Fastener Institute.

C. "Code and Specifications" of the American Institute of Steel Construction.

D. "Codes and Standards" of the Aluminum Association current Construction Manual series.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Shipment:

1. To the extent practical, factory assemble items specified herein.

2. Package and clearly tag parts and assemblies that are of necessity shipped unassembled, in a manner that will protect materials from damage, and facilitate identification and field assembly.

1.06 GENERAL FABRICATION

A. Fabrication shall be coordinated with connecting work.

B. The fabrication shall be done in units as large as practicable for finishing, handling, and installation.

C. All welding shall conform to the requirements of the American Welding Society.

D. Connections:

1. Shop connections shall be welded after removing all scale, and ground smooth.

2. Field connections shall be bolted, unless otherwise specified or detailed.

3. Punch or drill holes shall not be cut with a torch.

4. Joints exposed to weather shall be formed so as not to trap water.

5. Butt joints shall use the mill square end and be smoothed.

6. Corners shall use a cope and weld technique.

PART 2 - PRODUCTS

2.01 GENERAL

A. Like Items of materials shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

B. Where applicable, the structure and appurtenant facilities have been designed around the first named manufacturer's equipment. Metalwork furnished by all qualified interested manufacturers will be considered, provided that necessary structural, electrical, and mechanical changes required are submitted. The Contractor shall bear all costs for necessary changes for a complete and satisfactory installation.

C. Furnish miscellaneous items:

1. Miscellaneous metalwork and castings as shown, or as required to secure various parts together and provide a complete installation.

2. Items specified herein are not intended to be all inclusive. Provide metalwork and castings shown, specified, or which can reasonably be inferred as necessary to complete the project.

D. Unless otherwise indicated, materials shall meet the latest issue of ASTM Specifications as follows:

Item	ASTM Specification
Steel Shapes & Plates:	A36 Plates, A992 for "W" shapes
Steel Pipe Column	A500 Grade B
Structural Steel Tubing:	A500
Connection Bolts for Steel: Members; Use Hardened Washers also Under Head and Nut:	A325-N
Anchor Bolts & Nuts: Carbon Steel:	A307 or A36
Galvanized Steel Bolts and Nuts:	A153, Zinc Coating for A307
or A36 Flat Washers (Unhardened)	F844, Use A153 for Zinc
Coating Threaded Bars:	A36

All steel to be hot-dip galvanized after fabrication unless noted otherwise.

2.02 ANCHOR BOLTS

A. Anchor bolts for equipment and machinery, where permanently anchored into concrete shall be stainless steel, unless otherwise shown. The diameter, length, and any bend dimensions shall be as required by the equipment or machinery manufacturer. Unless otherwise required, use 5/8-inch minimum diameter and other geometry shown on the Drawings. Furnish a minimum of two nuts and a washer of the same material for each bolt. Provide sleeves as required or as shown for location adjustment.

B. Anchor bolts for other uses to anchor fabricated metal work or structural building columns, or other components where the connections will be protected or dry, shall be galvanized steel. Minimum size shall be 5/8-inch diameter by 12-inches long, unless otherwise shown. Furnish two nuts and one washer per bolt of the same material as the bolt, unless otherwise shown.

C. Anchor bolts for other uses to anchor fabricated metal work or structural building components, or structural frame components in areas of wet use, washdown areas, or areas outside heated buildings, shall be galvanized steel. Minimum size shall be 5/8-inch diameter by 12-inches long, unless otherwise shown. Furnish two nuts and one washer per bolt of the same material as the bolt, unless otherwise shown.

2.03 ANCHORING SYSTEMS FOR CONCRETE

A. Wedge Anchors:

1. Wedge anchors shall be Type 316 stainless steel, manufactured by ITT Philips Drill Division, Michigan City, IN; Hilti Super Kwik-Bolt, stud type, manufactured by Hilti, Inc., Tulsa, OK; Parabolt Concrete Anchors, manufactured by Molly Division of Emhart Corp., Temple, PA; or equal. Furnish sizes shown on Drawings. Provide ICBO (International Conference of Building Officials) or other similar building code organization recommendations regarding safe allowable design loads.

B. Epoxy Adhesive Anchors:

1. Provide for anchoring metal components in structures buried in earth conditions, or in submerged or wet locations.

2. Anchor rod shall be Type 316 stainless steel threaded rod free of grease, oil, or other deleterious material with a 45-degree chisel point. Where indicated, use typical reinforcing where attaching to existing concrete.

3. Epoxy Adhesive:

a. Meet ASTM C881, Type 1, Grade 3, Class A, B, or C.

b. Two-component, 100 percent solids, nonsag, paste, insensitive to moisture, designed to be used in adverse freeze/thaw environments and gray in color.

c. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.

4. Mixed Epoxy Adhesive:

a. Nonsag paste consistency with ability to remain in a 1-inch diameter overhead drilled hole without runout, holding the following properties:

1. Slant Shear Strength, ASTM C881/882, No Failure In Bond Line, Dry/Moist Conditions: 5,000 psi.

2. Compressive Strength, ASTM D695: 14,000 psi minimum.

3. Tensile Strength, ASTM D695: 4,500 psi.

4. Heat Deflection Temperature, ASTM D648: 135 degrees F, minimum.

5. Epoxy Adhesive Packaging:

a. Disposable, self-contained cartridge system capable of dispensing both epoxy components in the proper mixing ratio, and fit into a manually or pneumatically operated caulking gun.

b. Dispense components through a mixing nozzle that thoroughly mixes components and places epoxy at base of predrilled hole.

c. Mixing Nozzles: Disposable, manufactured in several sizes to accommodate sizes of anchor rods.

6. Manufacturers:

a. Hilti Corporation, P.O. Box 21148, Tulsa, OK, 74121, HIT HY 150 Adhesive Anchoring System.
b. ITW Ramset/Red Head, P.O. Box 90, Paris, KY 40361, Epcon Ceramic 6 Epoxy Anchor System.
c. Or equal.

2.04 BOLTS AND FASTENERS

A. Bolts and fasteners not permanently embedded in concrete, but located outdoors in areas subject to the weather shall be Type 316 stainless steel or galvanized as hereinbefore specified.

2.05 ZINC-RICH PAINT

A. Paint all non-hot dipped galvanized steel surfaces with a zinc-rich cold galvanizer product such as *Galvax*, manufactured by AmCon Epoxy® or approved equal. Follow manufactures instructions for surface preparation.

2.06 SOURCE QUALITY CONTROL

A. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

C. In addition to visual inspection, shop welded connections may be inspected and tested according to AWS D1.1.

PART 3 - EXECUTION

3.01 GENERAL

A. Workmanship and finish of all metalwork specified under this section shall be the highest grade and equal to the best practice of modern shops for the respective work. Exposed surfaces shall have smooth finish and sharp, well-

defined lines. Provide all necessary rabbets, lugs, and brackets so that the work can be assembled in a neat, substantial manner. Conceal fastenings where practical. Drill metalwork and countersink holes as required for attaching hardware or other materials. Fabricate materials as specified. Weld connections, except where bolting is directed. Items requiring special fabrication methods are mentioned herein. Fabrication of all other items shall be of equal quality. Methods of fabrication not otherwise specified or shown shall be adequate for the stresses and as directed by the Engineer.

B. Grind all exposed edges of welds smooth. All sharp edges shall be rounded to a 1/8-inch minimum radius; all burrs, jagged edges, and surface defects shall be ground smooth.

C. Welds and adjacent areas shall be prepared such that there is (1) no undercutting or reverse ridges on the weld bead, (2) no weld spatter on or adjacent to the weld or any other area to be painted, and (3) no sharp peaks or ridges along the weld bead. All embedded pieces of electrode or wire shall be ground flush with the adjacent surface of the weld bead.

3.02 WELDING

A. The technique of welding employed, appearance, quality of welds made, and the methods of correcting defective work shall conform to codes for Arc and Gas Welding in Building Construction of the AWS and AISC. Surfaces to be welded shall be free from loose scale, rust, grease, paint, and other foreign material, except that mill scale which will withstand vigorous wire brushing may remain. A light film of linseed oil may likewise be disregarded. No welding shall be done when the temperature of the base metal is lower than zero degrees F. Finished members shall be true to line and free from twists.

B. Prepare welds and adjacent areas such that there is no undercutting or reverse ridges on the weld bead, no weld spatter on or adjacent to the weld or any other area to be painted, and no sharp peaks or ridges along the weld bead. Grind embedded pieces of electrode or wire flush with adjacent surface of weld bead.

3.03 INSTALLATION OF FABRICATED METALWORK

A. Install in accordance with the shop drawings, the Drawings and these Specifications. Perform field welding and erection work by skilled mechanics. Install fabricated metalwork plumb or level as applicable. The completed installations shall, in all cases, be rigid, substantial, and neat in appearance. Erect structural steel in accordance with the applicable portions of AISC Code of Standard Practice, except as modified. Install commercially manufactured products in accordance with manufacturer's recommendations as approved.

3.04 ANCHOR BOLTS

A. All anchor bolts shall be accurately located and held in place with templates at the time the concrete is poured.

3.05 CONCRETE ANCHORS

A. Installation shall not begin until the concrete or masonry receiving the anchors has attained its design strength. Anchor shall not be installed closer than six times its diameter to either an edge of the concrete or masonry, or to another anchor, unless specifically detailed otherwise on the Drawings. Install in strict conformance with manufacturers written instructions. Use manufacturer's recommended drills and equipment.

B. Do not install epoxy adhesive anchors when temperature of concrete is below 35 degrees F or above 110 degrees F.

C. The minimum pitch diameter of the threaded portion of all bolts, anchor bars, or studs shall conform to ANSI B1.1, having a Class 2A tolerance before galvanizing. After galvanizing, the pitch diameter of the nuts or other internally threaded parts may be tapped over ANSI B1.1, Class 2B tolerance, by the following maximum amounts:

3/8-inch through 9/16-inch	0.016-inch oversize
5/8-inch through 1-inch	0.023-inch oversize
1-1/8-inch and larger	0.033-inch oversize

3.06 FIELD QUALITY CONTROL

A. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

C. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. In addition to visual inspection, field-welded connections may be inspected and tested according to AWS D1.1.

END OF SECTION 05500

SECTION 05520
HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section includes furnishing and installing all handrails and handrail supports, complete.

1.02 GENERAL

A. Like items of materials provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

1.03 DEFINITIONS

A. Handrails: Synonymous with terms; i.e., handrail system, railing system, ramp-rail system, and stair-rail system. Handrails are comprised of a framework of vertical, horizontal, or inclined members, grillwork or panels, accessories, or combination thereof.

B. Toeboards: Vertical barrier at floor level usually erected on handrails along exposed edges of floor or wall openings, platforms, ramps, or stairs to prevent miscellaneous items from falling through.

C. ICBO Reports: Published by ICBO for concrete anchor manufacturers.

D. Special Inspection: As governed by the ICBO Reports.

1.04 SUBMITTALS

A. Shop Drawings:

1. Indicate handrail profiles, sizes, connections, anchorage, size and type of fasteners, and accessories. Project-specific scale plans and elevations of handrails.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handrails adequately packaged and wrap to prevent scratching and denting during shipment, storage, and installation. Maintain protective wrapping until railing is completely installed.

PART 2 - PRODUCTS

2.01 DESIGN PERFORMANCE

A. Structural Performance of Handrails: Design, test, fabricate, and install handrails to withstand the following structural loads without exceeding the allowable design working stress or allowable deflection. Apply each load to produce maximum stress and deflection in each of the respective components comprising handrails.

1. Top Rail of Handrails: Capable of withstanding the following load cases applied:

   a. Concentrated load of 200 pounds applied at any point and in any direction in accordance with ICBO UBC.
   b. Uniform load of 50 pound per linear foot applied horizontally in accordance with ICBO UBC.
   c. Concentrated load need not be assumed to act concurrently with uniform loads in accordance with ICBO UBC.

2. In-Fill Area of Railing Systems:

   a. Capable of withstanding a horizontal concentrated load of 200 pounds applied to 1 square foot at any point in the system including panels, intermediate rails, balusters, or other elements composing the in-fill area.
   b. Horizontal concentrated load need not be assumed to act concurrently with loads on top rails of handrails.

3. Mid-rails with corner returns to withstand a 300-pound concentrated vertical load applied at any point or direction without damage and loosening of pipe, fittings, or attachment hardware.

4. Concrete Anchors for Handrail Wall Brackets: Anchors with a strength required by calculations with concrete strength assumed at 4,000 psi and not exceeding ICBO UBC allowable loads for actual spacing, edge distance, and embedment.

5. Concrete Anchors: In accordance with ICBO UBC allowable load values for size, length, embedment, spacing, and edge distance to match required loads shown in calculations.

2.02 STEEL HANDRAILS

A. General:

1. Furnish fabricated three rail handrails.

2. Pop rivets and glued railing construction not permitted.

3. Brackets, flanges and anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise noted.

4. Steel handrails, posts, and all connection material shall be hot-dipped galvanized.

C. Rails, Posts, and Formed Elbows

1. Tubing: ASTM A 500 (cold form)

2. Post and Railing: Nominal 1-1/2-inch diameter, ASTM A 53 Type F or Type S, grade as noted below.

a. Rails: 1.900-inch outside diameter by 0.145-inch wall thickness, Schedule 40.
b. Posts: 1.900-inch outside diameter by 0.200-inch wall thickness, Schedule 80.
c. Plates, Shapes, and Bars: ASTM A 36

D. Miscellaneous Materials:

1. Fasters: Galvanized steel plate material, Type 304 or 316 stainless steel ½" diameter anchors/bolts.

2. Concrete Anchors for Securing Bases and Brackets to Concrete: Type 304 or 316 stainless steel 1/2-inch concrete anchors.

3. Handrail Connections for Steel Walkway:

a. Galvanized steel post base.
b. Welding rods and bare electrodes: Select according to AWS specification for metal alloy welded

E. Concrete Embedded Metal Anchorages: In accordance with Section 05500, MISCELLANEOUS METAL ITEMS.

2.03 ANCHOR BOLTS, FASTENERS, AND CONCRETE ANCHORS

A. Locknuts, Washers, and Screws:

1. Elastic Locknuts, Steel Flat Washers, RHMS Round Head Machine Screws: Type A 304 or A 316 stainless steel.

2. Flat Washers: Molded nylon.

B. Concrete Anchors:

1. Stainless steel Type 304 or 316.

2. Use ICBO UBC approved service load allowable values for size, length, embedment, spacing, and edge distance to match required loads shown in calculations.

C. Epoxy Anchors: Heavy-duty 1/2-inch diameter, for exterior use only in accordance with Section 05500, MISCELLANEOUS METALS ITEMS, as an alternative to mechanical concrete anchors. Design and provide the number required. Do not use where fire or elevated temperatures above 110 degrees F exist.

2.04 FABRICATION OF GALVANIZED STEEL HANDRAILS

A. Shop Assembly:

1. Post Spacing: Refer to Drawings.

2. Railing Posts Bolted or welded to Metal, bolted to Concrete:

a. In lieu of field cutting, provide an approved fitting with sufficient post overlap, containing provisions for vertical adjustment.
b. Field fit-up is required.

3. Handrails free of burrs, nicks, and sharp edges when fabrication is complete. Welding is not permitted.

B. Shop/Factory Finishing: Use same alloy for uniform appearance throughout fabrication for railings. Handrail and post fittings shall match the fittings with the color of pipe in handrail. Sand cast parts not permitted.

C. Tolerances:

1. Shop assemble rails, posts, and formed elbows with a close tolerance for tight fit.

2. Fit dowels tightly inside posts.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide railing posts longer than needed and field cut to exact dimensions required in order to satisfy vertical variations on the actual structure. Install railing with a base that provides plus or minus 1/4-inch vertical adjustment inside the base fitting. If adjustment is required in the field and exceeds plus or minus 1/4-inch, reduce post length not to exceed beyond bottom of lowest setscrew or bolt in base fitting.

B. Modification to structure not permitted where handrail is attached.

C. Mount handrails only on completed walls or structures. Do not support handrails temporarily by means not satisfying structural performance requirements.

D. Repair field welded areas with zinc-rich repair paint.

Exception: Provide Welding procedure to engineer for welding thru galvanization.

3.02 HANDRAIL INSTALLATION

A. Assembly and Installation: Perform in accordance with manufacturer's written recommendations for installation, if pre-fabricated handrails are used.

B. Protection from Entrapped Water:

1. Make provisions in exterior and interior installations subject to high humidity to drain water from railing system.

2. Posts mounted in concrete, bends and elbows occurring at low points, drill weep holes of 1/4-inch diameter at lowest possible elevations, one hole per post or rail. Drill hole in the plane of the rail.

C. Setting Posts:

1. Surface Mounted:

a. Bolt post baseplate connectors firmly in place.
b. Shims, wedges, grout, and similar devices for handrail post alignment not permitted.

D. Posts and Rails:

1. Set posts plumb and aligned to within 1/8 inch in 12 feet.

2. Install posts and rails in same plane. Remove projections or irregularities and provide a smooth surface for sliding hands continuously along top rail. Use offset rail for use on stairs and platforms if post is attached to web of stringers or structural platform supports.

3.03 FIELD FINISHING

A. Corrosion Protection: Prevent galvanic action and other forms of corrosion caused from direct contact with concrete and dissimilar metals by coating metal surfaces.

B. Field repair of hot-dip galvanized coatings. Field repair of hot-dip galvanized surfaces, including those field welded, shall conform with ASTM A780.

END OF SECTION 05520

SECTION 05530
FABRICATED GRATING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This section includes furnishing and installing all fabricated grating and grating supports, complete.

1.02 GENERAL

A. Like items of materials provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements: Fabrication, installation, standard clearances, and tolerances shall be in accordance with the Aluminum Association standards.

1.04 SUBMITTALS

A. Product Data:

1. Catalog information and catalog cuts.

2. Manufacturer's specifications, including coatings.

3. Special handling and storage requirements.

4. Installation instructions.

B. Shop Drawings:

1. Grating: Show dimensions, weight, and size, and location of connections to adjacent grating, supports, and other work.

3. Grating supports: Show dimensions, weight, size, location, and anchorage to supporting structure.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Shipment:

1. To the extent practical, factory assemble items provided hereunder.

2. Package and clearly tag parts and assemblies that are of necessity shipped unassembled in a manner that will protect the materials from

damage, and facilitate identification and final assembly in the field.

B. Storage and Handling: In accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials shall meet the following ASTM Specifications:

1. Stainless Steel:

a. Bolts: A193, Type 316.
b. Nuts: A194, Type 316.

2. Galvanized Steel:

a. Plates, Bars and Shapes ASTM A 36

3. Anchor Bolts and Nuts:

a. Stainless: A193, Type 316.

4. Flat Washers (Unhardened): F844, use A153 for zinc coating.

B. Design and Fabrication:

1. Meet minimum dimensional requirements as shown in Drawings.

2. Field measure areas to receive grating, verify dimensions of new fabricated supports, and fabricate to dimension required.

3. Section Length: Sufficient to prevent section from falling down through clear opening when oriented in the span direction when one end is touching either the concrete or the vertical leg of grating support.

4. Minimum Depth of Grating: As shown in Drawings.

5. Metal Cross Bar Spacing: 2-inch maximum, unless otherwise shown or specified.

6. Cross Bars:

a. Flush with top of main bar and extend downward a minimum of 50 percent of the main bar depth.
b. Swaged Cross Bars:

(1) Within 1/4-inch of top of grating with 1/2-inch minimum vertical dimension after swaging, and minimum before swaging dimension of 5/16-inch square.
(2) Cross Bar Dimension After Swaging: Minimum 1/8-inch

wider than the opening at minimum of two corners at each side of each square opening in main bar.

(3) Tightly fit main bars and cross bars allowing no differential movement.

8. Do not use weld type cross bars.

9. Banding:

   a. Same material as grating.

10. Metals for Embedment, or Seat Angles for Partial Embedment in Concrete: Type 316 stainless steel, unless otherwise specified.

C. Grating Accessories: Anchor bolts, bolts, inserts, threaded anchor studs, wedge anchors, expansion anchors, adhesive anchors and as necessary for anchorage of grating to supports:

1. Stainless steel Type 316.

2. Fastener Capability: Firmly secure grating section to supports.

3. Fastener Clip(s) and Bolt(s): In accordance with grating manufacturer's recommendations, except minimum of four fasteners per grating section and removable from above grating walkway surface.

4. Provide stainless steel Type 316 threaded anchor studs, as fasteners for grating attachment to metal supports either not embedded or partially embedded in concrete, as manufactured by:

   a. Nelson Studs Welding Co., Lorain, OH.
   b. Omark Industries, KSM Fastenings Systems Div., Seattle, WA, or Portland, OR.

D. Grating Supports:

1. Seat angles and beams where shown.

2. Galvanized steel ASTM A36.

3. Coordinate dimensions and fabrication with grating to be supported.

2.02 FOOT TRAFFIC GRATING

A. Use galvanized steel grating at all locations, unless shown otherwise on the Drawings. Uniform Service Load: 100 psf minimum, unless otherwise shown.

B. Maximum Deflection: 1/4-inch, unless otherwise shown.

C. Banding: 3/16-inch minimum.

2.03 FABRICATION

A. General:

1. Exposed Surfaces: Smooth finish and sharp, well-defined lines.

2. Provide necessary rabbets, lugs, and brackets so work can be assembled in a neat, substantial manner.
3. Conceal fastenings where practical.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.

5. Weld Connections: Not permitted on grating except at banding bars.

B. Galvanized Steel:

1. Fabricate as shown and in accordance with manufacturer's recommendations as approved.

2. Grind smooth sheared edges exposed in the finished work.

3. Swage cross bars, if used, with equipment strong enough to deform cross bars as specified herein.

4. Eliminate any loose cross bar intersections on swaged grating.

C. Foot Traffic Grating: Any single grating section, individual plank, or plank assembly shall not be less than 1 foot 6 inches or greater than 3 feet 0 inches in width or weigh more than 150 pounds, unless otherwise shown on approved shop drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide equipment for lifting and placing as necessary.

B. Install in accordance with approved shop drawings, and as shown and as specified.

C. Install plumb or level as applicable in locations as shown.

D. Anchor grating securely to supports to prevent displacement from traffic impact.

E. Completed Installation: Rigid and neat in appearance.

F. Commercially Manufactured Products:

1. Install in accordance with manufacturer's recommendations as approved.

2. Secure grating to support members with fasteners.

3. Welding is not permitted.

4. Fasteners: Field locate and install.

5. Permit each grating section or plank style grating assembly to be easily removed and replaced.

G. Clearance Between Ends of Grating Sections and Vertical Surfaces of Supports or Concrete Walls: Not to exceed those hereinbefore specified.

H. Replace grating sections not meeting specified or detailed dimensional requirements.

END OF SECTION 05530

DIVISION 15

GATES

SECTION 15040
HEADGATES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Slide gates including lifts, stems and accessories, shall be of the size and type shown on the Drawings and specified herein. Gates shall be installed so that there is a seating head on the gate.

B. Sluice gate shall be of size and type shown on the Drawings and specified herein.

C. All gates supplied to this project shall be manufactured by an approved manufacturer.

D. Contractor shall ensure that all concrete formwork accommodates approved gate installations.

1.2 GATE SCHEDULE

Location	Open Size	Stem Height (gate invert to handwheel)	Gate Type	Quantity
Headgate Slide Gate	4' x 5' (V x H)	10'	Waterman SS-251-1-Y-60" x 48"-10 Slide Gate or approved equal	1
Sluice Gate	2' x 2' (V x H)	Rod Handel	Waterman Stop Gate or approved equal	1

1.3 SLUICE GATES

A. Sluice gate shall be surface mount type with stainless steel guide rails and slide.

B. Sluice gate shall be Waterman Stop Gate or Engineer approved equal.

1.4 SLIDE GATES MATERIALS OF CONSTRUCTION

A. Head slide gates shall be Waterman SS-251-1-Y-60"x48"- 10 or Engineer approved equal.

PART 2 – SCOPE OF WORK

2.1 SCOPE OF WORK

A. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the engineer.

Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified or otherwise required for a complete and properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of fabricated water control gates.

B. Unit Responsibility: To insure compatibility of all components directly related to the slide gates, unit responsibility for the slide gates, actuators and accessories as described in this section shall be the responsibility of the slide gate manufacturer unless specified otherwise.

2.2 SUBMITTALS

A. Submittals shall be in accordance with Sections 01300 and as specified herein. Submittals shall include as a minimum:
   1. Shop Drawings
   2. Manufacturer's operation and maintenance manuals and information.
   3. Manufacturer's installation certificate.
   4. Manufacturer's equipment warranty.
   5. Design calculations demonstrating lift loads and deflection in conformance to the application requirements. Design calculations shall be approved by a licensed engineer (PE) and shall be available upon request.

2.3 QUALITY ASSURANCE

A. Qualifications
   1. All equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 10-years of experience designing and manufacturing slide gates. The manufacturer shall have manufactured stainless steel slide gates of the type described herein for a minimum of 10 similar projects.
   2. The sealing system shall be certified and tested for operation and performance to leakage specifications compliant with AWWA C-561 for a minimum of 100,000 cycles.
   3. The project design is based on the Waterman SS-250 Series Fabricated Slide Gate as manufactured by Waterman Industries of Exeter, California. Proposed

alternates must be pre-approved, per addendum, at least 10-days prior to close of bid. Requests for alternates must be supplemented with detailed drawings, specifications, and references.

4. To insure quality and consistency, the slide gates listed in this section shall be manufactured and assembled in a facility owned and operated by the slide gate manufacturer. Third-party manufacturers contracted for fabrication and assembly of the slide gates will not be permitted.

PART 3 EQUIPMENT

3.1 GENERAL

A. The gates shall be either self-contained with yoke and bench stand operators, or non-self-contained with separate stem guides and operator, in accordance with the requirements of these specifications.
B. The gates shall be compliant with the latest version of AWWA C561 as described below.
C. Specific configurations shall be as noted on the gate schedule or as shown on the plans.
D. Materials:

COMPONENTS	MATERIALS
Frame, Yoke, Cover Slide, Wall Thimbles	**Stainless Steel ASTM A240, Type 304**
Seat/Seals & Stem Sleeves	**Ultra High Molecular Weight Polyethylene (UHMWPE) ASTM D-4020**
Cord Seal	**Neoprene ASTM D 2000**
Stems	**Stainless Steel: ASTM A-276, AISI Type 304**
Stem cover	**Clear Butyrate With Mylar Strip**
Fasteners and Anchor Bolts	**Stainless Steel: ASTM A-593 and 594, Type 304 CW**

3.2 FRAME AND GUIDE RAILS

A. The gate frame shall be composed of stainless steel guide rails with UHMW seat/seals upstream and downstream. The seat/seals shall form a tight seal between the frame and the slide (disc). The guides will be of sufficient length to support ½ the height of the slide when in the full open position.

B. Yoke shall not deflect more than 1/360th of the span under full head break load.
C. Seals shall be replaceable without removing the frame from the wall.

3.3 STEM AND STEM GUIDE

A. Material
   1. The stem shall be solid stainless steel of the specified grade.
B. Design
   1. Stem threads shall be machine-cut 29-degree full Acme or stub Acme type.
   2. Nominal diameter of the stem shall not be less than the crest of the threaded portion.

3.4 SEALS

A. The seals shall be self-adjusting. Seals requiring periodic maintenance and adjustments to maintain specified leakage rates will not be permitted.
B. The top seal design on upward opening gates consisting of four side seals shall incorporate a self-cleaning wiping function that prevents debris from building-up above the top seal and causing premature wear of the seats, seals, and gate face.
C. The UHMW seats shall impinge on the slide (disc) by way of a continuous loop cord seal. Seal designs incorporating resilient seals such as "J-bulb" or "P" seals that come in direct contact with the friction surface of the slide will not be considered.
D. The cord seal shall function as a seal between the frame and the UHMW, and as a spring force to maintain contact between the UHMW and the slide (disc).
E. The resilient bottom seal shall be set into the invert member of the frame which shall be formed in a manner to protect 3 sides of the seal only exposing the side that will come in contact with the slide. Disc-mounted invert seals exposing additional surface area will not be permitted.
F. The self-adjusting seal system shall provide an allowable leakage rate of no more than ½ AWWA leakage rate per minute per peripheral foot of perimeter opening for seating and unseating heads.

3.5 SLIDE COVER (DISC)

A. The slide cover (disc) shall be stainless steel plate reinforced with structural shapes welded to the plate.
   1. The slide cover shall not deflect more than 1/720th of the span, or 1/16" at the seated sealing surface of the gate under maximum specified head.
   2. The stem to gate connection shall be either the clevis type, with structural members welded to the slide and a bolt or bolts to act as a securing method, or a threaded and bolted (or keyed) thrust nut supported in a welded nut pocket.
   3. The clevis, or pocket and yoke, of the gate shall be capable of taking, without damage, at least twice the rated thrust output of the operator at 40 pounds of pull on a hand wheel or hand crank, and at locked-rotor stall of a motor operator.

4. The slide cover shall be constructed with vertical and horizontal reinforcement ribs.
5. All welds shall be performed by an AWS-certified welding technician.

3.6 ANCHOR BOLTS

A. Anchor hardware shall be provided by the slide gate manufacturer.
   1. The size, quantity, and location of the anchor hardware shall be engineered by the slide gate manufacturer. Upon client request manufacturer shall provide calculations for anchor bolt sizing and quantity.
   2. Anchor hardware consisting of studs, nuts and washers shall be provided by the manufacturer.

3.7 MANUAL LIFTS

A. Handwheel shall be located approximately 36 in. above grating or walkway. All lifts shall have thrust bearings, bronze lift nuts and a bronze stop nut to limit the downward travel of the stem and slide. All lifts shall be rising stem type. Stem covers made of clear butyrate shall be furnished for all lifts. Lifts shall be grease lubricated and re-greaseable through grease zerks. Oil bath lifts are not acceptable.

PART 4 EXECUTION

4.1 INSTALLATION

A. Installation of the gates shall be performed in accordance with the gate manufacturers recomendations. It shall be the responsibility of the CONTRACTOR to handle, store, and install the equipment specified in this Section in strict accordance with the Manufacturer's recommendations.
B. The CONTRACTOR shall review the installation drawings and installation instructions prior to installing the gates.
C. The gate frames shall be installed in a true vertical plane, square and plumb, with no twist, convergence, or divergence between the vertical legs of the guide frame.
D. The CONTRACTOR shall fill any void between the guide frames and the structure with non-shrink grout as shown on the installation drawing and in accordance with the grout manufacturer's recommendations.
E. The frame cross rail shall be adjusted as required to maintain consistent seal compression across the full width of the gate.

4.2 FIELD QUALITY CONTROL

A. Field testing shall be performed after installation of the equipment. Testing shall demonstrate the following:

   1. The equipment has been properly installed in accordance with manufacturer's instructions and recommendations.

2. The equipment has been installed in the specified location and orientation or as shown on the Contract Drawings.

3. The equipment has been aligned.

4. There are no mechanical defects in any of the parts.

4.2 FIELD TESTING

A. After installation, all gates will be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate assembly shall be water tested by the CONTRACTOR at the discretion of the ENGINEER and OWNER, to confirm that leakage does not exceed 0.1 USGPM per foot of head.

END OF SECTION 15040

APPENDIX A

PERMITS

Montana Department of
ENVIRONMENTAL QUALITY

SHORT-TERM WATER QUALITY STANDARD FOR TURBIDITY RELATED TO CONSTRUCTION ACTIVITY (318 Authorization)

Dear Applicant:

This 318 authorization is the result of your recent application for a 310 permit from your local Conservation District or a 124 permit from Montana Fish, Wildlife and Parks. This authorization is valid for the time frame noted on your permit.

This is not your 310 or 124 permit and no construction activity should occur until you have received a valid 310 or 124 permit as well as any other permits that apply to this proposed construction activity.

This authorization is the result of an Operating Agreement between the Montana Department of Environmental Quality (DEQ), and Montana Fish, Wildlife and Parks (FWP).

The applicant agrees to the comply with the conditions stated below, as well as other conditions listed in the 310 or 124 permit issued for this project. Signatures of the applicant and FWP are required to validate this authorization.

1. Construction activity in or near the watercourse are to be limited to the minimum area necessary, and conducted so as to minimize increases in suspended solids and turbidity that could degrade water quality and adversely affect aquatic life outside the immediate area of operation.

2. The use of machinery in the watercourse shall be avoided unless absolutely necessary.

3. All disturbed stream banks and adjacent areas created by the construction activity shall be protected with erosion control measures during construction. These areas shall be reclaimed with appropriate erosion control measures and revegetated to provide long-term erosion control.

4. Any excess material generated from this project must be disposed of above the ordinary high water mark, in an area not classified as a wetland, and in a position not to cause pollution of State waters.

5. Clearing of vegetation will be limited to that which is absolutely necessary for construction of the project.

6. This authorization does not authorize a point source surface water discharge. MPDES permit is required for said discharge.

7. Open cut creek crossings will not be allowed in flowing water. Stream water must be diverted around the open cut area (pump, flume etc.)

8. The applicant must conduct all activities in full and complete compliance with all terms and conditions of all permits required for this activity issued pursuant to the Montana Natural Streambed and Land Preservation Act (310 permit), the Stream Protection Act (124 permit) the Federal Clean Water Act (404 Permit), any MPDES permits for dewatering or storm water control in the construction area and any valid Memorandum of Agreement and Authorization (MAA) negotiated for this activity.

The FWP representative has determined that this project is within the scope of the programmatic Environmental Assessment prepared by DEQ and FWP for the issuance of narrative turbidity standards.

_____ Date: 8/1/19
FWP Representative's Signature

_____ Date: _____
Applicant's Signature

Name and location of project: Douglas Canal Rehab, Nevada Creek

3201 Spurgin Road
Missoula, MT 59804
August 1, 2019

Montana DNRC
Attn: John Connors, P.E.
PO Box 201601
Helena, MT 59620

SUBJECT: Permit No. SPA - 27-19 R-2
Waterbody: Nevada Creek
Project Name: Douglas Canal Rehab
Water Code: 04-3900

Dear Montana DNRC:

Montana Fish, Wildlife & Parks has reviewed the proposed project in Nevada Creek. **The project is approved provided it is carried out in accordance with the information in the application and all general and any special listed below.**

GENERAL CONDITIONS

1. Complete work affecting a streambed or stream bank in an expeditious manner to avoid unnecessary impacts to the stream.

2. Limit the clearing of vegetation to that which is absolutely necessary for construction of the project. Take precautions to preserve existing riparian vegetation. Salvage and reuse native vegetation where possible.

3. Install and maintain erosion control measures where appropriate to protect aquatic resources. Do not clear and grub land adjacent to streams prior to installing proper erosion and sedimentation controls. Conduct all work in a manner that minimizes turbidity and other disturbances to aquatic resources.

4. Plan temporary construction facilities to:

a. Minimize disturbance to stream banks, stream bank vegetation, and the streambed by locating staging or storage facilities at least 50' horizontally from the highest anticipated water level during construction;
b. not restrict or impede fish passage in streams; and
c. not restrict any flow anticipated during *use*.

5. Provide sediment controls for drainage from topsoil stockpiles, staging areas, access roads, channel changes, and instream excavations.

6. Isolate work zones from flowing and standing waters to prevent turbid water and sediments from being discharged into streams or other drainages that flow directly into the stream. Divert flowing waters around the work zone.

7. Do not spill or dump material into streams. Store and handle petroleum products, chemicals, cement and other deleterious materials in a manner that will prevent their entering streams.

8. Do not allow wash water from cleaning concrete-related equipment or wet concrete to enter streams.

9. Do not operate mechanized equipment in any stream or flowing water unless special authorization is obtained. If special authorization is granted, the following conditions apply:

a. Powerwash all equipment allowed in a stream prior to entering the stream channel.
b. Clean and maintain all equipment so that petroleum-based products and hydraulic fluids do not leak or spill into the waterway.

10. Reclaim streambeds and stream banks as closely as possible to their pre-disturbed condition.

11. Restore disturbed stream banks to their natural or pre-disturbed configuration to match adjacent ground contours or as specified in the project plans. Stabilize, reseed, and re-vegetate disturbed areas. Install and maintain long-term biodegradable erosion-control measures to protect these areas until adequate vegetation has been established.

12. Restore temporary access routes and any temporarily disturbed areas to original conditions, including original contours and vegetation.

13. Dispose of any excess material generated from the project above the ordinary high water mark and in an area not classified as a wetland.

SPECIAL CONDITIONS

1. This permit is not valid until the attached 318 authorization is signed and returned to Pat Saffel at the above address or faxed to 406-542-5529.

2. Minimize disturbance to vegetation near the stilling well site.

Note: This permit is valid for **one year** from the date of receipt.

318 AUTHORIZATION REVIEW

I have reviewed the above project on behalf of the Montana Department of Environmental Quality (DEQ) pursuant to the Montana Water Quality Act Short-term Water Quality Standards for Turbidity 75-5-318 MCA:

☐ This project **will not** increase turbidity if completed according to the conditions listed in the 310 or 124 permit. Therefore, application to DEQ for a 318 authorization **is not** required.

☐ Impacts to the physical and biological environment from turbidity generated as a result of this project are uncertain. Therefore, the applicant must contact the Montana Department of Environmental Quality, 1520 East Sixth Avenue, Box 200901, Helena, MT 59620-0901, (406 444-3080) to determine project specific narrative conditions required to meet short-term water quality standards and protect aquatic biota.

☒ Turbidity generated from this project is expected to be short-term and have only temporary and minor impacts on the physical and biological environment. Therefore, compliance with the conditions stated in ***DEQ's Short Term Water Quality Standard for Turbidity Related to Construction Activity,*** as well as other conditions listed in the 310 or 124 permit, are appropriate for this project.

Sincerely,

Patrick Saffel
Fisheries Manager

Cc: North Powell CD