FINAL DESIGN DOCUMENT

DOWNGRADIENT GROUNDWATER REMEDIATION SYSTEM
VOLUME II: TECHNICAL SPECIFICATIONS

HELEVA LANDFILL SITE
LEHIGH COUNTY, PENNSYLVANIA

EPA WORK ASSIGNMENT
NUMBER 37-08-3N59
CONTRACT NUMBER 68-W8-0037

NUS PROJECT NUMBER 0224

DECEMBER 1991
## SECTION 8.0
### FINAL TECHNICAL SPECIFICATIONS

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Note: All specification numbers according to CSI Manual of Practice.
DIVISION 1

General Requirements
PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall prepare a Contractor Health and Safety Plan (CHSP) in accordance with the requirements of this Section. The plan shall establish, in detail, the protocols necessary for the recognition, evaluation, and control of all hazards associated with each task performed by the Contractor and his subcontractors.

B. The Government has prepared a general Remedial Action Health and Safety Plan (RAHSP). The RAHSP shall provide the minimum requirements for project health and safety and shall be used along with other requirements of this Section, by the Contractor as a guideline in preparing the CHSP.

1.02 RESPONSIBILITIES

A. The Contractor shall be responsible for the development and submittal of the CHSP in accordance with this Section. The Contractor shall also be responsible for the implementation and enforcement of all health and safety practices and procedures as described/outlined in the CHSP for his employees and equipment as well as those of his subcontractors.

1.03 APPLICABLE REQUIREMENTS, GUIDELINES, AND STANDARDS

A. The CHSP shall be prepared in accordance with the RAHSP and the requirements listed below. In the case that these requirements and/or the RAHSP are conflicting, the one which offers the greatest degree of protection shall be followed.

1. Occupational Safety Health Administration (OSHA) General industry Standards found at 29 CFR 1910. The Contractor is made especially aware of the requirements found at 29 CFR 1910.120. Additionally, the requirements found at 29 CFR 1910.1200 (Hazard Communication) shall be applied to this project.
regardless of judicial status. A written Hazard Communication Program meeting these requirements shall be included in the CHSP.


6. ANSI, Protective Footwear, Z41.1.


8. ANSI, Practice for Occupational and Educational Eye and Face Protection, Z87.1.


END OF SECTION
SECTION 01040

COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

A. This work shall consist of the Contractor's responsibility to coordinate and communicate project activities with the Government Project Manager, and all subcontractors or other parties as designated by the Government Project Manager.

B. The items included under this section are the provision of labor, materials, and equipment and the coordination of the Contractor with all involved parties.

1.02 GENERAL OBLIGATIONS

A. The Contractor, any subcontractor, or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall cooperate with all firms or persons authorized to perform any work at or adjacent to the project site.

1.03 SITE CONDITIONS

A. Modifications in the work due to minor interferences and structural obstructions shall be accomplished as part of the Work.

PART 2 - PRODUCTS

2.01 GENERAL

A. The choice of quantity and type of labor, materials, and construction equipment shall be at the discretion of the Contractor, but must be available in the quality and quantity to perform the Work as specified in the Contract and schedule.

B. The Contractor shall furnish equipment which will be efficient, appropriate, and large enough to secure a satisfactory quality of work and a rate of progress which will ensure the completion of the work within the project schedule. If at any time such equipment...
appears to the Government Site Representative to be inefficient, inappropriate, or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, the Government Site Representative may order the Contractor to increase the efficiency, change the character, or increase the equipment, and the Contractor shall conform to such order. Failure by the Government Site Representative to give such an order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

PART 3 - EXECUTION

3.01 GENERAL PROCEDURES

A. The Contractor shall not unload or store materials in areas where these actions will interfere with the progress of the project or impede the work on site.

B. The Contractor shall not block or perform any work on the site access roads, except for the express purpose of maintaining the access roads.

3.02 OPEN EXCAVATIONS

A. The Contractor shall, at his own expense, adequately safeguard all open excavations by providing temporary barricades, caution signs, lights, and other means to prevent accidents to persons and damage to property. The Contractor shall provide suitable and safe bridges and other crossings for accommodating travel by vehicles and workmen. Bridges provided for access during construction shall be removed when no longer required. The size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Government Site Representative. If the excavation becomes a hazard, the Government Site Representative may require special construction procedures, such as limiting the size of the excavation or requiring that the excavation shall not remain open overnight.

B. The Contractor shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles that could be dangerous to the public shall be well lighted at night.

C. All excavations shall comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction.
D. As required by OSHA regulations (29 CFR 1926-652) trenches or excavations with banks more than 5 feet high shall be shored, laid back to a stable slope or equivalent.

3.04 PROTECTION OF WORK, PROPERTY AND PERSONS

A. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury, or loss to all employees on the work and other persons who may be affected thereby; all the work and all materials or equipment to be incorporated therein, whether in storage on or off the site; and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, buildings, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

B. In emergencies affecting the safety of persons or the work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Government, is obligated to act, at his discretion, to prevent threatened damage, injury, or loss. He shall give the Government written notice of any significant changes in the work or deviations from the Contract Specifications caused thereby, and a Change Order shall be requested covering the changes and deviations involved.

C. Relocations of existing utilities indicated in the Contract Specifications to be performed by others are not a part of this Contract. However, it shall be the Contractor's responsibility to coordinate his construction schedule with the performance of such relocation so as not to cause delay in this Contract.

3.05 TRAFFIC REGULATION

The Contractor shall provide traffic control throughout the project. These controls shall include, but not be limited to, flagmen, cones, and warning signs.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This work shall consist of the performance of a property line survey, prior to construction.

B. Components of this work shall include all research, field activities, and report preparation.

1.02 SUBMITTALS

A. The Contractor shall submit to the Government Site Representative copies of the field notes, all reduction calculations, and a map showing the property lines, horizontal control, and the property corners as set by the Contractor, within 14 days following completion of the actual field survey.

PART 2 - PRODUCTS

The Contractor shall provide all labor, materials, and equipment period required for the performance of work.

PART 3 - EXECUTION

3.01 PROPERTY-LINE SURVEY

A. The Contractor shall research all deeds and local survey information necessary to define the property lines of the lot on which the facility is located.

B. The Contractor shall perform all field work necessary to define the property lines. This work shall include but not be limited to:

2. The stakeout of property corners with 5/8-inch diameter iron pins and property lines (as directed by the Government) with 2-inch by 2-inch by 15-inch long wooden hubs spaced every 50 feet on line.

C. Each surveying crew shall include at least one professional surveyor licensed in the Commonwealth of Pennsylvania.

END OF SECTION
SECTION 01170
SPECIAL PROVISIONS

PART 1  GENERAL

1.01  SERVICES OF MANUFACTURER'S REPRESENTATIVES

A.  Bid prices for equipment furnished under Divisions 11, 13, 15, and 16 shall include a competent representative of the manufacturers of all equipment to supervise the installation, adjustment, and testing of the equipment and to instruct Government operating personnel on the operation, maintenance, startup, shutdown, safety, lubrication and troubleshooting procedures of all equipment.

B.  See the detailed Specifications for additional requirements for furnishing the services of manufacturer's representatives.

C.  A certificate from the manufacturer stating that the installation of the equipment is satisfactory, that the unit has been satisfactorily tested, is ready for operation, and that the operating personnel have been suitably instructed in the operation, maintenance, lubrication, and care of the unit shall be submitted upon completion of these tasks. This certificate shall be in the form as attached to the end of this Section.

D.  For equipment furnished under other Divisions, the Contractor, unless otherwise specified, shall furnish the services of accredited representatives of the manufacturer only when some evident malfunction or overheating makes such services necessary in the opinion of the Government Project Manager.

1.02  MANUFACTURER'S OPERATION AND MAINTENANCE MANUALS

A.  Three preliminary and six final complete sets of operation and maintenance instructions covering all equipment furnished under Divisions 11, 13, 15, and 16 shall be submitted.
B. The manual for each piece of equipment shall be a separate document with the following specific requirements:

1. Contents:

   Table of contents and index.
   Brief description of each system including all components.
   Starting and stopping procedures.
   Special operating instructions.
   Routine maintenance procedures.
   Routine and special lubrication procedures and instructions.
   Safety considerations.
   Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams.
   One copy of each wiring diagram.
   List of spare parts, manufacturer's price, and recommended quantity.
   Name, address, and telephone numbers of local service representatives.

2. Material:

   Loose leaf on 60 pound punched paper.
   Holes reinforced with plastic cloth or metal.
   Page size, 8-1/2 inches by 11 inches
   Diagrams and illustrations, attached foldouts as required of original quality, reproducible by dry copy method.

   Covers: oil, moisture, and wear resistant 9 x 12 size.

C. Maintenance and lubrication schedules shall be included in the manuals for each piece of equipment. The Contractor shall provide a list including the equipment name, address, and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained. This schedule shall be in the form indicated at the end of this Section.
D. Submittals to the Government Contracting Officer:

1. Three preliminary copies of manuals shall be submitted to a location to be determined by the Government Project Manager. These preliminary copies must be submitted no later than 15 days following approval of the shop drawings for each piece of equipment. Six final copies of complete manuals shall be submitted to the Government Project Manager prior to field tests.

2. Each manufacturer's operation and maintenance manuals(s) shall have printed on the cover of the manual the specification section and the item number and that specific equipment's plant location.

1.03 INSTALLATION OF EQUIPMENT

A. Special care shall be taken to ensure proper alignment of all equipment with particular reference to the pumps and electric drives. The units shall be carefully aligned on their foundations by qualified millwrights after their sole plates have been shimmed to true alignment at the anchor bolts. The anchor bolts shall be set in place and the nuts tightened against the shims. After the foundation alignments have been approved by the Government Site Representative, the bedplates or wing feet of the equipment shall be securely bolted in place. The alignment of equipment shall be further checked after securing to the foundations, and after conformation of all alignments, the sole plates shall be finally grouted in place. The Contractor shall be responsible for the exact alignment of equipment with associated piping, and under no circumstances, will "pipe springing" be allowed.

B. All wedges, shims, filling pieces, keys, packing, red or white lead grout, or other materials necessary to properly align, level, and secure apparatus in place shall be furnished by the Contractor. All parts intended to be plumb or level must be proven exactly so. Any grinding necessary to bring parts to proper bearing after erection shall be done at the expense of the Contractor.

1.04 GREASE, OIL, AND FUEL

A. The Contractor shall supply all lubricants, applicators and labor for lubricating the equipment, in accordance with manufacturer's recommendations, as indicated in the approved Operations and Maintenance Manuals, for field testing, startup, and prior to
Government' acceptance. A supply of required lubricants sufficient for startup and one year of operation shall also be supplied by the Contractor.

1.05 TOOLS

A. Any special tools (including grease guns, other lubricating devices, wrenches, etc.) which may be necessary for the adjustment, operation, and maintenance of any equipment shall be furnished with the respective equipment.

B. Tools shall be furnished in heavy steel tool boxes complete with lock and duplicate keys.

1.06 CLEANING AND REPLACEMENT OF GLASS

A. All glass shall be thoroughly cleaned and polished by qualified window cleaners just prior to acceptance of the work at the expense of the Contractor.

B. All broken glass shall be replaced by the Contractor if the Contractor is responsible for breaking it at no expense to the Government.

1.07 ARCHITECTURAL COATINGS

A. Maintain coordination among all Sections (windows, louvers, doors and frames, etc.) requiring coatings. All coatings shall match to the satisfaction of the Government Site Representative with regard to color and texture. Items rejected by the Government Site Representative shall promptly be removed from the job site.

1.08 PIPE MARKING

A. Pipe marking is included in Division 9 under Painting, but it shall be the Contractor’s responsibility to assist, as required by the Government Site Representative, in identifying pipe contents, direction of flow, and all else required for proper marking of pipe.
1.09 VALVE INDICES

A. The Contractor shall be responsible for furnishing and installing tags for all valves required for this project. Tags shall be noncorrosive brass, 2 inches in diameter, 19-gage thick. Submit to the Government Site Representative for approval, one sample of the tag proposed and the manufacturer’s standard color chart and letter styles. Tags shall have stamped on them the information required as detailed in the valve numbering system indicated below. The valve numbering system shall consist of a letter prefix to identify the process and three digits to identify the valve. As an example, valving for clarifier effluent would be numbered CEF-001, CEF-002, CEF-003, etc. The letter prefixes are indicated on the Contract Drawings.

B. The Contractor shall be responsible for furnishing three preliminary sets of plans at the 50 percent completion point of the project, which indicate the identification numbers for all valves required on the project, for review and approval by the Government Project Manager. After final approval, furnish six final sets of plans indicating the identification numbers for all valves required on the project and one complete set of mylar drawings in ink, for the Government.

C. The Contractor shall submit a completed valve directory for all valves required on the project, in the form indicated at the end of this section, which shall indicate the valve number, location/system, size and type, manufacturer, and the valve functional description.

D. The Contractor shall furnish an additional 25 blank valve tags for future use.

1.10 STORAGE AND HANDLING OF EQUIPMENT ON SITE

A. The Contractor shall be responsible for the shipment, storage and handling of all equipment.

b. Special attention shall be given to the storage and handling of equipment on and off site. As a minimum, the procedure outlined below shall be followed:

1. Equipment shall not be shipped until approved by the Government Site Representative. The intent of this requirement is to reduce onsite storage time prior to installation and/or operation. Under no circumstances shall equipment be
delivered to the site more than 1 month prior to installation without written authorization from the Government Site Representative.

2. All equipment having moving parts such as gears, electric motors, etc., and/or instruments shall be stored in a temperature and humidity controlled building approved by the Government Site Representative, until such time as the equipment is to be installed.

3. All equipment shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer.

4. Manufacturer's storage instructions shall be carefully studied by the Contractor and reviewed by him with the Government Site Representative. These instructions shall be carefully followed and a written record of this kept by the Contractor.

5. Moving parts shall be rotated a minimum of once weekly to insure proper lubrication and to avoid metal-to-metal “welding.” Upon installation of the equipment, the Contractor shall start the equipment, at least under half load, once weekly for an adequate period of time to insure that the equipment does not deteriorate from lack of use.

6. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance by the Government.

7. When approval for longer term storage has been obtained, the Contractor shall provide a written monthly inspection and maintenance check list which details the manufacturer’s required tasks that were performed on each piece of equipment in storage on this project. This check list must be signed by the Contractor’s representative doing the required maintenance tasks.

8. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a
condition equal to that of equipment that has been shipped, installed, tested, and accepted in a minimum time period. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and repaired or replaced.

9. All items of equipment provided with space heaters shall have such devices energized at all times while in storage and once installed.

1.11 NOISE LIMITATIONS

A. All equipment to be furnished under this Contract, unless specified otherwise in the technical specifications, shall be designed to insure that the sound pressure level does not exceed 85 decibels over a frequency range of 37.8 to 9,600 cycles per second at a distance of 3 feet from any portion of the equipment, under any load condition, when tested using standard equipment and methods unless otherwise noted. Noise levels shall include the noise from the motor. Mufflers or external baffles shall not be acceptable for the purpose of reducing noise. Data on noise levels shall be included with the shop drawing submittal.

1.12 SPARE PARTS

A. Spare parts for certain equipment provided under Divisions 11, 12, 13, 15, and 16 have been specified in the pertinent Sections of the Specifications. The Contractor shall collect and store all spare parts in a secured warehouse at the site until the end of the project or as otherwise when directed by the Government Site Representative. At the end of the project, the spare parts shall be delivered to the site, logged in, and placed in designated storage areas by the Contractor as directed by the Government Site Representative.

B. Spare parts shall be packed in cartons, properly labeled with indelible markings with complete descriptive information including manufacturer, part number, part name, and equipment for which the part is to be used.

C. If the pertinent specification does not call out specific spare parts, then the Contractor is required to provide the spare parts as recommended by the manufacturer in the manufacturer's operation and maintenance manual.
## Typical Maintenance Schedule

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<th>Item</th>
<th>Action</th>
<th>Frequency</th>
<th>Remarks</th>
</tr>
</thead>
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<tr>
<td>Sedimentation</td>
<td>Check scum removal mechanism washdown, washdown if required; remove any debris, etc.</td>
<td>Daily</td>
<td>Scrape and clean walls of structure Repair any damage to wear shoes.</td>
</tr>
<tr>
<td></td>
<td>Dewater, examine structure, scrape and paint all exposed metals, examine wear shoes.</td>
<td>6 mos</td>
<td></td>
</tr>
<tr>
<td>Sludge Collector</td>
<td>Remove shear pin, clean off rust, grease and replace.</td>
<td>6 mos</td>
<td></td>
</tr>
<tr>
<td>Overflow Weir</td>
<td>Check Serviceability</td>
<td>Daily</td>
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## Typical Lubrication Schedule

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<th>Manufacturer's Recommendations</th>
<th>Type Lubricant</th>
<th>Frequency</th>
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<td>Spur and Worm gearing</td>
<td>Check oil level</td>
<td>See below; same as for oil change</td>
<td>Weekly</td>
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<tr>
<td></td>
<td>Change oil</td>
<td>75-80 NSMP Gem Oil (Winter)</td>
<td>6 mos</td>
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<td>80-90 NSMP Gem Oil (Summer)</td>
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<td>Flush out drives before oil change</td>
<td>Kendall Flushing Oil change</td>
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<td>Gear Motors*</td>
<td>Change oil</td>
<td>Kenoil 053 R&amp;O (Winter)</td>
<td>2,000 hrs or 6 mos</td>
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<td>Kenoil 072 R&amp;O (Summer)</td>
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</table>

*See manufacturer's instructional manual for initial operation instructions. (IMPORTANT)
EQUIPMENT MANUFACTURER'S CERTIFICATE OF INSTALLATION
TESTING AND INSTRUCTION

Client __________________________
Project __________________________
Contract No. _______________________

EQUIPMENT SPECIFICATION SECTION
EQUIPMENT DESCRIPTION __________________________

__________________________________________
(Print Name)

__________________________________________
(Print manufacturer's name)

hereby CERTIFY that ________________________
(Print equipment name & model w/serial No.)

installed for the subject project has (have) been installed in a
satisfactory manner, has (have) been satisfactorily tested, is (are) ready
for operation, and that operating personnel have been suitably instructed
in the operation, lubrication and care of the unit(s).

CERTIFIED BY: ____________________________ DATE: __________
(Signature of Manufacturer's Representative)

CONTRACTOR'S ACKNOWLEDGEMENT OF MANUFACTURER'S INSTRUCTION

I(we) the undersigned, authorized representatives of the __________________________
and/or Contractor's Operating Personnel have received
class room and hands on instruction on the operation, lubrication and
maintenance of the subject equipment and prepared to assume normal
operational responsibility for the equipment:

DATE: ____________________________
DATE: ____________________________
DATE: ____________________________
DATE: ____________________________

END OF SECTION
PART 1 - GENERAL

1.01 PRE-CONSTRUCTION CONFERENCE

A. After the Contract is awarded and prior to issuance of the Notice to Proceed, the Contractor shall meet with the Government Project Manager for a Pre-Construction Conference. The purpose of this conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures established. The agenda will include the review of the Contractor’s tentative milestone schedule; procedures for the transmittal, review, and distribution of submittals; project planning documents; invoicing; Health and safety responsibilities, construction quality control, payrolls, and labor relations; environmental protection; maintaining record documents; field decisions and contract changes; uses of site premises; office and storage area layout; Exclusion Zone and Contamination Reduction Zone layout; site security; housekeeping; and major equipment and material deliveries and priorities.

B. At least 10 days prior to the Pre-Construction Conference, the Contractor shall submit his proposed Contractor Quality Control Plan (CQCP) and Health and Safety Plan (CHSP). The plans will be briefly reviewed to provide a general understanding of each system. A more detailed discussion and review of each plan will be covered during the Pre-Construction Conference.

1.02 PROGRESS MEETINGS

A. The Contractor shall attend progress meetings at a minimum of once per week and such additional meetings as required, when scheduled by the Government Project Manager. The Contractor shall attend these meetings with all necessary personnel.
1. The Government Project Manager shall execute the following for the progress meetings:

   a. Prepare agenda for meetings.

   b. Make physical arrangements for meetings.

   c. Preside at meetings.

   d. Record the minutes, including significant proceedings and decisions.

   e. Reproduce and distribute copies of minutes after each meeting to participants in the meeting and to parties affected by decisions made at the meeting.

2. Typical Agenda

   a. Review and approval of minutes of previous meeting.

   b. Review of work progress since previous meeting.

   c. Discussion of field observations, problems, conflicts.

   d. Discussion of problems that may impede construction schedule.

   e. Review of offsite delivery schedules.

   f. Discussion of corrective measures and procedures to regain projected schedule.

   g. Revision to construction schedule.

   h. Review of progress during succeeding work period.

   i. Coordination of schedules.

   j. Review of submittal schedule and corrective measures if necessary.

   k. Maintenance of quality and safety standards.
I. Discussion of pending changes and substitutions.

m. Review of proposed changes for effect on construction schedule and on mechanical completion; and effect on other contracts of the projects.

n. Discussion of other business.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

The Contractor shall provide the submittals required by these Specifications for the Government review.

1.02 SUMMARY OF SUBMITTALS

The submittals which the Contractor is required to provide include, but are not limited to, those specified by the following sections and Table 01300-1.

1.03 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

A. SHOP DRAWINGS

1. Engineering data covering all equipment and fabricated materials that will become a permanent part of the work under this Contract shall be submitted for review. Shop drawings as specified in individual work Sections include, but are not necessarily limited to, custom-prepared data such as fabrication and erection/installation drawings, scheduled information, setting diagrams, actual shop-work manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection, and test reports including performance curves and certifications, manufacturer’s certificates, as applicable to the work.

2. Shop drawings submitted by the Contractor’s subcontractor/supplier for review shall be sent directly to the Contractor for preliminary checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
<table>
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<tr>
<th>Reference Specification</th>
<th>Submittal Identification/Description</th>
<th>Shop Drawings</th>
<th>Sample</th>
<th>Guarantee</th>
<th>Manufacturer’s Data</th>
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3. The Contractor shall check all his subcontractor's shop drawings regarding measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Drawing and Specifications. Drawings found to be inaccurate or otherwise in error shall be returned to the Contractor's subcontractor for correction before submission to the Government.

4. Each submittal shall have affixed to it the following Certification Statement, signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and similar data and I have checked and coordinated each item with other applicable reviewed shop drawings and all Contract requirements."

5. All deviations from the Contract Specifications shall be identified on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittal shall, as pertinent to the deviations, indicate essential details for all changes proposed by the Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

6. Each submittal shall indicate the intended use of the item in the work. When catalog pages are submitted, applicable items shall be clearly identified. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

7. Submittals shall be sequentially numbered, with resubmittals of the same or supplementary information numbered with the original submittal number and an "-A" for the second submittal, "-B" for the third submittal, etc.

B. PRODUCT DATA

1. Product data, as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed
performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing, and printed product warranties, as applicable to the Work.

2. Product data shall also include, if requested by the Government, items of disposable clothing, safety equipment, breathing apparatus, communication devices, items of equipment to be used on the site, and any other items which are required for the safety and health of all personnel on the site. This information shall be submitted to the Government to verify that the requirements for materials have been met. This information shall be required for, at a minimum, the concrete mix, crushed stone, seed mixture, gratings, and concrete manholes.

C. SAMPLES

1. Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, and units of work to be used by the Government for independent inspection and testing, as applicable to the work.

D. SUBMISSION REQUIREMENTS

1. Coordination of Submittal Items

Prepare and transmit each submittal 5 days in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections of the Specifications, so that the installation will not be delayed by processing times including revision and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of time will be authorized because of the Contractor’s failure to transmit submittals sufficiently in advance of the work.
2. Number of Submittals Required
   
a. Shop drawings: Submit six copies.

b. Product Data: Submit six copies.

c. Samples: Submit the number stated in the respective Specification Sections or as directed by the Government Contracting Officer.

d. All other submittals: Submit three copies unless stated elsewhere in the Contract Specification or as directed by the Government Contracting Officer.

3. All submittals, regardless of origin, shall have the following identification data, as applicable, contained thereon or permanently adhered thereto:

   a. Date of submission and dates of any previous submissions.

   b. Project Name and Contract Number.

   c. Contractor’s name and address.

   d. Supplier’s name and address.

   e. Manufacturer’s name and address.

   f. Submittal or resubmittal number.

   g. Title or identification of submittal.

   h. References to applicable Specification paragraphs and Contract Drawings.

   i. Contractor’s Certification Statement.

   j. Deviations from Contract Documents.
E. RESUBMISSION REQUIREMENTS

1. Make any corrections or changes in the submittals required by the Government and resubmit until approved. For shop drawings and product data, resubmittal may not be required.

F. REVIEW OF SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

1. After review by the Government, shop drawings, product data, and samples will be returned to the Contractor stamped with the following classifications:

   a. Approved.

   b. Approved except as noted. Resubmittal not necessary.

   c. Approved except as noted. Resubmittal necessary.

   d. Disapproved. Resubmittal necessary.

   e. Receipt acknowledged.

   f. Submittal not required.

2. Indicate any changes that have been made in addition to those requested by the Government.

3. Samples

Submit new samples as required for initial submittal.

4. No portion of the work requiring a shop drawing, product data, or sample shall be commenced nor shall any material be fabricated or installed prior to review of the shop drawing, product data, or sample by the Government and the submittal returned to the Contractor marked "NO EXCEPTIONS NOTED" or "EXCEPTIONS NOTED." The Government shall not be responsible for any expense or delay due to contractor's corrections or remedies required to accomplish conformity.
5. Any need for more than one resubmission, or other delay in obtaining the Government's review of submittals, will not entitle Contractor to an extension of the Time.

6. Reviews required by this section will be accomplished by the Government Site Representative and returned to the Contractor within 21 days after its receipt by the Government.

G. DISTRIBUTION

1. Distribute reproduction of shop drawings, product data, and samples returned to the Contractor marked "NO EXCEPTIONS NOTED" or "EXCEPTIONS NOTED," where required, to the job site file and elsewhere as directed by the Government. Number of copies shall be as directed by the Government Contact Officer but shall not exceed six (6).

1.04 CONSTRUCTION PHOTOGRAPHS

A.

1. The Contractor shall photographically record progress of construction and provide 3-1/2 inch x 5-inch glossy photographs and negatives.

2. Photographs will include: preconstruction photographs, weekly progress photographs, and post construction photographs.

3. Pre and post construction photographs shall be 8" x 10" colon.

B. Each photographic print shall have attached to the backing a label, approximately 4 inches wide by 2 inches high containing thereon in typed lettering:

1. Project name and Contract number

2. Contractor's name

3. Photographer's name
4. Photographer’s numbered identification of exposure

5. Date and time of exposure

6. Orientation of view

7. Short description of view

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

With its proposal, the Contractor shall provide a Contractor's Construction Operations Plan (CCOP). The CCOP shall identify personnel, equipment, and construction procedures to be used in carrying out the requirements of this project.

1.02 CONTENTS OF THE CCOP

A. The Construction Operations Plan shall outline the overall construction sequencing and procedures to be followed during the site work activities. The plan shall contain a thorough and concise summary of how the work will be accomplished and shall include at a minimum:

1. Contractor's technical approach including work sequence, major milestones, health and safety, and general work procedures.

2. Construction Operations Organization Chart showing lines of authority and responsibility. Number of personnel to be utilized on the job should be indicated in appropriate organizational elements. If significant changes in the organization are expected to occur during the life of the project or phases of construction, these should be discussed.

3. Names, qualifications, and work experience of all Contractor supervisors, health and safety personnel, and employees with Quality Control responsibilities. If the personnel identified in the CCOP are not available at the start of the project, the Contractor shall submit, prior to mobilization, the names and qualifications of substitute personnel, with equal or more extensive experience, to the Government Contract Officer for approval.
4. Equipment to be utilized for the site activities.

5. Discussion of regulatory requirements applicable to the project and how compliance will be assured. Personnel training requirements should be listed and compliance demonstrated.

1.03 NOTIFICATION OF CHANGE

After submittal of the CCOP, the Contractor shall notify the Government Contract Officer in writing of any proposed change.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. The purpose of this section is to detail the minimum requirements the Contractor shall address and abide by with respect to quality control.

B. The Government shall be responsible for the preparation of the project's Quality Assurance Project Plan (QAPP) as part of the Project Operations Plan (POP).

C. The Contractor shall be responsible for the preparation of the Contractor Quality Control Plan (CQCP), which details his quality control organization and the equipment calibration procedures to be used during the course of work.

D. The Contractor shall be responsible for the implementation and control of the provisions of the QAPP and CQCP.

E. Except for Government inspection and tests, inspection and testing of all work shall be the responsibility of the Contractor. Sufficient inspections and tests of all items of work, including that of subcontractors, shall be performed on a continuing basis to ensure conformance to applicable Specifications and Drawings with respect to the quality of materials, workmanship, construction, finish, functional performance, and identification. The Contractor shall furnish qualified personnel, appropriate facilities, instruments and testing devices necessary for the performance of the quality control function. The controls shall be adequate to cover all construction operations both on and offsite, shall be keyed to the proposed construction sequence and shall be correlated by the Contractor's quality control personnel.
1.02 CONTRACTOR'S QUALITY CONTROL PLAN

A. The Contractor shall outline the hierarchy and responsibilities of his quality control organization.

B. The Contractor shall include copies of all instrument calibration logs to be used for approval by Government Site Representative.

C. The CQCP shall be submitted, for review and approval, at least 10 days prior to the Pre-Construction Conference.

D. The CQCP shall identify procedures for scheduling and managing submittals, including those of subcontractors, offsite fabricators and suppliers.

E. The CQCP shall describe procedures for the following:

1. Data reduction and Reporting
2. Performance and System Audits
3. Data Assessment
4. Reports (Monthly summary reports of project status shall be prepared and submitted.)

F. Preventative Maintenance Procedures and Schedules. A preventive maintenance system for facilities and instrumentation shall be described in the CQCP. Equipment maintenance procedures shall be documented for all testing and measuring instruments requiring routine maintenance. This equipment should be tagged with maintenance labels indicating the date of required maintenance, the person maintaining the equipment, and the next maintenance date. Information pertaining to life histories of equipment maintenance shall be stored in individual Equipment History Logs for each instrument at the site requiring routine maintenance.

G. Included with the CQCP shall be the Contractor's Quality Control Daily Report form, which shall include, at a minimum, the following:

1. Location of each activity in progress.
2. Weather conditions.
3. Each activity performed.
4. Specific inspections performed and results.
5. Problems identified.
6. Corrective actions taken, if any.
7. Instrument calibrations, frequency, and results.
8. Verbal instructions from the Government Site Representative.
9. Type of test performed, samples collected, personnel involved, and results of tests including quality control results.
10. Results of quality control checks, duplicate analysis, etc.
12. Contractor's certification.

PART 2 - PRODUCTS

The Contractor shall provide all labor, materials, and equipment required to perform the work.

PART 3 - EXECUTION

3.01 CONTROL

A. Contractor Quality Control means the Contractor assures himself and the Government that the remedial action implementation complies with the requirements of the Drawings and Specifications. The controls shall be adequate to cover all contract operations. During site operations the Contractor shall follow guidelines and procedures detailed in the QAPP.

3.02 DOCUMENTATION

A. The Contractor shall submit to the Government Site Representative on a daily basis the Contractor's Quality Control Daily Reports and shall maintain up-to-date records of quality control operations, activities, and tests performed including the work of suppliers and subcontractors.

B. These records shall be in a form approved by the Government and shall indicate a description of trades working on the project, the number of personnel working, the weather conditions encountered, any delays encountered, and acknowledgment of
deficiencies noted along with the corrective actions taken regarding current and previous deficiencies.

C. These records shall cover both conforming and defective or deficient features and shall include a statement that supplies and materials incorporated in the work comply with the contract.

D. The Contractor shall keep records of the completion inspection, including a "punch list" of items that do not conform to the Drawings and Specifications. For each item on this list, the Contractor shall document the corrective actions taken.

END OF SECTION
SECTION 01430

ENVIRONMENT PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section covers the work required for the protection of the environment throughout the course of the project, except for those measures set forth in other sections of these Specifications.

B. Environmental protection shall be defined as the retention of the environment in its natural state, to the greatest extent possible, during the project implementation, and the enhancement of the natural appearance in its final condition.

C. Items to be considered under this section are air, water, and land resources and shall include noise, solid waste management, and management of other pollutants.

D. The Contractor shall be responsible for complying with all applicable Federal, state, and local laws concerning the prevention, abatement, and control of all environmental pollution arising from the project activities.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 PROTECTION OF LAND RESOURCES

A. The Contractor shall confine his project activities to the work areas shown on the Drawings.
B. The Contractor shall take all measures necessary to prevent tracking of mud and dirt onto adjacent public roadways. These measures shall include a gravel entrance. Adjacent public roadways shall be cleaned as often as necessary to maintain a dust and mud free surface.

3.02 PROTECTION OF WATER RESOURCES

The Contractor shall implement special measures to prevent chemicals, fuels, oils, greases, excavated materials, and decontamination fluids from entering public waters.

3.03 The Contractor shall, at all times, perform work in a manner that minimizes the interference with or the disturbance to fish and wildlife.

3.04 BURNING

Under no circumstances shall the burning of debris or waste materials be conducted at the site.

3.05 TEMPORARY CONTROLS

A. Noise Control

The Contractor shall conduct his operations so as not to violate any applicable ordinances, regulations, rules, and laws. All construction machinery and vehicles shall be equipped with practical sound-muffling devices and operated in a manner to cause the least noise, consistent with efficient performance of the work.

B. Dust Control

The Contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water. Dusty materials in piles or in transit shall be covered to prevent blowing.
C. Water Control

The Contractor shall provide for the drainage of stormwater and such water as may be applied or discharged on the site in performance of the work. Drainage facilities shall be adequate to prevent damage to the work, the site, and adjacent property.

D. Erosion Control

1. The Contractor shall prevent erosion of soil on the site and adjacent property resulting from his construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operations that will disturb the natural protection.

2. Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation preserved to the greatest extent practicable. The temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This work shall include the provision, layout, installation, maintenance, and removal (upon completion of work) of all temporary facilities required by the Statement of Work.

B. The facilities shall include, but not be limited to:
   1. Government's office trailer
   2. Contractor's office trailer
   3. Equipment and storage trailers
   4. Personnel lunchroom facility
   5. Sanitary facilities
   6. Communications equipment

1.02 OTHER REQUIREMENTS

A. The Contractor shall comply with the latest National Electrical and Building Codes.

B. The Contractor shall comply with all applicable Federal, state, and local laws and regulations, and with utility company requirements.

C. Field offices shall be equipped as specified and shall be available at the site for Government's use prior to the commencement of any field work under the Contract. The field offices shall be located as directed by the Government Site Representative.
1.03 SUBMITTALS

The Contractor shall submit to the Government Site Representative, for approval, Site Layout Drawings showing the proposed location of all construction facilities, as well as construction equipment lists. These shall be submitted at least 10 days prior to the Pre-Construction Conference.

PART 2 - PRODUCTS

2.01 FIELD OFFICE

The Contractor shall provide and maintain two field offices (1 each for the Contractor and Government).

2.02 GOVERNMENT' FIELD OFFICE

A. The Government' field office shall be a trailer-type, mobile structure. The trailer shall contain a minimum of 400-square feet of floor area, two offices, four lockable windows, and two lockable exterior doors. This office shall be for the free and exclusive use of the Government.

B. The Contractor shall provide and maintain the following equipment and furnishings within the Government' field office trailer:

- 1 telecopy machine with separate service. Machine capable of transmitting and receiving. Must be compatible with Xerox Model 7020 Transceiver.
- 3 desks with locking drawers
- 3 swivel chairs
- 8 straight chairs
- 1 conference table, minimum 3 feet by 8 feet
- 1 drafting table, 3 feet by 6 feet
- 2 drafting stools
- 2 steel file cabinets (letter size), 4 lockable drawers each
- 1 plan rack
- 1 plan hanger
- 2 bookcases, 3 shelves each
- 2 waste-paper baskets
• 2 coat racks
• 1 first aid kit
• 2 telephones, separate service
• 1 desk top, heavy duty, electric, dry process photocopier including a comprehensive service policy covering maintenance
• 1 current model, electric typewriter, IBM Selectric or equal
• 1 water cooler including comprehensive service policy

2.03 CONTRACTOR'S FIELD OFFICE

A. The Contractor shall maintain a suitable office located as directed by the Government. This office shall be the headquarters of the Site Superintendent. Any communication given to the said Superintendent shall be deemed to have been delivered to the Contractor.

2.04 SERVICES

All occupied field trailers shall be provided with, at a minimum, the following services:

• Electric lighting, 4-foot fluorescent tubes.
• Heating and cooling, sufficient to maintain an ambient air temperature of 70 degrees Fahrenheit.
• Potable water.
• Fire extinguisher, nontoxic, dry chemical approved for class A, B, and C fires.
• Sufficient supply of electrical outlets.

2.05 EQUIPMENT AND STORAGE TRAILERS

The Contractor shall provide adequate facilities for the storage of equipment and materials. The equipment and storage trailers shall be located as directed by the Government.
A. The Contractor shall site all temporary facilities at approved locations and properly anchor them to withstand all anticipated weather conditions.

END OF SECTION
PART 1 - GENERAL

1.10 SUMMARY

This section outlines the minimum requirements the Contractor shall address with respect to maintaining a secure project site.

1.02 SITE CONTROL

A. Control of all persons and vehicles entering and leaving the project site shall be provided by the Contractor. The Contractor shall exclude from the site, all personnel not properly identified or those without a legitimate business purpose. All visitors must be approved by the Government Site Representative.

B. The Contractor shall provide the following services:

- Provide 24-hour security personnel.

- Maintain a current list of persons authorized by Contractor or Government to enter the site.

- Require display of identification by onsite personnel.

- Require personnel to sign in upon entering the site and to sign out when leaving. Maintain a single-volume, permanent log of all construction and supervisory personnel, visitors mobile equipment, and vehicles entering and leaving the site.

- Require signature of visitors on a Site Access Release form relieving the EPA, Government, Contractor and their officers, employees, and agents of the liability of consequences related to the potential hazards associated with site entry. The language on the form must be reviewed by the Government Site Representative.
1.03 POSTED REGULATIONS

The Contractor shall provide and erect the following signs:

- A notice directing visitors to the security officer shall be posted at the site entrance.
- A notice which states "Warning, Hazardous work area, do not enter unless authorized" shall be posted at the entrances to the Main Work Area.
- Safety regulations and safety reminders shall be posted at conspicuous locations throughout the site.

1.04 SITE CONTROL

A. The Contractor shall submit to the Government Site Representative, for approval, the qualifications of all security personnel.

B. The Contractor shall maintain control of the site and shall be responsible for around-the-clock (24-hour/day) site security during the period of onsite operations.

C. The Contractor shall ensure that all security personnel have complied with the training and medical examination requirements as specified in Section 01037: REMEDIAL ACTION HEALTH AND SAFETY.

D. The Government Site Representative shall have the right of approval and rejection of the security personnel assigned to the project site at any time during Contractor activities.

END OF SECTION
SECTION 01700
PROJECT RECORD DOCUMENTS/CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall maintain accurate and comprehensive records of all site activities as well as all additions, substitution of materials, variations in work, and any other revisions to the Contract Specifications.

1.02 SUBMITTALS

A. The Contractor shall deliver to the Government Contract Officer within 30 days of the completion of Work, all Project Record Documents. Delivery shall be a condition of final payment.

B. The Project Record Documents shall include all items specified in Section 2.01A of this section.

C. The submittal shall be accompanied by a transmittal letter containing:

- Date
- Project title and address
- Contractor's name and address
- Title and number of each record
- Certification that each document, as submitted, is complete and accurate
- Signature of the Contractor's representative
PART 2 - PRODUCTS

2.01 MATERIALS

A. The Contractor shall maintain, at the job site, one copy of the following Project Record Documents:

- As-built drawings showing all variations from the contract drawings
- Support Plans
- Modifications to the Contract
- Sampling and analysis records and results
- Contractor's daily progress or activity reports, including:
  - records of all site work
  - records of site inspections
  - meteorological records
  - safety and accident incident reports
- Wage records as required for Federal and state funded projects
- Contractor's Quality Control Summary
- Other items as required by Contract

B. The Contractor shall provide safe, onsite storage for all Project Record Documents. This storage shall be available to the Government for inspection.

PART 3 - EXECUTION

3.01 RECORDING

A. The Contractor shall clearly label each document as "Project Record."

B. The Contractor shall keep all record documents current.

C. Specifications and Addenda shall be legibly marked up to record Contract's modifications, field orders and other matters not originally specified.
3.02 CONTRACTOR'S QUALITY CONTROL SUMMARY

Within 30 days of the completion of the Work, the Contractor shall prepare and submit a Contractor's Quality Control Project Summary Report. The report is a compilation and summarization of the Quality Control Daily Reports. The intended purpose of this report is to state the overall quality of data produced during the project and the acceptability of data based on QA/QC efforts. An appendix to this report will include copies of all documentation concerning data collection, analysis, and reporting. The appendix will contain the following:

A. Meteorological records
B. Daily inspection records
C. Results of all testing

END OF SECTION
DIVISION 2

Site Work
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to demolish existing structures, equipment and pipelines as required for the construction of the new work as shown on the Drawings and as specified herein.

B. This section includes complete removal and disposal of existing structures, foundations, slabs, buried piping and miscellaneous appurtenances encountered during construction operations.

C. Demolition includes:

1. Complete demolition and removal of all existing structures which are encountered in the way of the new work as shown on the Drawings.

2. Partial demolition as necessary below finished grade of all existing structures which are not in service or required for construction of the treatment facility.

3. Temporary modification of structures, equipment, appurtenances and utilities as necessary to allow for operation of the facilities during construction.

4. Removal of existing chainlink fence and gate when required by the Government.

5. Removal of existing landscaping including trees, shrubs, etc., as necessary.

D. Blasting and the use of explosives will not be permitted for any demolition work.
1.02 RELATED WORK NOT INCLUDED

A. General Site Preparation is included in Section 02100.

B. Excavation, Backfill and Grading is included in Section 02200.

1.03 CONDITION OF STRUCTURES

A. The Government Contracting Officer assumes no responsibility for the actual condition of the structures to be demolished or modified.

1.04 DISPOSAL OF MATERIAL

A. Remove debris, rubbish and other materials resulting from demolition operations from site. Transport and legally dispose of materials off site.

B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

C. Burning of removed materials is not permitted on project site.

1.05 TRAFFIC AND ACCESS

A. Conduct demolition and modification operations, and the removal of equipment and debris to ensure minimum interference with roads, both onsite and offsite and to ensure minimum interferences with occupied or used facilities.

B. Do not close or obstruct streets or other occupied or used facilities without permission from the Government Site Representative. Provide alternate routes around closed or obstructed traffic in access ways.

1.06 PROTECTION

A. Exercise precautions for fire prevention. Acceptable fire extinguishers shall be available at all times in areas where demolition work by burning torches is being performed. Burning of demolition debris shall not be permitted on or near the site.
B. The Contractor shall furnish signs, lights, barricades and other equipment as may be necessary for the safe prosecution of his work. All protection shall be removed when demolition work is completed.

1.07 DAMAGE

A. Promptly repair damage caused to adjacent facilities by demolition operations as directed by the Government Site Representation and at no cost. Repairs shall be made to a condition at least equal to that which existed prior to commencement of demolition activities.

1.08 UTILITIES

A. Maintain existing utilities which remain in service and protect against damage during demolition operations.

B. Temporary utilities must be in operation prior to removal of existing utilities to be demolished. Remove temporary utilities at completion of new work.

C. The Contractor shall cooperate with the Government Site Representative to shut off utilities serving structures of the existing facilities as required by demolition operations.

D. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services under the jurisdiction of the utility companies.

E. All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.10 DUST AND NOISE CONTROL

A. The Contractor shall take all possible measures to minimize the amount of dust and noise resulting from demolition activity.
PART 2 PRODUCTS

2.01 MATERIALS

A. All materials or items of equipment required for the performance of the work of this section shall be suitable for the intended purpose and shall be equal, where applicable, to similar items and materials specified in other sections of the Specifications.

PART 3 EXECUTION

3.01 DEMOLITION

A. Demolition shall be performed to the limits shown on the Drawings or, if no limits are shown, to a depth at least 2 feet below final grade, or 2 feet below any new foundation or pipe.

B. Removal all existing work as indicated on the Drawings and prepare adjoining areas for installation of new work or for blocking up and filling in of openings.

C. Demolition debris shall not be used for fill or backfill.

3.02 BURIED PIPING

A. Remove all buried piping encountered during excavation unless otherwise directed by the Government Contracting Officer.

3.03 MISCELLANEOUS CONCRETE

A. Remove miscellaneous concrete where shown on the Drawings or where necessary for the construction of the new structure and piping.

END OF SECTION
PART 1  GENERAL

1.01  SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to prepare the site for construction. The work includes, but is not limited to, implementing the following procedures prior to any intrusive activities.

2. Site Debris Removal.
3. Clearing and Grubbing.

B. Site preparation shall not begin until final approval of all plans required in Section 01300 has been received.

1.02  RELATED WORK NOT INCLUDED

A. Excavation, Backfill and Grading is included in Section 02200.
B. Materials is included in Section 02200.
C. Fences and Gates are included in Section 02830.

1.03  APPLICABLE PUBLICATIONS


PART 2  PRODUCTS

2.01  FILL MATERIALS

A. Fill materials shall conform to the provisions of Section 02200.
2.02 CONCRETE

A. Concrete supply and placement shall conform to the provisions of Section 03300.

PART 3 EXECUTION

3.01 GENERAL

A. Generation of airborne particulate matter shall be minimized at all times.

B. All work areas shall be constructed to maintain linear grade and shall be maintained in good condition throughout the progress of the work, as required. In the event of damage, all repair and replacement necessary shall be made to the approval of the Government Site Representative.

3.02 HEALTH AND SAFETY PROCEDURES

A. The conditions and procedures outlined in Section 01037 shall be followed during this operation.

B. During this operation, the Contractor shall provide the following:

1. Prior contact with the appropriate emergency public service agency (civil defense, police, fire, and hospital).
2. Air monitoring equipment.
3. Personnel protective equipment and clothing.
4. Sufficient potable water for personnel hygiene and decontamination.

3.03 PROTECTION OF EXISTING WELLS

A. The Contractor shall use all means necessary to protect the existing wells.

B. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary to the approval of the Government Site Representative.

3.04 CLEARING AND GRUBBING
A. General

1. Except as otherwise directed, cut, grub, remove, and dispose of all shrubs, roots, and any other objectionable material as required within the limits of work defined on the Drawings and as approved by the Government Site Representative.

2. Materials removed as a result of clearing and grubbing shall be regarded as non-hazardous and shall be disposed of off site.

3. Also included is the filling of holes resulting from grubbing or removal operations, and the grading and restoration of cleared areas.

4. The Contractor is advised that it is the intention of this contract to protect and save any trees within the limit of work. The Contractor shall protect all trees 2 inches in diameter and greater that are not to be removed and are in danger of being damaged. The trees shall be protected by completely encircling with a minimum of 3/4-inch planking at a minimum height of 8 feet or with snow fencing as directed by the Government Site Representative.

5. In the performance of clearing and grubbing, the Contractor shall be responsible for the preservation of all public and private property, existing lawns, trees, plants, and other vegetation that are to remain within or adjacent to the project and shall use every precaution necessary to prevent damage or injury thereto. He shall give special attention to the protection of the natural vegetation and other existing landscape features and surroundings. The Contractor shall repair all injuries to bark, trunk, limbs, and roots or remaining plants by properly dressing, cutting, tracing, and painting, using only approved tree surgery methods, tools, and material. The Contractor shall replace to their original condition, by approved seeding methods and materials as specified in Section 02485, all grass areas which have been damaged by his work. The Contractor shall not remove, cut, injure, or destroy trees or shrubs outside the limits of work.

6. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect or misconduct, on the part of the Contractor in the execution of the work, such property shall be restored by the Contractor, at his expense, to a condition equal to that existing before such
damage or injury was done, or he shall make good such damage or injury in such other manner as may be acceptable to the Government Site Representative.

7. On-site burning will not be permitted.

8. In addition to complying with all pertinent codes and regulations, comply with the requirements of those insurance carriers providing coverage for this work.

B. Clearing

1. Clearing operations shall consist of the complete removal and disposal of all trees, brush, and vegetation.

2. Trees and brush may be chipped on site prior to removal from the site.

C. Grubbing

1. Grubbing shall consist of the removal of all stumps, roots, and buried logs. All tap roots, lateral roots, or other projections over 1-1/2 inches in diameter shall be removed to a depth of 3 feet below the natural ground surface. All holes caused by grubbing operations shall be filled in layers to the lower level of adjacent stripping operations and each layer compacted to a density equal to that of the adjoining undisturbed material.
PART 1  GENERAL

1.01  SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidental required to remove and dispose of all surface water and ground water entering excavations, when required.

1.02  RELATED WORK NOT INCLUDED

A. Excavation, backfill and grading is included in Section 02200.

1.03  SUBMITTALS

A. Submit shop drawing to the Government Contracting Officer as provided in Section 01300. Show details of dewatering system including proposed areas for drainage disposal.

B. Receipt of the Contractor's plan for dewatering by the Government Contracting Officer shall not relieve the Contractor of sole responsibility for the means, methods and adequacy of the dewatering system.

PART 2  PRODUCTS

2.01  MATERIALS

A. Piping, pumping equipment and all other materials required to provide dewatering of excavations shall be suitable for the intended purpose. Standby pumping units shall be maintained at the site to be used in case of failure of the normal pumping units.
PART 3 EXECUTION

3.01 DEWATERING AND DRAINAGE SYSTEM

A. At all times during construction, provide and maintain required equipment and facilities to dewater ponded work areas, to remove all ground water and surface water entering excavations, and to remove all standing water from such excavations until remediation and refill are complete to the satisfaction of the Government Site Representative.

B. Construct well or pump installations with proper sand or fabric filters to prevent drawing of finer-grained soil from the surrounding ground.

C. Construct dikes and berms, install temporary plugs or other temporary structures to isolate the work area from run-on. Provide for emergency handling or storm flows.

D. Collect water entering the excavation form surface runoff in shallow ditches around the perimeter of the excavation and drain to the specified disposal areas.

E. Dispose of drainage so that flow or seepage back into the excavated area will be prevented.

F. Drainage shall be surface discharged to an area approved by the Government Site Representative.

END OF SECTION
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, fill compaction and grading required to complete the work shown on the Drawings and specified herein. The work shall include, but not necessarily be limited to excavation for structures, piping, all backfilling, fill and required grading; disposal surplus and unsuitable materials; and all related work such as sheeting, bracing and water handling.

B. The work of all sections in Division 2 of these Specifications shall be coordinated with the work specified under this Section.

C. Provide all necessary facilities for dewatering when required as specified in Section 02140.

1.02 RELATED WORK NOT INCLUDED

A. Site preparation is included in Section 02100.

B. Piping, valves, and supports are included under respective Sections of Division 15.

C. Dewatering is included in Section 02140.

1.03 EXISTING UTILITIES, STRUCTURES AND FACILITIES

A. The locations of existing underground structures as shown on the Drawings are approximate only and are shown only for the convenience of the Contractor, who must verify the information to his own satisfaction.
B. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, the Contractor shall inform the Government Site Representative of such piping or utility immediately. The Contractor shall make modification as directed by the Government Contracting Officer.

C. The Contractor shall be held responsible for the cost of repairing all utilities, structures and subsurface drains which become damaged due to his construction operations, whether or not they appear on the Drawings. The Contractor shall comply with the provisions of Act 172 (1986) of the Commonwealth of Pennsylvania to ascertain the location and type of utilities, prior to performing any excavation. All costs, including the costs of services of representatives of the affected utilities, incurred in such location operations shall be included in the Work.

D. Furnish all the necessary equipment and assume the responsibility of handling any water from storm, surface and flood flows which may be encountered at any time during construction. The manner of providing for these flows shall meet with the approval of the Government Site Representative.

E. Should it become necessary to permanently or temporarily move any conduits, pipes, wires or structures in order to permit the Contractor to execute the Work, the Contractor shall notify the Government Site Representative of the location and circumstances, and will cease work if necessary, until satisfactory arrangements have been made by the owners of said obstructions to properly care for the same. Changes or temporary removal of such items shall be included in the Work.

F. The Contractor shall, shore up and protect any poles, or other public or private structures which may be encountered or endangered in the prosecution of the Work, and that may not be otherwise provided for, and he shall repair and make good any damages caused to any such property by reason of his operations. All existing active structures which due to the prosecution of the work are removed shall be replaced by the Contractor.

1.04 SUBMITTALS

A. Submit to the Government Contracting Officer for review in accordance with Section 01300, the proposed methods for construction, including dewatering,
excavation, filling, compaction, and backfilling for the various portions of the work. The Contractor shall remain responsible for the adequacy and safety of the methods.

B. Submit for approval of the Government Site Representative results of the compaction testing specified herein. Subsequent work on a specific area cannot proceed until test results have been approved by the Government Site Representative.

C. Submit for approval sieve analyses of materials to be used as specified herein.

1.05 SOIL TESTING

A. Testing shall be conducted by an independent laboratory hired by the Contractor and approved by the Government Contracting Officer. If test results do not meet the specified requirements, Contractor shall correct deficiencies in compacted material and shall retest.

B. Field density tests of the compaction of subgrade and each layer of fill shall be performed for every 1,000 square feet of foundation area and every 5,000 square feet of paving areas. The tests shall be in accordance with one of the following: ASTM D1556, ASTM D698, ASTM D2167, ASTM D2922, or ASTM D2937. Contractor shall allow time for the performance of the tests upon completion of each layer of fill in a designated area. The Contractor shall provide equipment to cut out smooth-surfaced spot locations designated by the Government Site Representative on which to perform the test. When the tests indicated that density or moisture content does not meet requirements specified herein, the particular layer or portion thereof, as determined by the Government Site Representative, shall be reworked by rolling or by scarifying, wetting, or drying and compacting until the required density has been obtained.

1.06 JOB CONDITIONS

A. Contractor shall barricade open excavations occurring as part of this work, and shall post and operate warning lights as recommended by authorities having jurisdiction.

B. Contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
PART 2 PRODUCTS

2.01 MATERIALS

A. Structural Fill

1. Structural Fill (bank run gravel) shall be gravel, sandy gravel, or gravelly sand free of organic material, loam, wood, trash, snow, ice, frozen soil, and their objectionable material and shall be well graded within the following limits:

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<tr>
<th>Sieve Size</th>
<th>Percent Finer by Weight</th>
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<tr>
<td>4-in</td>
<td>100</td>
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<tr>
<td>No. 4</td>
<td>20 - 70</td>
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<tr>
<td>No. 40</td>
<td>5 - 35</td>
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<tr>
<td>No. 200</td>
<td>0 - 7</td>
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</tbody>
</table>

2. The Government Site Representative may reject structural fill if the content and size of material does not conform to these specifications.

B. Sand

1. Sand shall conform to ASTM C33 for fine aggregate.

PART 3 EXECUTION

3.01 STRIPPING AND STORING OF TOPSOIL

A. Those portions of the site on which the new work is to be built, shall be stripped of all topsoil, prior to other earthwork operations.

B. Topsoil shall be stripped to a depth of not less than 12-inches from all areas where new work is to be constructed.
3.02 EXCAVATION BELOW GRADE

A. If the bottom of any earth excavation is taken out below the limits shown on the Drawings or specified or directed by the Government Site Representative, it shall be refilled at the Contractor's expense with concrete, 8-in layers of compacted fill or other material satisfactory to the Government Contracting Officer. The type of material to be used shall be at the Government Contracting Officer's option.

B. If water intrusion into an excavation occurs through Contractor's failure to postpone final excavation immediately above the subgrade until shortly before placing of the new work thereon, or other failure or neglect to conduct the excavation work properly so that the surface of the subgrade is in proper condition when his is ready for construction, the Contractor shall remove the unsuitable material and replace it with concrete, compacted fill, or other approved material at his own expense so that the conditions of the subgrade meets with the approval of the Government Site Representative before any work is placed thereon.

3.03 TRENCH PROTECTION

A. The Contractor shall construct and maintain sheeting and bracing as required to support the side of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, existing piping and/or foundation material from disturbance, undermining, or other damage.

B. Where necessary, sheeting shall be driven ahead of the excavation as it advances. The bracing shall be so arranged as not to place any stress on portions of the completed work until general construction thereof has proceeded far enough to provide ample strength to support the loads.

C. All sheeting and bracing shall be removed unless otherwise directed by the Government Site Representative. Sheet ing and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction or other structures, utilities, existing piping, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed by the Government Site Representative.
E. The right of the Government Site Representative to order sheeting and bracing to be left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

3.04 TRENCH EXCAVATION

A. Excavation for all trenches required for the installation of pipes and electrical cables shall be made to the depth of 6 inches below each unless otherwise shown on the Drawing. Contractor shall excavate the trench to provide a minimum of 48-inch clear cover over the top of pipe and 36-inch clear cover over top of the electrical cables unless otherwise noted on the Drawing. Contractor shall excavate in such manner and to such widths as will give suitable room for laying the pipe within the trenches, for bracing and supporting, and for pumping and drainage facilities. The trench width at the top of the pipe shall not exceed the allowable as determined by the depth of cut and indicated on the Drawings.

B. Rock shall be removed to a minimum 8-inches clearance around the bottom and sides of all the pipe being laid.

C. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Government Site Representative. Excavate any organic soil material from the bottom of the trench to a depth of 3 feet below the pipe invert and replace with sand.

3.05 BACKFILLING

A. Site excavated common fill shall be used as fill against exterior walls of structures, as embankment fill or in other areas as designated by the Government Site Representative. Common fill shall be placed in layers having a maximum thickness of 12 inches measured before compaction.
B. Common fill shall be placed in all other areas and shall be compacted to at least 92 ± 2 percent of maximum density as determined by ASTM Compaction Tests, Designation D698.

C. Materials placed in fill areas shall be deposited to the lines and grades shown on the Drawing making due allowance for settlement of the material.

D. The surfaces of filled areas shall be graded to smooth true lines, strictly conforming to grades indicated on the grading plan, and no soft spots or uncompacted areas shall be allowed in the work.

E. No compacting shall be done when the material is too wet either from rain or from excess application of water. At such times, work shall be suspended until the previously placed and new materials have dried sufficiently to permit proper compaction.

3.06 DISPOSAL OF SURPLUS MATERIAL

A. Materials shall be neatly piled so as to inconvenience as little as possible the public and adjoining property owners until used or otherwise disposed of.

B. Suitable excavated material shall be used for fill embankments or backfill on the different parts of the work as required.

C. At the Contractor's option, surplus clean fill materials may be regraded on-site or disposed of off-site.

3.07 GRADING

A. Grading in preparation for placing of gravel areas, drives and appurtenances shall be performed at all places that are indicated on the Drawings, to the lines, grades, and elevations shown and as otherwise directed by the Government Site Representative. All material encountered, of whatever nature, within the limits indicated, shall be removed and disposed of as directed. During the process of grading, the subgrade shall be maintained in such condition that it shall be well drained at all times. When directed, temporary drains and drainage ditches shall be installed to intercept or divert surface water which may affect the prosecution or condition of the work.
B. If at the time of grading it is not possible to place any material in its proper section of the permanent structure, it shall be stockpiled in approved areas for later use.

C. The right is reserved to make minor adjustments or revisions in lines or grades if found necessary as the work progresses, due to discrepancies on the Drawings or in order to obtain satisfactory construction.

D. Stones or rock fragments larger than 4 inches in their greatest dimensions will not be permitted in the top 6-inch layer of the finished subgrade of all fills.

END OF SECTION
PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section includes the excavation and disposal of rock and boulders.

B. Only rock, boulders and existing foundations actually removed will be paid for and in no case will allowance be made for removal outside of the limits of trenching and excavation shown on the Drawings and specified, unless such materials have been taken out at the direction of the Government Site Representative. Rock, boulders, and existing foundations removal allowances will be approved by the Government Site Representative prior to performing the work.

1.02 DEFINITIONS

A. Rock, boulder and existing foundations excavation shall mean rocks, boulders or foundations exceeding 1 cubic yard in volume which can not be excavated without resorting to drilling or other approved methods.

B. Materials which can be loosened with a pick, frozen material, shale and hard pan which for convenience or economy is loosened by drilling and wedging will not be measured as rock excavation.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.01 GENERAL

A. Excavated materials will be stripped for measurement as directed by the Government Site Representative, and no payment will be made for rock excavated or loosened before measurement. Unless otherwise directed by the Government Site
Representative, materials shall be fully excavated at least 25 feet in advance of pipe laying, to a point 6 inches below the bottom of the pipe and to a width not to exceed the width of the trench for the size of the pipe to be laid therein. Materials shall be excavated so as to provide a minimum clearance of 6” from the outside face of all pipe and structures.

3.02 BLASTING

A. No blasting will be permitted.

3.03 DISPOSAL AND REPLACEMENT OF ROCK

A. Excavated rock, boulders and foundations shall not be used to backfill trenches. Rock, boulders and foundations shall be removed from the jobsite and disposed of at the Contractor’s expense.

END OF SECTION
PART 1 GENERAL

1.01 SCOPE OF WORK

A. This work shall consist of furnishing and placing grass seed, soil supplements, and mulch on all areas disturbed as a result of the work activities at the site. These areas shall include, but not be limited to:

- Areas cleared and grubbed
- Storage areas
- Trailer areas
- Temporary access roads
- Backfill areas
- Areas around Treatment Plant

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials shall meet the requirements in the following designated sections of the Commonwealth of Pennsylvania Department of Transportation Specification (Pub 408), 1987.

<table>
<thead>
<tr>
<th>Material</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulverized Agricultural Limestone</td>
<td>804.2(a)1</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>804.2(a) 2 and 3</td>
</tr>
<tr>
<td>Seed (Formula B or D)</td>
<td>804.2(b) 2</td>
</tr>
<tr>
<td>Mulch Materials</td>
<td>805.2(a)1</td>
</tr>
</tbody>
</table>
PART 3  EXECUTION

3.01  CONSTRUCTION METHODS

A. General - Seeding shall be performed between the dates of March 1 to June 1 and August 1 to October 1, unless extended by the Government Site Representative in writing.

B. Tillage - Immediately prior to seeding, all areas shall be cultivated to provide a reasonably firm, but friable seed bed. The depth of tillage shall be 2 inches.

C. Soil Supplements - Apply the soil supplements at the rates specified in Section 804.3(c) of Pub. 408.

D. Seeding - Seed shall be sown by approved methods which provide for the uniform distribution of seed. The rate of application shall be 21 pounds per 1,000 square yards for Formula B or D. After applying the seed, the seed bed shall be firmed by means of a roller.

E. Mulching - Place hay or straw uniformly in a continuous blanket at a minimum rate of 1,200 pounds per 1,000 square yards.

F. Hydroseeding - if the Contractor selects the option to hydroseed, this method shall conform to the applicable requirements of Sections 804 and 805 of Pub. 408.

G. Maintenance - The Contractor shall be responsible for the proper maintenance of all grass areas, until the entire project has been accepted. This includes watering, if required. Prior to acceptance, when a seeded surface has become damaged or gullied by the action of weather or by the Contractor's operations, the affected areas shall be promptly regraded, limed, fertilized, and re-seeded as originally specified.

END OF SECTION
PART 1 GENERAL

1.01 DESCRIPTION

A. This work shall consist of constructing granular access road and parking area around the treatment building in accordance with the Drawings and as specified herein. The components of this work shall include, but shall not be limited to, the removal of unstable soil, grading, compaction, placement of geotextile material, and the construction of a granular access road.

1.02 RELATED WORK NOT INCLUDED

A. Soil testing is included, in Section 02200.

B. Grading is included in Section 02200.

PART 2 PRODUCTS

2.01 MATERIALS

A. Shall comply with the following designated sections of the Commonwealth of Pennsylvania Department of Transportation Specifications (Pub 408), 1987.

B. Select Granular Material (2RC) - Shall comply with Section 703.3 of Pub 408.

PART 3 EXECUTION

3.01 GENERAL PROCEDURES

A. The Contractor shall Remove any topsoil or unstable soil from the access road and parking area and store at location approved by the Government Site Representative.
B. The Contractor shall grade and compact the subgrade to at least 95 percent of maximum density as determined by ASTM Compaction Test D698. When material is too coarse to use the above method, compaction will be determined based on nonmovement of material under compaction equipment.

At the time of compaction the Contractor shall, maintain the subgrade material's moisture content not more than 2 percentage points above optimum moisture for that material. However, on subgrades displaying pronounced elasticity or deformation under rolling, maintain a moisture content not greater than optimum at the time of compaction or at the time of placing the overlaying construction. When the specified stability cannot be obtained, excavate material in the area to a depth that, when replaced and recompacted at a moisture content not exceeding optimum, the subgrade will have required stability.

C. The Contractor shall place Class 4 geotextile material as shown on the Drawings with a minimum overlay of 12 inches at all junctures.

D. The Contractor shall spread 12 inches of select granular material and compact to achieve a firm base i.e., at least 100 percent of maximum density as determined by ASTM compaction test D698.

E. The access road and parking area constructed by the Contractor will remain in place at the completion of the project.

END OF SECTION
PART I GENERAL

1.0 SCOPE OF WORK

A. This section applies to the design of the well screen length and slot size, the design of the gravel pack gradation, and the furnishing of all labor, materials, and equipment required to perform the drilling and installation of three extraction wells, nine observation wells, and associated testing.

B. Drilling and installation/construction of extraction wells and observation wells will be performed in accordance with appropriate methods described in American Water Works Association (AWWA) Standards A100-84: Water Wells, or as otherwise specified.

C. Descriptions of the work by task that will be provided under this specification follow:

• Mobilize/demobilize the required drilling, sampling, well construction and installation equipment, supplies and materials, as well as competent and experienced personnel to perform this task.

• Prepare drilling sites as needed for drill rig access.

• Drill three borings for extraction wells in accordance with these specifications. An observation well boring will be drilled proximal to each extraction well boring. Well drilling will also include collection of formation samples. Approximate boring depth is 200 feet.

• Perform step drawdown pumping tests for the three extraction borings at the following pumping rates (in gpm): 80, 110, 150. The first two pumping rates should be sustained for a minimum of 6 hours each. The third pumping rate (150 gpm) should be maintained for a minimum period of 12 hours. Actual
pumping rates and time periods for pumping may be altered as per the Government field geologist, based on aquifer conditions.

- The tests will be performed by pumping the wells at the selected rates and recording time-drawdown data in the pumping well and nearby observation wells for each step. Drawdown reading should be taken at a rate of at least ten readings per log cycle time. The pumping rate should be measured at a frequency sufficient to assure that the rate is maintained at a constant level.

- Analyze the step drawdown data and the borehole yield for long term pumping rates at the stepped pumping rates for the three extraction well boreholes.

- Based on the results from the step drawdown pumping tests, install the extraction wells and proximal observation wells in accordance with these specifications. Information pertaining to well depths and borehole diameters, screen sizes and depths (extraction wells), open hole intervals (observation wells), casing diameters, and well numbers are shown on Drawing 0224-5D6.

- Install the other six adjacent observation wells. Following aquifer testing confirmation that the extraction well borings are suitable, the remaining six observation well borings will be drilled and constructed as per these specifications with a depth of 100 feet.

- Test the extraction wells for plumbness and alignment.

- Develop the extraction and observation wells.

- Perform pumping test on extraction well at a flow rate to be determined (estimated at or around 110 gpm) for a minimum of 3 days. The Government will be responsible for monitoring the observation wells; the Government and the Drilling Contractor both shall monitor the pumping well separately.

- Clean-up around each drill site.
1.02 REFERENCES

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

A. American Society for Testing and Materials (ASTM) Publications
   - A 312/A312M-87a: Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
   - C 150-86: Standard Specification for Portland Cement
   - D 1586-84: Standard Method for Penetration Test and Split-Barrel Sampling of Soils

B. American Water Works Association (AWWA) Standards
   - A 100-84: Water Wells

1.03 REQUIREMENTS

A. Protection

All existing utilities, above and below ground, benchmarks, monuments, etc., shall be carefully maintained and protected during all phases of field activities; i.e., drilling and well installation.

B. Equipment Decontamination

Equipment shall be decontaminated in accordance with the Contractor Health and Safety Plan (CHSP) prior to beginning the downgradient extraction well system drilling program, between borings, and prior to completion of program. No equipment shall be removed from the site until it has been certified by the Contractor as adequately decontaminated as approved by the Government Site Representative.
C. Quality Assurance

The Contractor and any lower-tier subcontractors shall be required to adhere to all the Government ARCS III Quality Assurance Program Plan requirements and shall contact the Government for resolutions of any exceptions taken to the Quality Assurance plan prior to execution.

The Contractor shall exert necessary controls to ensure that the services or products to be procured meet the elements identified in the Statement of Work and shall report any changes, defects, or noncompliances to the Government Site Representative.

Work performed by the Contractor shall be supervised by a qualified driller experienced in extraction/pumping well installation. In addition, the Government representative (i.e., geologist) will be present during drilling activities to inspect and oversee the field activities.

D. Site activities are to be performed in accordance with all applicable Federal, state, and local regulations and standards. In particular the drilling contractor must be licensed in the Commonwealth of Pennsylvania. The Contractor is responsible for obtaining all required licenses, permits, or required approval to perform the work. All applicable fees are to be paid by the Contractor.

1.04 WELL LOCATIONS

The locations of the three downgradient extraction wells and nine observation wells are shown on site plan drawing 0224-2D1. A cross-section diagram of an extraction well and the two types of observation wells are shown on drawings 0224-5D5 and 0224--5D6. Information pertaining to well depths, borehole diameters, screen sizes and depths, open hole intervals and casing diameters can also be found on these drawings.

1.05 SUBSURFACE CONDITIONS

Logs from borings in the vicinity of the proposed extraction wells are attached at the end of this Specification. The groundwater should be considered contaminated as described in the Health and Safety Plan (see Section 01307).
1.06 SITE HEALTH AND SAFETY PLAN

The Contractor must comply with the Site Health and Safety Plan (Site HASP). The Site HASP is described in Section 01307.

1.07 DISPOSAL OF CONTAMINATED MATERIALS

Any cuttings brought to the surface as a result of drilling operations shall be contained by the Contractor and transported to the Heleva Landfill Site and placed at a designated staging area. The Government will determine the ultimate disposal method for the cuttings based on sample analyses. The Contractor will not be responsible for the cuttings after placing them within the staging area. Any water brought to the surface during drilling, well development, or testing activities shall be pumped or otherwise transported to the downgradient treatment system. The Contractor is responsible for this operation.

1.08 ABANDONMENT OF BORINGS AND WELLS

In the event that a boring or well needs to be abandoned because of loss of tools or for other reasons caused by the Contractor, the Contractor shall, fill the abandoned hole with cement grout or bentonite chips, as directed by the Government Site Representative and consistent with Commonwealth of Pennsylvania requirements, remove all well casing if present, and construct a new well within 25 feet of the original location at the Contractor's expense. If abandonment is deemed necessary by the Government because of inadequate yields resulting from natural causes similar abandonment procedures shall be followed but will be charged to the project as normal costs. Well abandonment shall be performed within 7 days of notification to the Contractor by the Government that well abandonment is required.

PART 2 SUBMITTALS

The Contractor shall submit the following information for approval by the Government:
2.01 DRILLING METHOD, PROPOSED EQUIPMENT, AND PROCEDURES

2.02 EXTRACTION WELLS AND OBSERVATION WELLS CONSTRUCTION DETAILS

A. Gravel pack material, composition and grading, and design calculations to conform with well construction specifications.

B. Casing, pipe, and screen materials and sizes.

C. Grout admixtures.

2.03 WELL DEVELOPMENT, PROPOSED EQUIPMENT, AND PROCEDURES

2.04 STEP DRAWDOWN AND PUMPING TEST METHOD, PROPOSED EQUIPMENT, AND PROCEDURES

2.05 PLUMBNESS AND ALIGNMENT DUMMY

2.06 PLUMBNESS AND ALIGNMENT TEST RESULTS

2.07 DRILLER’S LOG FOR COMPLETED HOLE

2.08 WELL COMPLETION REPORT AND CONSTRUCTION DIAGRAM FOR EACH WELL

2.09 WELL PERFORMANCE TEST DATA REPORT FOR EACH WELL

PART 3 SUPPLIES FOR EXTRACTION WELL CONSTRUCTION

3.01 TEMPORARY CASING

Temporary casing does not have to be new pipe, but shall be clean, decontaminated, steel pipe. Such casing may be used to support the sides of less consolidated portion of the drill hole during bedrock drilling and well construction. Temporary casing shall have a minimum 12-inch diameter.
3.02 PERMANENT CASING

Permanent casing pipe shall be new and shall conform to ASTM A-312/A312M Specification for corrosion resistant Type 304 Schedule 5S stainless steel. The well casing sections shall have a nominal 8-inch inner diameter and 10-foot length. End fittings shall be double entry Stub ACME flush screw threads. The casing shall be steam cleaned and allowed to air dry prior to packaging. The casing sections shall be individually and separately wrapped in protective polyethylene prior to shipment.

The top of the well casing shall be equipped with a removable head assembly consisting of a surface plate from which the vertical discharge pipe is suspended, contains provisions for the electric pump cable and also for a 3/4-inch water level monitoring probe to pass through, and include an elbow that directs the water into a piping system as required. The piping system connecting to the vertical discharge pipe shall be approximately 4.0 feet below ground surface. Therefore, the head assembly will be located below ground surface. A manhole box shall be placed around the well to protect and permit access to the well casing and head assembly. This manhole box shall be installed after construction and testing of the extraction well are complete. See Drawing 0224-5D5 for construction details of the manhole box.

The number of the well shall be stamped or engraved onto both the removable well head assembly and the top of the manhole cover in a visible location. The cover shall be equipped with a secure locking device.

3.03 WELL SCREEN

The well screen shall be continuous slot, wire wound design. The well screen shall be made of corrosion resistant Type 304 stainless steel. The screen size shall have a nominal 8-inch pipe size diameter. Each section of screen shall be a nominal 10-foot length and shall be equipped with end fittings. End fittings shall be double entry Stub ACME flush screw threads with chemical resistant (Viton) O-ring on male end fitting. The bottom screen of the well shall be equipped with a threaded cap and end plate.

The screen slot size for all but the uppermost screen section shall be nominal 30 slot (0.030 inches). The screen slot size for the uppermost 10-foot screen section shall be nominal 20 slot (0.020 inches). The screens shall have tensile, column, and collapse strengths adequate for well construction and operating conditions. Screen design is illustrated on Drawing 0224-5D5.
The screens shall be cleaned of cutting grease, etc., using appropriate methods to assure that the metal surface is free of all organic contamination. Each screen section shall be individually and separately wrapped in nominal 4-mil protective polyethylene prior to shipment.

3.04 FILTER PACK

Filter pack shall be placed in the nominal twelve-inch diameter borehole and must consist of clean, well-sorted, well-rounded grains. The filter pack should be composed of quartz sand. Because the well is designed with two different screen sizes (30 slot for the lower unweathered bedrock portion; 20 slot for the upper weathered portion of aquifer) the filter pack shall consist of two types. Each size-type filter pack shall be selected so that approximately 90 percent of the material is retained by the appropriate (i.e., 20 and 30 slot) screen. The two screens with different slot sizes shall be separated by a 10-foot section of casing. This area shall be referred to as the "transition zone." The filter pack must be placed within the transition zone so that the coarser filter pack material is approximately eight feet above the uppermost 50 slot screen to prevent the finer grained filter pack from entering the lower screened portion of the well. Except for the transition zone, the filter pack should have a uniformity coefficient of not more than 2.00.

3.05 CEMENT GROUT

Grout shall consist of Portland cement conforming to ASTM C150, Type I or II, mixed with a maximum of 6.5 gallons of water per 94-pound bag, and 3 percent bentonite powder by weight.

3.06 BENTONITE WELL SEAL

The bentonite seal shall be installed using compressed bentonite pellets, 1/2- or 3/8-inch diameter.

PART 4 EXTRACTION WELL CONSTRUCTION

4.01 GENERAL REQUIREMENTS

The method of drilling shall be approved by the Government Project Manager. The use of bentonite drilling muds will not be approved except for drilling operations in overburden materials. The execution of all work associated with the drilling operations shall be performed by competent workmen. Each driller shall have a minimum 5 years experience and each driller's helper shall have at least 1 year experience specifically in water well drilling and construction operations associated with hazardous waste sites.
Each extraction well shall be constructed of 8-inch diameter stainless steel screen and casing within a nominal 12-inch diameter borehole. Specifications for materials used for well construction are described in Part 3.0 of this Section. Submittal of the drilling method description shall include, as a minimum, description of drill rig and drilling method, bits to be used, fluids, temporary casing, method for soil and water containment, and abandonment operations for borings and wells.

4.02 SETTING TEMPORARY CASING

The temporary casing shall be nominal 12-inch diameter and shall be installed through the soils and weathered bedrock to approximately 2 feet into competent bedrock and at least 10 feet total into bedrock. The purpose is to seal off the weathered portion of the bedrock aquifer during drilling operations. Larger diameter casing may be used if first approved by the Government Project Manager.

The Contractor shall have the option of permanently installing this casing as approved by the Government Project Manager. If permanently installed, the casing must be adequately grouted into place. After the well is constructed and developed, the top of the casing shall be cut to extend nominally 4.5 feet below ground surface.

4.03 DECISION CRITERIA FOR INSTALLING EXTRACTION WELLS

Each extraction well boring will initially be advanced as a minimum 6-inch diameter borehole. After drilling to the desired final depth, the boring will be tested to determine its water yielding capacity.

A step drawdown pumping test will be performed on each proposed extraction well borehole prior to reaming and well casing/screen installation to determine whether it is suitable for use as an extraction well. The Contractor shall provide a pump and all necessary equipment and materials to pump water at a maximum rate of 150 gpm after the well has been developed. The boring shall be pumped at 80, 110, and 150 gpm. The first two pumping rates shall be sustained for a minimum of six hours apiece. The third pumping rate (150 gpm) shall be maintained for a minimum of 12 hours. The water level will be constantly monitored by the Government during pumping in the boring being pumped and also in the proximal observation boring and other adjacent borings as may be available. The Contractor will provide a flow measurement device so that flow rates can be monitored and adjusted as necessary throughout the test. Based on the results of the Government data analysis, the decision shall be made to construct the extraction well, to complete the boring as an observation well, or to abandon the well boring. Determination criteria for boring abandonment or completion as an observation well will include but not be to limited one or more of the following:
• The boring is not capable of sustaining the required groundwater extraction rate necessary for plume remediation (approximately 110 gpm), either in total or within acceptable limits of drawdown (± 20 percent of aquifer thickness), as decided by the Government.

• The capture zone produced by pumping groundwater from the boring is inadequate for plume remediation.

• Borehole conditions (either natural or induced) are deemed inadequate for conversion to an extraction or observation well (lack of water yield, severe borehole collapse, loss of tools in the borehole, etc.).

If the boring is deemed to be suitable for conversion to an extraction well, it will be reamed to a nominal diameter of 12 inches, then the well shall be completed as described in Paragraphs 4.05 through 4.12 of this section. If the boring is to be completed as an observation well, 6 inch diameter casings will be set and grouted into bedrock, then the well shall be completed as described in Paragraphs 6.04 through 6.07 of this section.

4.04 ABANDONMENT OF BORINGS AND WELLS

If deemed necessary, wells and borings shall be abandoned by backfilling with a cement bentonite mixture or bentonite chips as described in Paragraph 3.05 this Section. Prior to backfilling, any casing and screen installed in the well shall be removed, if possible.

The boring shall be filled to the ground surface by pressure pumping the grout from the bottom of the boring using a tremie tube.

4.05 INSTALLATION OF INNER CASING AND SCREEN

During well construction activities, the screen and casing shall at all times be suspended, preventing the assembly from resting on the bottom during installation. The weight of the column shall not be released until adequate lateral support is attained by placement of the filter pack. The string shall be lowered into the boring by a method which will allow for control of the rate of lowering at all times. To avoid causing damage to the screen, the column must not drop or fall uncontrollably into the borehole. Approved centering devices shall be installed on sections of casing at equidistant 40-foot intervals.
4.06 INSTALLATION OF THE FILTER PACK

After the screen and casing are concentrically set in the boring, the filter pack shall be installed around the column by filling the entire annular space with filter gravel. The filter pack shall be emplaced using a gravel conductor pipe with a minimum 1.5-inch inner diameter. The conductor pipe shall be lowered to the hole bottom along the annulus. It shall be arranged so that gravel fed at uniform rates fills the hole from the bottom up. Water may be added to the gravel during emplacement to enhance the process. The filter pack shall be installed to a depth of 2 feet above the top of the uppermost screen in the finished and fully developed well. Pumping of the well should be performed to settle the filter pack prior to well seal emplacement. The filter pack must be adequately sized to satisfy the requirements for the two screen slot sizes as discussed in Paragraph 3.04 of this Section. Extreme caution must be exercised to assure that the upper portion of the filter pack remains at the appropriate depth interval.

Dumping filter gravel from the ground surface while agitating the well casing will not be a permissible installation method. Other methods for filter pack installation may be suggested by the Contractor, but are subject to approval by the Government Project Manager.

4.07 TEST FOR PLUMBNESS AND ALIGNMENT

After the screen and casing is installed, and again after the filter pack is emplaced, plumbness and alignment shall be tested. A 6-foot long 6-inch diameter plumb shall be lowered to the well bottom. Should the plumb fail to move freely throughout the casing/screen column for the depth of the well, the plumbness and alignment of the well shall be corrected by the Contractor. Should the plumbness and alignment not be correctable, as determined by the Government Site Representative the well shall be abandoned and a new well drilled and constructed at cost to the Contractor.

4.08 WELL SEAL INSTALLATION

A minimum 2-foot thick bentonite seal shall be placed within the annular space between the casing and drilled hole and directly above the top of the filter pack to prevent leakage of grout into the filter pack. The seal should not be installed until the well has been pumped sufficiently to settle the filter pack, and additional filter pack material added as necessary to maintain a level at least 2 feet above the top of the uppermost screen (as per Paragraph 4.11). After the seal is set in place, it may be necessary to pour water into the annulus to assure hydration of the bentonite pellets. The seal shall be allowed to hydrate for a minimum of four hours before placement of overlying grout. It is the
Contractor's responsibility that an adequate seal is placed to prevent grout migration into the well's gravel pack. Seal thickness and hydration time may be increased at the Contractor's discretion.

4.09 GROUTING METHOD

The grout shall be comprised of the mixture described in Section 3.05 of this Specification. It is important that the grout be mixed thoroughly and be free of lumps. Grout shall be placed via a tremie pipe within the annular space between the casing and drilled hole. The grout shall be pressure pumped to the hole bottom and forced upward until it is flush with the ground surface. The grout shall be placed in one continuous operation before setting begins, to assure that a satisfactory seal is formed. The temporary casing used to construct the well shall be withdrawn as grouting proceeds with the grout level maintained above the temporary casing bottom. As an alternative, the temporary casing may be left in the ground as a permanent installation (refer to Paragraph 4.02 of this Section).

After removal of the temporary casing and settlement of the grout, additional grout should be added as needed to maintain the grout level even with the ground surface.

4.10 BORING LOG AND WELL COMPLETION REPORT

The Contractor and the Government Site Representative shall separately prepare and submit a boring log and also a well completion report for each extraction well.

The boring log will contain, at a minimum, the following information, when applicable, for each extraction well boring:

- Stratification and depths of contacts
- Soil and/or rock types encountered
- Color
- Bedding thickness and depth to contact
- Hardness
- Fracturing
- Weathering
- Depth at which water is first encountered and depth to zones with distinguishable high water yields
- Other distinguishing characteristics
The well construction report shall, at a minimum, contain the following:

- Reference point for depth measurement and survey
- Name of driller and drilling method
- Development method
- All casing/screen diameters and materials
- All boring casing/screening depths
- Borehole diameters
- Descriptions and depths of all backfill materials (filter pack, grout, etc.)
- Depth to top of rock

4.11 WELL DEVELOPMENT

Each extraction well shall be developed in accordance with the method proposed by the Contractor and approved by the Government Project Manager. Well development shall include combined surging and pumping at a minimum. The well shall be developed until water pumped at 110 gpm has a sand content less than 5 mg/L at pump startup. Development equipment shall have the capacity to remove all cutting fluids, sand, rock cuttings, and any other foreign material. Water collected during development shall be collected in a settling tank to allow for suspended material to separate, and then transported to the treatment plant via temporary piping as approved by the Government Project Manager. A design for temporary piping shall be prepared by the Contractor and submitted to the Government for approval.

Development shall be performed in two stages. The first stage shall occur after the coarser filter pack but before the finer-grained filter pack is emplaced. Additional coarse filter pack shall be added as necessary to maintain a level approximately 2 feet below the uppermost screen. The second stage shall be performed no earlier than 2 days after the grout has been poured, to seal the annular space above the bentonite seal, to ground surface. The wells shall be developed for a minimum time period of 4 hours each.

4.12 CAPACITY TEST

A 3-day pumping test shall be performed at a constant pumping rate of approximately 110 gpm, or as otherwise directed by the Government, on each of the three extraction wells. Each pumping test shall be performed as described in Paragraph 4.03 of this Section.
Data collected during these pumping tests will be used to finalize estimates of aquifer characteristics for each of the three extraction wells. This data will eventually be used to more accurately estimate the capture zone for the overall downgradient extraction system.

PART 5  SUPPLIES FOR OBSERVATION WELL CONSTRUCTION

5.01 PERMANENT CASING

Permanent casing pipe shall be new and shall conform to ASTM A 53-87b Specification for Grade A black steel. The casing shall be Schedule 40 and shall have a nominal 6-inch inner diameter and 10- to 20-foot length. End fittings shall be double entry Stub ACME flush screw threads. The casing shall be steam cleaned and allowed to air dry prior to installation.

The casing top shall extend approximately three feet above ground surface and shall be equipped with a locking cap which seals the well casing. The number of the observation well shall be stamped or engraved onto the side of the casing immediately below the cover in a visible location.

PART 6  OBSERVATION WELL CONSTRUCTION

6.01 GENERAL REQUIREMENTS

The method of drilling shall be approved by the Government Project Manager. The use of bentonite drilling muds will not be approved except for drilling operations in overburden materials. The execution of all work associated with the drilling operations shall be performed by competent workmen. Each driller shall have a minimum of 5 years experience and each drillers helper shall have at least 1 year experience specifically in water well drilling and construction operations associated with hazardous waste sites.

Each observation well shall be constructed as a 6-inch diameter open borehole bedrock well. Specifications for materials used for observation well construction are described in Part 5.0 of this Section. Information pertaining to well depths and borehole diameters, open hole intervals, casing diameters, and well numbers are shown on Drawing 0224-5D6. Submittal of the drilling method description shall include, as a minimum, description of drill rig and drilling method, bits to be used, fluids, temporary casing, method for soil and water containment, and abandonment operations for borings and wells. Any exception proposed by the Contractor relative to drilling and observation well construction as outlined in Parts 5.0 and 6.0 of this Section shall be described in detail in the Technical Proposal and will be subject to approval by the Government Project Manager.
6.02 DECISION CRITERIA FOR ABANDONMENT OF BORINGS AND OBSERVATION WELLS

Improperly constructed wells and borings shall be abandoned as per the procedures described in Paragraph 4.04 of this Section.

Determination criteria for observation well boring abandonment will include but not be limited to one or more of the following:

- Proper well installation and construction (as described herein) cannot be performed.
- The target depth of the boring is not reached.

6.03 SETTING PERMANENT CASING

The permanent casing shall be nominal 6-inch diameter and shall be installed through the soils and weathered bedrock to approximately 2 feet into competent bedrock and at least 10 feet total into bedrock. The casing must be adequately grouted into place using a cement-bentonite mixture as described in Paragraph 5.02 of this Section. The purpose is to seal off soils and the weathered portion of bedrock from the zone to be monitored.

6.04 TEST FOR PLUMBNESS AND ALIGNMENT

After the casing is installed and the open portion of the borehole is drilled, plumbness and alignment shall be tested. A 6-foot long 4-inch diameter plumb shall be lowered to the well bottom. Should the plumb fail to move freely throughout the casing/open-hole column for the depth of the well, the plumbness and alignment of the well shall be corrected by the Contractor. Should the plumbness and alignment not be correctable, as determined by the Government Site Representative, the well shall be abandoned as specified in Paragraph 4.04 of this Section and a new well drilled and constructed at cost to the Contractor.

6.05 GROUTING METHOD

The grout shall be comprised of the mixture described in Paragraph 3.05 of this Section. It is important that the grout be mixed thoroughly and be free of lumps. Grout shall be placed via a tremie pipe within the annular space between the casing and drilled hole. The grout shall be pressure pumped to the hole bottom and forced upward until it is flush with the ground surface. The grout
shall be placed in one continuous operation before setting begins, to assure that a satisfactory seal is formed.

6.06 BORING LOG AND WELL COMPLETION REPORT

The Contractor and the Government Site Representative shall separately submit a boring log and also a well completion report for each extraction well. Refer to Paragraph 4.10 of this Section for details.

6.07 WELL DEVELOPMENT

Each observation well shall be developed in accordance with the method proposed by the Contractor and approved by the Government Project Manager. Development shall include combined surging and pumping at a minimum. The well shall be developed until approved by the Government Site Representative. Development equipment shall have the capacity to remove all cutting fluids, rock cuttings, and any other foreign material. Water collected during development shall be transported to the treatment plant via temporary piping as approved by the Government Site Representative.

Development shall be performed no earlier than 2 days after the grout has been poured, to seal the annular space above the open borehole to ground surface. A minimum of 2 hours of development time is required.

PART 7 OTHER ACTIVITIES PERTINENT TO EXTRACTION AND OBSERVATION WELLS

7.1 CLEAN-UP

Upon completion of construction and other incidentals for each well, all debris and surplus materials resulting from work shall be removed from the jobsite by the Contractor. This task will be performed to the satisfaction of the Government Site Representative.

END OF SECTION
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals necessary and install the chain link fence and gate as shown on the Drawings and as specified herein.

1.02 RELATED WORK NOT INCLUDED

A. Earthwork and backfill is included in Section 02200.

B. Concrete is included in Division 3.

PART 2 PRODUCTS

2.01 MATERIALS

A. 8-Foot High Chain Link Fence and Gate:

1. Posts and Rails:

   a. All posts, rails, gate frames, and post braces shall be Schedule 40 standard steel pipe produced to the requirements of ASTM A120, (no hydrostatic testing is required) and hot-dip galvanized in accordance with ASTM A123.

   b. Minimum NPS pipe diameters shall be as follows:

      - End, corner and pull posts 2-1/2"
      - Line posts 2"
      - Swing gate post
        - Single swing (up to 6 feet) 2"
        - Single swing (from 6 to 13 feet) 3-1/2"
        - Double swing (up to 12 feet) 2"
Double swing (from 12 to 26 feet) 3-1/2"
- Top rail .1-1/4"
- Horizontal post braces 1-1/4"

c. All posts shall be equipped with pressed steel combination tops with barbed wire supporting arms. Tops shall be provided with a hole to permit through passage of the top rail.

d. Post tops, extension arms, rail sleeves, and miscellaneous clamps shall be hot-dipped galvanized in accordance with ASTM A123.

2. Fence Fabric:

a. Wire for chain link fence fabric shall be No. 9 galvanized wire gage carbon steel produced in accordance with ASTM A817.

b. Galvanized fence fabric shall be produced from helically wound and interwoven steel wire forming a continuous 2 inch mesh in accordance with ASTM A392.

c. Galvanized ties or clips of adequate strength shall be provided in sufficient number for attachment of the fabric to line posts at intervals not exceeding 15 inches and to the top rail at a maximum 24 inch spacing.

3. Barbed Wire:

a. Barbed wire shall consist of three (3) strands of twisted 12-1/2 gage steel wire with four point barbs on 5 inch spacing. Wire shall be zinc coated in accordance with ASTM A121.

4. Tension Bars:

a. Tension bars shall be minimum 3/16 inch by 3/4 inch flat steel plates and not more than 2 inches shorter than the fabric height. Bars shall be hot-dip galvanized in accordance with ASTM A123.
5. Terminal Post Bands:

   a. Bands or clips of adequate strength shall be provided in sufficient number for attachment of the fabric and stretcher bars to all terminal posts at intervals not exceeding 15 inches. Tension bands shall be formed from No. 12 gage flat or beveled steel and attached with 3/8 inch diameter carriage bolts hot-dip galvanized in accordance with ASTM A153.

6. Gates:

   a. Gates shall be swing, as shown on the Drawings. Gates shall be complete with latches, stops, keepers and hinges.

   b. Gate frames shall be constructed of Schedule 40, 1-1/4 inch NPS diameter standard steel pipe produced to the requirements of ASTM A120 and hot-dip galvanized in accordance with ASTM A123. Frames shall be welded at corners or assembled with fittings, and when fittings are used, 3/8 inch minimum diameter truss rods shall be provided to prevent sag or twist.

   c. Gate leaves shall have vertical intermediate bracing as required, spaced so that no members are more than 8 feet apart. Gate leaves 10 feet or over shall have a horizontal brace or one 3/8 inch minimum diameter diagonal truss rod.

   d. The end members of gate frames shall be extended 1 foot above the top horizontal member for attachment of 3 strands of barbed wire.

   e. Gate fabric shall be the same as used in the fence construction.

   f. Hinges for swing gates shall permit full opening to a position parallel to the fence. Hinges shall not twist or turn under gate motion, and shall be non-removable after installation. The gate should be easily opened by one person.

   g. Gate latches, stops, and keepers shall be provided for all gates. Latches shall have a plunger-bar arranged to engage the center stop, except that for single gates for openings less than 10 feet wide a forked latch may be provided. Catches shall be arranged for locking. Center stops shall consist of a device arranged to be set in concrete and to engage a plunger bar of the latch of
double gates. No stop is required for single gates. Keepers shall consist of a mechanical device for securing the free end of the gate in the full open position.

h. All gate hardware shall be zinc coated in accordance with ASTM A153.

i. All gates shall be equipped with padlocks.

2.02 TECHNICAL REQUIREMENTS

1. Description of Services:

a. Contractor shall provide all supervision labor, materials and equipment necessary to furnish and install all footings, fencing, gates, and related items shown and called for on design drawing. Contractor shall clear and grub miscellaneous trees and shrubbery located within 5 feet of the fence, if encountered.

2. General:

a. Fence and gates shall be 9 feet overall in height with a fabric height of 8 feet and 3 strands of barbed wire set at a 45° angle to the fence line.

b. Line posts shall be spaced equally not more than 10 feet on centers.

c. Rails shall be furnished in random lengths averaging a minimum of 20 feet. Joints shall be made up with extra long pressed steel sleeves to provide a rigid connection while permitting expansion and contraction.

d. All end and corner posts shall be braced horizontally to the adjoining line post at the mid-height of the fabric by means of standard steel pipe.

e. Diagonal tension bracing shall be provided from end, corner, or gate posts to line posts, consisting of 3/8 inch minimum diameter steel truss rods with turn buckles or equivalent provision of adjustment.
f. One tension bar shall be provided for each end and gate post, and two (2) for each corner and pull post.

g. Barbed wire supporting arms shall be fitted with clips or other devices for attachment of each strand of wire. Arms shall be of sufficient strength to withstand a weight of 250 pounds applied at the outer strand of barbed wire.

PART 3: EXECUTION

3.01 INSTALLATION

A. Set all posts to depth of 3-feet. After setting and plumbing posts, fill holes with 2,500 psi concrete as specified in Division 3. Post footings shall be placed monolithically, and the top surface shall be approximately 2 inches above the surrounding ground line. A concrete block or flat stone shall be placed at the bottom of augured hole before the post concrete is placed. Concrete shall cure for a minimum of 72 hours after posts are set before fence installation continues.

B. Brace all terminal posts horizontally with sections used for top rail. The top rail shall extend through all line posts to form a continuous brace from end to end for each stretch of fence, be securely fastened at the end of each run, and have joints made with expansion sleeve couplings not less than 6-inches long.

C. Install fabric with stretcher bars at vertical edges and tie wires at top and bottom edges. Attach stretcher bars to gate frame at not more than 12-inches off center.

END OF SECTION
DIVISION 3

Concrete
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install all concrete reinforcement as shown on the Drawings and specified herein.

1.02 RELATED WORK NOT INCLUDED

A. Concrete is included in Section 03300.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Section 01300.

B. The following shall be submitted for review prior to the fabrication of reinforcement.

1. Placing drawings for steel reinforcement.

2. Bar bending details.

3. Anchor bolt details.

1.04 REFERENCE STANDARDS

A. Steel reinforcement in concrete shall conform to ACI 350 and ACI 318 unless otherwise specified herein.

1.05 PRODUCT DELIVERY AND HANDLING

A. Reinforcing shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.
B. Reinforcement shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same designations as shown on the submitted placing drawings.

C. Reinforcing steel shall be stored off the ground and shall be protected from moisture and kept free from dirt, oil, or injurious contaminants.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials shall be new and conform to the following material specifications.

1. Concrete reinforcing bars: ASTM A 615, Grade 60.


5. Tie wires for reinforcement: 16-/12-gauge or heavier, black annealed wire.

B. The following alternate materials are allowed:

1. ASTM A 616 (rail-steel), Grade 60 deformed bars for ASTM A 615 (Billet-Steel) deformed bars.

2. ASTM A 617 (Axle-steel) Grade 60 deformed bars (Billet-Steel), Grade 60.
2.02 FABRICATION OF REINFORCEMENT

A. Fabrication tolerances shall be in accordance with the CRSI, Code of Standard Practice-Fabrication.

B. Bars shall be cold bent.

C. Bars shall be bent around a revolving collar having a diameter of not less than that recommended by the CRSI, Code of Standard Practice-Detailing. Hooks shall conform to the same Code.

PART 3 EXECUTION

3.01 INSTALLATION

A. Surface condition, bending, spacing, and tolerances of placement of reinforcement shall conform to the CRSI, Code of Standard Practice-Field Erection.

B. Except as otherwise indicated on the Drawings, the minimum concrete cover of reinforcement shall be as follows:

1. Concrete cast against and permanently exposed to earth; 3-inch.

2. Concrete surfaces in contact with soil, water, sewage, sludge or exposed to the weather; 2-inch.

3. Concrete surfaces not in contact with soil, water, sewage, sludge or exposed to the weather.

   Beams, girders, columns: principal reinforcement, ties, stirrups or spirals; 1-1/2 inch

   Walls and bottom steel of slabs - 1 inch.

   Shells and top steel of slabs - 3/4 inch.
C. Reinforcement which is to be exposed for a considerable length of time after being placed shall be painted with a heavy coat of neat cement slurry, if required by the Government Site Representative.

D. No reinforcing bars shall be welded either during fabrication or erection unless specifically called for on the Drawings, specified herein, or with prior written approval of the Government Site Representative. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved, it shall confirm to the AWS Structural Welding Code-Reinforcing Steel, AWS D1.4.

3.02 REINFORCEMENT AROUND OPENINGS

A. Place an equivalent area of steel to that interrupted by an opening, pipe penetration, or duct penetration around the opening or penetration. The bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

3.03 SPLICING

A. Except as otherwise indicated on the Drawings, compression embedment and lap splices shall be 30 diameters, but not less than 12 inches. The lap splice length for column vertical bars shall be based on the bar size in the column above.

B. Except as otherwise indicated on the Drawings, tension lap splices shall be in accordance with the applicable tables in the ACI 315 Detailing Manual. Class B splices shall be used when 50 percent or less of the bars are spliced within the required lap length, otherwise Class C splices shall be used.

C. Splices in reinforcement for tension tie members and hangers shall be welded to develop in tension at least 125 percent of the specified yield strength of the bar. Splices in adjacent bars shall be offset the distance of a Class C splice. Splicing of bars in tension tie members and hangers shall be avoided whenever possible.

E. Splices in welded wire fabric shall be lapped not less than 1-1/2 courses or 12-inches. Fabric splices shall be tied together with wire ties spaced no more than 24-inches on center.
3.04 ACCESSORIES

A. The Contractor is solely responsible for determining, providing and installing accessories such as chairs, chair bars, and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the steel and the placement of concrete.

B. Precast concrete blocks with wire shall be used where the reinforcing steel is to be supported over soil.

C. Stainless steel protected bar supports shall be used to firmly hold vertical reinforcement in position.

D. Precast concrete blocks with wires or plastic protected bar supports shall be used to support reinforcing steel on formwork. If the bottom of the precast blocks will be exposed to offer removal of forms, the color and appearance of the block shall match that of the adjacent concrete.

E. Alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcing steel fastened to the bottom and top mats, may be used if approved by the Government Site Representative.

END OF SECTION
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install, complete, the permanent accessories for concrete joints as shown on the Drawings and specified herein to minimize groundwater leakage into the structure, to allow for the expansion and contraction of the structure and to protect the concrete joints from damage.

1.02 RELATED WORK NOT INCLUDED

A. Concrete and non-shrink grout is included in Section 03300.

B. Concrete finishes are included in Section 03350.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Section 01300.

B. The following layout drawings shall be submitted for review prior to submittal of reinforcing shop drawings and the start of concrete work.

1. Layout drawings showing the location of all concrete joints as shown on the Drawings and those additional concrete joints proposed by the Contractor to facilitate the construction. Submitting the contract specifications shall not be considered as compliance with this Section.

2. The additional joints proposed by the Contractor shall be carried continuously through the structure and shall not terminate at a construction joint or control joint constructed perpendicular to the proposed joint.
3. Layout drawings showing the location and extent of all joint waterstops. The type and size of all waterstops to be used including splice location shall be indicated for each joint.

C. The following technical information shall be submitted for review prior to their installation.

1. Catalog cuts for all products.

2. Additional product information and/or samples requested by the Government Contracting Officer to determine their conformance with the specifications.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Sealants shall be stored in unopened containers, under cover, in a cool dry place.

B. Plastic products shall be stored in a cool dry place out of direct sunlight.

C. Products shall be handled and stored per Manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Waterstops

1. Plastic waterstops shall be extruded from an elastomeric plastic compound with virgin polyvinylchloride as the basic resins. The compound shall contain no reprocessed materials. Waterstops shall be any of the following types or as shown on the Drawings.

a. Dumbbell type waterstops for expansion joints shall be 9-inch by 3/8-inch with a center bulb. The waterstops shall be Horn/Durajoint Type DB-6 by A. C. Horn catalog No. D89-38 by Vinylex Corporation, Style 753 by Greenstreak Plastic Products, or equal. Dumbbell waterstops for joints shall be 6-inch by 3/8-inch. The waterstops shall be Horn/Durajoint Type DB-2 by A. C. Horn catalog
No. D6-38 by Vinylex Corporation, Style 748 by Greenstreak Plastic Products, or approved equal.

B. Premolded Joint Filler

1. Self-expanding cork premolded joint filler shall conform to ASTM D 1752, Type III.

C. Bond Breaker

1. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the premolded joint filler or concrete surface as required. The tape shall be the same width as the joint.

2. Bond breaker for concrete other than where tape is specifically called for shall be either bond breaker tape or a nonstaining type bond prevention coating such as Williams Tilt-up Compound by Williams Distributors Inc., Silcoseal 77, by SCA Construction Supply Division, Superior Concrete Accessories or approved equal.

D. Sealant

1. Sealants for tanks, basins, channels and/or substructure shall be Sikaflex 1a manufactured by Sika Chemical Company, Vulkem 116 by Master Mechanics Company, NP1 by Sonneborn, or approved equal.

2. Sealant for non-submerged structural joints 1 inch or less in width shall be Sikaflex 1a manufactured by Sika Chemical Company, Vulkem 116 manufactured by Master Mechanics Company, NP1 by Sonneborn, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. PVC waterstops shall be spliced and/or joined in conformity with the manufacturer's recommendations to form a continuous seal along the joints and at intersections. The finished splices and connections shall have a tensile strength of not less than 80 percent of the unspliced section. The splices and connections shall not be subjected to any
force for 10 minutes after making the splice or connection. Where the waterstop is discontinuous at the top of walls, it shall be terminated 2 inches from the top surface unless otherwise detailed on the Drawings.

B. Each side of PVC dumbbell, flat-ribbed or wire reinforced flat-ribbed waterstop shall be tied to the reinforcement at least 12-inch on center of horizontal joints and at least 18-inch on center for vertical joints to prevent displacement during the concreting operations. Dumbbell water stops shall be secured by clips manufactured for that purpose. Wire reinforced flat-ribbed waterstops shall be secured by tying to the projecting wire reinforcing. Flat-ribbed waterstops shall be secured by passing the tie wires through punched or drilled holes between the first and second rib on each side. Center bulb type waterstops shall be installed with the center bulb centered in the joint. Waterstops without center bulbs shall be positioned with midpoint of the waterstop centered on the joint. Care shall be taken to place the concrete equally on each side of vertically oriented waterstops without distorting or displacing the waterstop. Concrete shall be placed under horizontally oriented waterstops and shall be completely visually checked for continuous contact with the concrete without entrapment of air before concrete is placed on the top side of the waterstops. Waterstops in vertical joints shall be held rigid by split bulkhead forms.

C. PVC surface type waterstops need only to be held in position by the joint form. Care shall be taken to prevent concrete from getting behind the waterstop.

D. Install labyrinth water stops in accordance with the manufacturer’s instructions.

E. Joint fillers shall be attached to the concrete with a bonding agent compatible with the joint sealant and joint filler. All installations shall be in accordance with the manufacturer’s recommendations. Premolded filler shall be precut to butt tightly against the waterstop if present and to leave the recess detailed on the Drawings for sealant. All butt splices shall be taped to prevent intrusion of the second concrete placement into the filler joint.

F. Bond breakers shall be provided at the location shown on the Drawings. Bond breaker tape shall be used at joints to separate the sealant from premolded joint filler and to separate the sealant from concrete at the bottom of the sealant. Tape for these installations shall be the same width as the joint or sealant recess.
G. Sealants shall be installed in clean recesses at the location indicated on the Drawings. The application of the sealant shall conform to all the manufacturer's recommendations including temperature, moisture, primer, primer cure time and joint and recess preparation. Masking tape shall be applied to each side of the joint prior to the installation of the sealant and removed afterwards along with any spillage to leave a sealant installation with straight edges and a neat orderly appearance. Gray colored sealants shall be used unless otherwise specified or shown on the Drawings.

H. Expansion joint dowels shall be held horizontally in the forms with rigid ties to prevent displacement during the placement of the concrete. Dowel caps shall be positioned and rigidly held during concrete placement to allow at least 1 inch of expansion after installation.

END OF SECTION
PART 1   GENERAL

1.01  SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to place all concrete, reinforcing steel, forms, waterstops, grouting of base and bearing plates, electrical duct encasement, and miscellaneous related items including sleeves, relets, anchor bolts, inserts and embedded items specified under other Sections.

1.02  RELATED WORK NOT INCLUDED

A. Concrete reinforcement is included in Section 03200.
B. Concrete finishes are included in Section 03350.
C. Joints accessories are included in Section 03250.

1.03  DESCRIPTION

A. Concrete shall be of Portland cement, fine aggregate, coarse aggregate, water and admixtures as specified and shall be ready-mixed, or transit-mixed concrete produced by a plant acceptable to the Government Site Representative. All constituents, including admixture, shall be batched at the central batch plant.

B. Reinforced concrete shall conform to ACI Specification 318.

C. All testing and inspection services required will be provided by a laboratory selected by the Contractor and approved by the Government Site Representative. Cost of such work will be paid for by the Contractor. Methods of test will comply in detail with the latest applicable ASTM Methods of Test.

D. Samples of constituents and of concrete as placed will be subjected to laboratory tests. All materials incorporated in the work shall conform to approved samples.
1.04 SUBMITTALS

A. The Contractor shall first submit fine and coarse aggregate samples, conforming to specifications below, illustrative of colors available from local pits and in sufficient supply for this project. The Government Site Representative will designate those samples most likely to produce the desired shade in the concrete using the cement specified below for exposed concrete surfaces. The Contractor shall make two 12-inch by 12-inch by 4-inch samples of concrete from the aggregates selected, and these samples shall be judged for their color or hue after the required 28-day curing time. Provide additional samples until approval is obtained. The concrete sample selected shall remain at the job site and all exposed concrete placed on the job shall be identical in appearance at 30 feet.

B. For other submittals, see Paragraph 1.05.

1.05 QUALITY ASSURANCE

A. The actual acceptance of aggregates and development of mix proportions to produce concrete conforming to the specific requirements shall be determined by means of prior laboratory tests made with the constituents to be used on the work.

B. Well in advance of placing concrete, the Contractor shall discuss with the Government Site Representative the proposed source of materials and concrete mixture which he proposes to use. He shall furnish samples of aggregate and cement for testing, deliver them to the laboratory selected, and shall permit ample time for the laboratory to develop a proposed design mix or to modify the design of the mix within the limits of these specifications.

C. The following limiting strengths, water:cement ratios and cement factors shall apply.
<table>
<thead>
<tr>
<th>Minimum Compression Strength psi at 28 days</th>
<th>Maximum Net Water Content Gallons/100 lbs*</th>
<th>Minimum Cement Factor 100 lbs/cubic yard**</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500</td>
<td>7.4</td>
<td>4.3</td>
</tr>
<tr>
<td>3500</td>
<td>6.4</td>
<td>5.2</td>
</tr>
</tbody>
</table>

* Maximum; decrease if possible. This represents total water in mix at time of mixing, including free water on aggregates, and water in admixture solution.

** Minimum; increase as necessary to meet other requirements. These cement factors apply to “controlled” concrete subject to specific inspection.

When high-early-strength Portland cement is permitted, the same strength requirements shall apply except that the indicated strengths shall be attained at seven days instead of 28 days.

E. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Government Site Representative may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.

F. If, during the progress of the work, the Contractor desires to use materials other than those originally approved, or if the materials from the sources originally approved change in characteristics, the Contractor shall, have made new acceptance tests of aggregates and establishment of new basic mixtures by the approved testing laboratory being employed on the work. Objectionable changes in color of the structure shall not result from these modifications.

G. Consistency of the concrete as measured by the ASTM Designation C-143 shall be as shown in Table B.
TABLE B

<table>
<thead>
<tr>
<th>Portion of Structure</th>
<th>Slump (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recommended</td>
</tr>
<tr>
<td>Pavement and slabs on ground</td>
<td>2</td>
</tr>
<tr>
<td>Plain footings, gravity walls, slabs and beams</td>
<td>2-3</td>
</tr>
<tr>
<td>Heavy reinforced foundation walls and footings</td>
<td>3-4</td>
</tr>
<tr>
<td>Thin reinforced wall and columns</td>
<td>4</td>
</tr>
</tbody>
</table>

H. Concrete shall be of such consistency and mix composition that it can be readily worked into the corners and angles of the forms and around the reinforcement, inserts, and wall castings without permitting materials to segregate or free water to collect on the surface, due consideration being given to the methods of placing and compacting.

I. No excessively wet concrete will be permitted, and if at any time concrete of such consistency beyond the limits of Table B is delivered to the job, the Government Site Representative may direct the Contractor to reject same or to add extra cement for which no additional payment will be made. A supply of cement shall be kept available at the site for this purpose. No additional water shall be added by drivers to transit-mix trucks except that established for the design. Failure to comply with this requirement shall be justification for rejecting the concrete.

J. The entrained air, as measured by the Pressure Method, ASTM C-231, shall be:

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Air Measured at Discharge from truck (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finished slabs</td>
<td>3.0 maximum</td>
</tr>
<tr>
<td>All other</td>
<td>3.5-5.0</td>
</tr>
</tbody>
</table>

1.06 ACCEPTANCE TESTS

A. Conformity of aggregates to these Specifications, and the actual proportions of cement, aggregates, and water necessary to produce concrete conforming to the
requirements set forth in Table A, shall be determined by tests made with representative samples of the materials to be used on the work. Tests will be made at the Contractor's expense by a laboratory approved by the Government Site Representative.

B. Cement shall be subject to testing to determine that it conforms to the requirements of this Specification if it is required by the Government Site Representative.

C. Samples of fine and coarse aggregates shall be furnished for examination and testing at least three weeks before the Contractor proposes to use them in the work.

D. Water content of the concrete shall be based on a curve showing the relation between water content and 7- and 28-day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age, and shall have a range of values sufficient to yield the desired data, including all the compressive strengths called for on the plans, without extrapolation. The water content of the concrete to be used, as determined from the curve, shall correspond to the following test strengths:

<table>
<thead>
<tr>
<th>Design Strength</th>
<th>Min. Lab. 7 Days*</th>
<th>Strength 28 Days**</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,500</td>
<td>2,000</td>
<td>2,900</td>
</tr>
<tr>
<td>3,500</td>
<td>3,000</td>
<td>4,100</td>
</tr>
</tbody>
</table>

* May be employed for preliminary design.
** To be used for final designs.

E. In no case, however, shall the resulting mix conflict with the limiting values for maximum water:cement ratios and minimum cement contents as specified in Table A.
PART 2  PRODUCTS

2.01  MATERIALS

A. Materials shall conform to these Specifications and any State or local specification requirements.

B. Cement for all cast in place concrete shall be a domestic Portland cement (ASTM C-150, Type II) or high early strength Portland cement (ASTM C-150, Type III) free from injurious water soluble salts or alkalies. High early strength cement may only be used with written approval of the Government Site Representative. Air entraining cements shall not be used. Cement brands shall be subject to approval of the Government Site Representative.

C. Aggregates

1. Fine aggregates shall consist of washed inert natural sand conforming to the requirements of ASTM Specification C-33, and the following detailed requirements:

<table>
<thead>
<tr>
<th>Sieve Number</th>
<th>Percent Retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0-5</td>
</tr>
<tr>
<td>16</td>
<td>25-40</td>
</tr>
<tr>
<td>50</td>
<td>70-87</td>
</tr>
<tr>
<td>100</td>
<td>93-97</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fineness Modulus</td>
<td>2.60-3.00</td>
</tr>
<tr>
<td>Organic</td>
<td>See Plate 2, ASTM C-40</td>
</tr>
<tr>
<td>Silt</td>
<td>2 percent maximum</td>
</tr>
<tr>
<td>Mortar Strength</td>
<td>95 percent minimum as per C-87 Section 10</td>
</tr>
<tr>
<td>Soundness</td>
<td>8 percent maximum loss, using magnesium sulfate, subjected to 5 cycles</td>
</tr>
</tbody>
</table>
2. Course aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM Specification C-33 and the following detailed requirements.

<table>
<thead>
<tr>
<th>Sieve Number</th>
<th>Percent Retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>See Plate 1, per ASTM C-40</td>
</tr>
<tr>
<td>Silt</td>
<td>1.0 percent maximum</td>
</tr>
<tr>
<td>Soundness</td>
<td>8 percent maximum loss, using magnesium sulfate, subjected to 5 cycles</td>
</tr>
</tbody>
</table>

3. The following designated sizes of aggregate shall be the maximum employed in concrete.

   (a) 2-inches for plain concrete
   (b) 1-inch for reinforced sections 10-inches and over in thickness
   (c) 3/4-inch for reinforced sections less than 10-inch thickness

4. Note:

   The "Designated Size" and the corresponding gradations shown represent the end or combined gradation of the coarse aggregate to be used in the final concrete.

D. Water

1. Water shall be clean and free from injurious amounts of oils, acid, alkali, organic matter, or other deleterious substances.

2. When subjected to the mortar strength test described in ASTM C-87, the 28-day strength of mortar specimens made with the water under examination and normal Portland cement shall be at least 100 percent of the strength of similar specimens made with distilled water.

3. Potable tap water will normally fulfill the above requirements.
E. Admixtures

1. A water reducing agent shall be used in all concrete. The admixture shall conform to ASTM Specification C-494, Type A. Proportioning and mixing shall be as recommended by the manufacturer.

2. Admixtures causing accelerated setting of cement in concrete shall not be used. Air entraining admixtures with demonstrated compatibility with the concrete mix shall be used as required as a moderate addition to the water reducing agent to obtain the specified percent of air in the resultant concrete.

F. Grout

1. Grout for setting bearing plates for structural steel, machinery, and other equipment shall be mixed as recommended by the manufacturer to give the necessary consistency for placing and to give a minimum compressive strength of 3,000 psi in 3 days and 6,800 psi in 28 days.

2. Non-shrink grout shall be Masterflow 713 as manufactured by the Master Builders Company, Euco N-S by Euclid Chemical Company, Five Star Grout by U.S. Grout Corporation, or approved equal.

PART 3 EXECUTION

3.01 MEASURING MATERIALS

A. Materials shall be measured by weighing except as otherwise specified or where other methods are specifically authorized by the Government Project Manager. The apparatus provided for weighing the aggregates and cement shall be suitably designed and constructed for this purpose. Scales shall have been certified by the local Sealer of Weights and Measures within one year of use. Each size of aggregate and the cement shall be weighed separately. The accuracy of all weighing devices shall be such that successive quantities can be measured to within one percent of the desired amount. Cement in standard packages (sacks) need not be weighed, but bulk cement and fractional packages shall be weighed.
B. Water shall be measured by volume or by weight. The water-measuring device shall be capable of control to 1/2 percent accuracy. All measuring devices shall be subject to approval. Admixtures shall be dispensed either manually with use of calibrated containers or measuring tanks, or by means of an approved automatic dispenser designed by the manufacturer of the specific admixture.

3.02 MIXING

A. Concrete shall be ready-mixed, or transit-mixed, as produced by equipment acceptable to the Government Site Representative. No hand mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of, and under the direction of, the Government Site Representative.

B. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the name plate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.

C. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturer's Bureau of the National Ready-mixed Concrete Association, as well as ACI Standard 614 and ASTM Specification C-94.

D. The retempering of concrete or mortar which has partially hardened, that is, mixing with or without additional cement, aggregate, or water, will not be permitted.

E. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.
### 3.03 FIELD TESTS

A. Sets of three field control cylinder specimens will be taken at random by the Contractor at the request of the Government Site Representative during the progress of the work, in conformity with ASTM Designation C-31; the total number of specimens taken on the project may average one set per 150 cubic yards, and in general no less than one set of specimens will be taken on any one day when concrete is placed. The cylinders shall be tested at the Contractor’s expense by a Government-approved laboratory and the results submitted to the Government Contracting Officer. When average ultimate 28-day strength of control cylinders in any set falls below the required ultimate strength or below proportional minimum 7-day strengths where proper relation between 7- and 28-day strengths have been established by tests, proportions, water content, or temperature conditions shall be changed to secure the required strength.

B. The Contractor shall cooperate in the making of such tests to the extent of allowing free access to the work for the selection of samplers, providing heated moist storage facilities for specimens, affording protection to the specimens against injury or loss through his operations, and furnishing material and labor required for the purpose of taking concrete cylinder samples, curing boxes, and shipping boxes.

C. Slump tests will be made in the field by the Contractor.

D. The Government Site Representative will retain the right to perform any additional tests, inspections, etc. as he deems necessary. The Contractor shall provide concrete cylinders as necessary for these tests.

### 3.04 INSPECTION AND CONTROL

A. The preparation of forms, placing of reinforcing steel, conduits, pipes, and sleeves, batching, mixing, transportation, placing and curing of concrete shall be at all times under the inspection of the Government Site Representative.

B. The Contractor will also engage the services of a testing laboratory to establish the basic mixtures of concrete as required by the specifications.

C. Air entrainment shall be measured by the Contractor at time of concrete deposit in accordance with ASTM Designation C-231.
3.05 CONCRETE APPEARANCE

A. Concrete for every part of the work shall be of homogeneous structure which, when hardened, will have the required strength, durability and appearance.

B. Formwork, mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no finishing.

3.06 FORMS

A. Forms shall be used for all concrete masonry, including footings. Forms shall be so constructed and placed that the resulting concrete will be of the shape, line, dimensions, appearance, and to the elevations indicated on the Drawings.

B. Forms for all exposed exterior and interior concrete walls shall be B-B Plyform Class I Exterior plywood, mill oiled and edge sealed. For curved walls, provide approved curved form material to provide the smooth radius shown. Moldings for chamfers and rustications shall be milled and planed smooth.

C. Forms for all other cast in place concrete shall be made of wood, metal, or other approved material. Wood forms shall be constructed of sound lumber or plywood of suitable dimensions, free from knotholes and loose knots; where used for exposed surfaces, board shall be dressed and matched. Plywood shall be sanded smooth and fitted with tight joints between panels. Metal forms shall be of an approved type for the class of work involved and of the thickness and design required for rigid construction.

D. Edges of all form panels in contact with concrete shall be flush within 1/32-inch and forms for plane surface shall be such that the concrete will be plan within 1/16-inch in 4 feet. Forms shall be right to prevent the passage of mortar and water and grout.

E. Forms for walls shall have removable panels at the bottom for cleaning, inspection, and scrubbing in of bonding paste. Forms for walls of considerable height shall be arranged with tremies and hoppers for placing concrete in a manner that will prevent segregation and accumulation of hardened concrete on the forms or reinforcements above the fresh concrete.
F. Molding or bevels shall be placed to produce a 3/4-inch chamfer on all exposed projecting corners. Approved chamfer strips shall be provided at horizontal and vertical extremities of all wall placement to produce "clean" separation between successive placement shown.

G. Forms shall be sufficiently rigid to withstand vibration, to prevent displacement or sagging between supports, and constructed so the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for their adequacy.

H. Forms, including new pre-oiled forms, shall be oiled before reinforcement is placed, with an approved nonstaining oil or liquid form coating not having a paraffin base.

I. Before form material is re-used, all surfaces in contact with concrete shall be thoroughly cleaned, all damaged places repaired, all projecting nails withdrawn, all protrusions smoothed and in the case of wood forms pre-oiled.

J. Form ties encased in concrete shall be designed so that after removal of the projecting part, no metal shall be within 1 inch of the face of the concrete. That part of the tie to be removed shall be at least 1/2 inch diameter or be provided with a wood or metal cone at least 1/2 inch in diameter and 1 inch long. Form ties in concrete exposed to view shall be the cone-washer type. Throughbolts or common wire shall not be used for form ties.

3.07 PLACING AND COMPACTING

A. Unless otherwise permitted, the work begun on any day shall be completed in daylight of same day.

B. Place no concrete until reinforcing steel, pipes, conduits, sleeves, hangers, anchors, and other work required to be built into concrete have been inspected and approved by the Government Site Representative. Remove water and foreign matter from forms and excavation. Place no concrete on frozen soil, and provide adequate protection against frost action during freezing weather. All soil bottom for slabs and footings shall be approved by the Government Site Representative before placing concrete.
C. Transport concrete from mixer to place of final deposit as rapidly as practicable by methods which prevent separation of ingredients and displacement of reinforcement, and which avoid rehandling. Deposit no partially hardened concrete.

D. "Cold joints" are to be avoided, but if they occur, are to be treated as bonded construction joints.

E. At construction joints the surfaces of the concrete already placed, including vertical and inclined surfaces, shall be thoroughly cleaned of foreign materials and laitance, and weak concrete and roughened with suitable tools to expose a fresh face. At least 2 hours before and again shortly before the new concrete is deposited, the joints shall be saturated with water. After glistening water disappears, the joints shall be given a thorough coating of neat cement slurry mixed to the consistency of very heavy paste. The surfaces shall receive a coating at least 1/8-inch thick, well scrubbed in by means of stiff bristle brushes whenever possible. New concrete shall be deposited before the neat cement dries.

F. Deposit concrete to maintain, until the completion of the unit, a horizontal plastic surface. Vertical lifts shall not exceed 24 inches and shall preferably be 18 inches.

G. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal lined and each section shall have approximately the same slope. The slope shall not be less than 25 degrees nor more than 45 degrees and shall be such as to prevent the segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used, and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally over distances exceeding 5 feet.

H. In thin sections of considerable height, concrete shall be placed using suitable hoppers, spouts with restricted outlets, or otherwise, as required or approved.
I. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cubic yards of concrete placed per hour. In addition, one spare vibrator in operating condition shall be on the site.

J. Concrete slabs on the ground shall be well tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.

K. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the Drawings or approved by the Government Site Representative.

3.08 CURING AND PROTECTION

A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

B. Concrete placed at air temperature below 40°F shall have a minimum temperature of 60°F. When the air temperature is below 40°F or near 40°F and falling, the water and aggregates shall be heated before mixing. Accelerating chemicals shall not be used to prevent freezing. All concrete shall be so protected that the temperature at the surface will not fall below 50°F for at least 7 days after placing. The Contractor shall submit for approval by the Government Project Manager the methods he proposes to use against low temperatures. No salt, manure, or other chemical shall be used for protection.

C. All concrete, particularly exposed surfaces, shall be treated immediately after concreting or cement finishing is completed to provide continuous moist curving above
50°F for at least 7 days, regardless of the ambient air temperature. Walls and vertical surfaces may be covered with continuously saturated burlap, or other approved means; horizontal surfaces, slabs, etc., shall be ponded to a depth of 1/2 inch or kept continuously wet by use of sprinklers.

D. In cold weather supplementary continuous warm curing (above 50°F) shall provide a total of 350 day-degrees (i.e., 5 days 70°F, etc.) of heat.

E. Wherever practicable, finished surface and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

3.09 REMOVAL OF FORMS

A. Except as otherwise specifically authorized by the Government Site Representative, forms shall not be removed before the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design, and not before reaching the following number of day-degrees (whichever is the longer):

<table>
<thead>
<tr>
<th>Forms for</th>
<th>Day-degree*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beams and slabs</td>
<td>500</td>
</tr>
<tr>
<td>Walls and vertical surfaces</td>
<td>100</td>
</tr>
</tbody>
</table>

* Day-degree: Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60°F equal 300 day-degrees. Temperatures below 50°F are not to be included.

B. Shores shall not be removed until the concrete has attained at least 60 percent of the specified strength and also sufficient strength to support safely its own weight and the construction live loads upon it.

3.10 FAILURE TO MEET REQUIREMENTS

A. Should the strengths shown by the test specimens made and tested in accordance with the above provisions fall below the values given in Table A, the Government Site Representative shall have the right to require changes in proportions as outlined above to apply on the remainder of the work. Furthermore, the Government Site
Representative shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Government Site Representative shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. In such cases of failure to meet strength requirements the Contractor and the Government Site Representative shall confer to determine what adjustment, if any, can be made in conformity with Sections 15 and 17 of ASTM Specification C-94 for Ready-Mixed Concrete.

B. When the tests on control specimens of concrete fall below the required strength, the Government Site Representative will require check tests for strengths to be made by means of typical cores drilled from the structure in accordance with ASTM Methods C-42 and C-39. In case of failure of the latter, the Government Site Representative, in addition to other recourses, may require, at the Contractor's expense, load test on any one of the slabs, beams, piles, caps, and column in which such concrete was used. Test need not be made until concrete has aged 60 days.

C. Slabs or beams, under load test, shall be loaded with their own weights plus a superimposed load of 2 times design live load. The load shall be applied uniformly over portion being tested in approved manner, and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period does not exceed value:

\[ D = 0.001 \frac{L \times L}{t} \]

in which "L" is span in feet, "t" is depth of slab or beam in inches.

D. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, slab or beam under test recovers at least 75 percent of observed deflection.

E. Should the strength of test cylinders fall below 60 percent of the required minimum 28-day strength, the concrete shall be rejected and shall be removed and replaced.
3.11 PATCHING AND REPAIRS

A. It is the intent of this Specification to require forms, mixture of concrete and
workmanship so that concrete surfaces, when exposed, will require no patching.

B. As soon as the forms have been stripped and the concrete surfaces exposed, fins and
other projections shall be removed, recesses left by the removal of form ties shall be
filled except as specified below, and surface defects which do not impair structural
strength shall be repaired. Clean all exposed concrete surfaces and adjoining work
stained by leakage of concrete, to approval of the Government Site Representative.

C. Immediately after stripping of forms, remove the cones and break off metal ties except
where required below to be left in place. Holes are then to be promptly filled upon
stripping as follows: Moisten the hole with water, followed by a 1/16-inch brush coat
of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the
hole with a 1:1.5 mixture of cement and concrete sand mixed slightly damp to the
touch (just short of "balling"). Hammer the grout into the hole until dense, and an
excess of paste appears on the surface in the form of a spiderweb. Trowel smooth with
heavy pressure. Avoid burnishing.

D. When filling tie cone holes, patching or repairing exposed surfaces the same source of
cement and sand as used in the parent concrete shall be employed. Adjust color if
necessary by addition of proper amounts of white cement. Rub lightly with a fine
carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with
the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the
surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

E. Defective concrete and honeycombed areas as determined by the Government Site
Representative shall be chipped down reasonably square and at least 1 inch deep to
sound concrete by means of hand chisels or pneumatic chipping hammers. Irregular
voids or surface stones need not be removed if they are sound, free of laitance, and
firmly embedded in the parent concrete, subject to Government Site Representative’s
final inspection. If honeycomb exists around reinforcement, chip to provide a clear
space at least 3/8 inch wide all around the steel. For areas less than 1-1/2 inch deep, the
patch may be made in the same manner as described above for filling form tie holes,
care being exercised to use adequately dry (non-trowelable) mixtures and to avoid
sagging. Thicker repairs will require build-up in successive 1-1/2 inch layers on
successive days, each layer being applied (with slurry, etc.) as described above. To aid strength and bonding of the multiple layer repairs, the Government Site Representative may order the use of Embeco non-shrink, metallic aggregate by Master Builders Company, Cleveland, Ohio, Ironite by Fox Industries, Madison IL or approved equal, as an additive as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Volumes</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Embeco</td>
<td>0.15</td>
<td>0.25</td>
</tr>
<tr>
<td>Sand</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

G. For very heavy (generally formed) patches; the Government Contracting Officer may order the addition of pea gravel to the mixture and the proportions modified as follows:

<table>
<thead>
<tr>
<th>Material</th>
<th>Volumes</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Embeco</td>
<td>0.2</td>
<td>0.33</td>
</tr>
<tr>
<td>Sand</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Pea Gravel</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

H. In cases where the Embeco is employed in multiple patches and a rusty finish is not desired on the surface, such as exposed faces of walls, etc., the final layer (or at least the final 1/2 inch) shall be composed of the 1:1.5 grout without Embeco. After hardening, rub lightly as described above for form tie holes.

3.12 INSTALLATION SCHEDULE

A. Concrete for all structures shall have minimum compressive strength at 28 days of 3,500 psi.

B. Concrete fill and duct encasement shall have a minimum compressive strength at 28 days of 2,500 psi.
3.13 MISCELLANEOUS WORK

A. All bolts, anchors, miscellaneous metals or other sleeve steel work required to be set in the concrete forms for attachment of masonry, structural, and mechanical equipment shall be set or installed under this Division. The Contractor shall be fully responsible for the setting of such materials in the forms and shall correct all such not installed in a proper location or manner at his own expense.

B. Electric conduits shall be installed in the concrete as required by the Drawings and specified elsewhere in these Specifications. Outlet boxes and fixtures shall be located in reference to the final floor, wall or ceiling finish and shall be so secured that they will not be displaced by concrete placing.

C. Pipes or conduits for embedment, other than those merely passing through shall not be larger in outside diameter than one-third the thickness of the slab, wall or beam in which they are embedded, unless indicated on the Drawings, nor shall they be spaced closer than three diameters on center, nor so located as to unduly impair the strength of the construction. The Government Site Representative shall approve the location of all conduits and fixtures.

D. Electrical Duct Encasement

1. Provide not less than 3 inches of concrete between the outside of a duct and the earth. Provide not less than 2 inches of concrete between adjacent ducts.

2. Where duct lines pass through concrete walls, concrete envelopes shall be extended through the wall and finished flush with inside surface. Provide watertight construction joints using water stops specified in Section 03250.

E. Concrete foundations, supports and bases for all equipment and machinery shall be built to the equipment manufacturer's requirements, as approved by the Government Site Representative, with anchor bolts installed.

F. All motor control centers and power control centers shall be installed on 4-inch minimum depth concrete base as specified above.
3.14 FIELD CONTROL

A. The Contractor shall advise the Government Site Representative of his readiness to proceed at least six working hours prior to each concrete placement. The Government Site Representative will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Government Site Representative.

B. The Government Site Representative may require that the Contractor take cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work.

C. The Contractor shall repair all core holes to the satisfaction of the Government Site Representative.

END OF SECTION
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to finish cast-in-place concrete surfaces as specified herein.

1.02 RELATED WORK NOT INCLUDED

A. Patching and repair of defective and honeycombed concrete is included in Section 03300.

1.03 SCHEDULE OF FINISHES

A. Concrete for the project shall be finished in the various specified manners either to remain as natural concrete or to receive an additional applied finish or material under another Section.

B. Finishes to the base concrete for the following conditions shall be finished as noted and as further specified herein:

1. Concrete to receive dampproofing: Off-form finish.

2. Exterior concrete (excluding slabs and walking surfaces) and exposed interior concrete: Rubbed finish as approved.

3. Concrete for exterior on walks, stairs, containment structures and other horizontal areas: Broomed finish, non-slip.

4. Concrete not exposed in the finished work and not scheduled to receive an additional applied finish or material: Off-form finish.
5. Concrete to receive paint: Rubbed finish.

6. Concrete to receive hardener: Wood float, non-slip.

1.04 RESPONSIBILITY FOR CHANGING FINISHES

A. The surface finishes specified herein are required for the proper application of products specified under other Sections. Where products different from those specified are approved for use, it shall be the Contractor's responsibility to determine if changes in concrete finishes are required and to provide them.

1.05 SUBMITTALS

A. Submit for review as provided in Section 01300 for shop drawings, detailed materials specifications and installation procedures for all materials.

1.06 MANUFACTURER'S REPRESENTATIVE

A. Provide the services of a factory representative of the manufacturer of the acid resistant finish system for the entire time when slab is being prepared and system is being installed and for inspection after completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cementitious and component materials required for finishing with the concrete surfaces shall be as specified in Section 03300.

B. Chemical hardener shall be Lapidolity by Sonneborn, Hornolith by A. C. Horn, Penalith by W. R. Meadows or approved equal fluosilicate base material.
3.01 FORMED SURFACES

A. Forms shall not be stripped before the provisions of Section 03300, Paragraph 3.08A have been met.

B. Care shall be exercised to prevent damaging of surfaces or edges or obliterating the lines of chamfers, rustications or corners when removing the forms or doing any work adjacent thereto.

C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to the satisfaction of the Government Site Representative.

D. Concrete to receive dampproofing and concrete not exposed in the finished work shall have off-form finish with fins and other projections removed and tie cones and defects filled as specified under Section 03300.

E. 1. Immediately upon stripping forms and before concrete has changed in color, all fins shall be carefully removed with a hammer. While the wall is still damp apply a thin coat of medium consistency neat cement slurry by means of bristle brushes to provide a bonding coat within all pits, air holes or blemishes in the parent concrete; avoid coating large areas of the finished surface with this slurry.

2. Before the slurry has dried or changed color, apply a dry (almost crumbly) grout consisting of one volume cement to 1-1/2 volumes of clean masonry sand having a fineness modulus of approximately 2.25 and complying with the gradation requirements of ASTM C-33. Grout shall be uniformly applied by means of damp (neither dripping wet nor dry) pads of coarse burlap approximately 6-inch square used as a float. Grout shall be well scrubbed into the pits and air holes to provide a mortar in the imperfections to be patched.

3. Allow the mortar to partially harden for one or two hours depending upon the weather. If the air is hot and dry, keep the wall damp during this period using a fine, fog spray. When the grout has hardened sufficiently so it can be scraped from the surface with the perpendicular edge of a steel trowel without damaging the grout in the small pits or holes, cut off all that can be removed within a trowel.
Grout allowed to remain on the wall too long will get too hard and will be difficult to remove.

4. Allow the surface to dry thoroughly and rub it vigorously with clean dry burlap to completely remove any dried grout. No visible film of grout should remain after this rubbing. The entire cleaning operation for any area must be completed the day it is started. Do not leave grout on surfaces overnight. Allow sufficient time for grout to dry after it has been cut with the trowel so it can be wiped off clean with the burlap.

5. On the day following the repair of pits, air holes and blemishes, the walls again shall be wiped off clean with dry, used pieces of burlap containing old hardened mortar which will act as a mild abrasive. After this treatment, there shall be no built-up film remaining on the parent surface. If, however, such is present a fine abrasive stone shall be used to remove all such material without breaking through the surface film of the original concrete. Such scrubbing shall be light and sufficient only to remove excess material without working up a lather or mortar or change the texture of the concrete.

6. A thorough wash-down with stiff bristle brushes shall follow the final bagging or stoning operation in order that no extraneous materials remain on the surface of the wall. The wall shall be sprayed with a fine fog spray periodically to maintain a continually damp condition for at least 3 days after the application of the repair grout.

3.02 FLOORS AND SLABS

A. Floors and slabs shall be screened to the established grades and shall be level with a tolerance of 1/8 inch when checked with a 12-foot straightedge, except where drains occur, in which case floors shall be pitched to drains as indicated. Failure to meet either of the above shall be for removal, grinding, or other correction as directed by the Government Site Representative.

B. Following screening as specified above, power disc compact as follows:

1. Immediately after final screening a dry cement/sand shake in the proportion of 2 sacks of Portland cement to 350-pounds of coarse natural concrete and shall be
sprinkled evenly over the surface at the rate of approximately 500 pounds per 1,000 square feet of floor. Neat, dry cement shall not be sprinkled on the surface. This shake shall be thoroughly floated into the surface with an approved disc type power compacting machine weighing at least 200 pounds if a 20-inch disc is used or 300 pounds if a 24-inch disc is used (such as a “Kelly Float” as manufactured by the Weisner-Rapp Corporation of Buffalo, New York). A mechanical blade-type float or trowel is not acceptable for this work.

NOTE: This operation (application of the cement and shake) may be eliminated at the discretion of the Government Site Representative if the base slab concrete exhibits adequate fattiness and homogeneity; and the need is not indicated.

2. The floor or slab shall be compacted to a smooth surface and the floating operation continued until sufficient mortar is brought to the surface to fill all voids. The surfaces shall be tested with a straightedge to detect high and low spots which shall be eliminated.

3. Compaction shall be continued only until through densification is attained and a small amount of mortar is brought to the surface. Excessive floating shall be avoided.

C. After procedures specified in Paragraphs 3.02A and 3.02B of this section are accomplished, floors and slabs for particular conditions shall be finished as specified in the Paragraphs 3.02D and 3.02E of this section.

D. Wood float are required maintaining surface tolerances to provide a non-slip finish as approved.

E. Concrete for exterior, non-submerged service shall be broomed in the direction of slab drainage maintaining the surface tolerance to provide a non-slip finish as approved.

3.03 CONCRETE RECEIVING CHEMICAL HARDENER

A. After 28 days, minimum, concrete cure, apply chemical hardener in three applications to a minimum total coverage of the undiluted chemical of 100 square feet per gallon and in accordance with manufacturer’s recommendations as reviewed.
3.04 APPROVAL OF FINISHES

A. All concrete surfaces, when finished, will be inspected by the Government Site Representative.

B. Surfaces which, in the opinion of the Government Site Representative, are unsatisfactory shall be refinished or reworked until approved by the Government Contracting Officer.

END OF SECTION
DIVISION 4

Masonry
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to construct all masonry work as shown and as specified herein.

B. The work under this Section includes, but is not necessarily limited to, the following:

1. Concrete Masonry units (CMU)

2. Masonry reinforcing ties and anchors and installation only of vertical and CMU lintel reinforcing in masonry

3. Grouting as specified herein

1.02 RELATED WORK NOT INCLUDED

A. Vertical and CMU lintel reinforcing is furnished under Division 3.

B. Grouting of baseplates and equipment is included in Division 3.

C. Miscellaneous metals are included in Division 5.

D. Caulking is included in Division 5.

E. Welding of anchors to structural steel is included in Division 13.

1.03 PROTECTION OF MATERIALS

A. All perishable materials for the work of this section shall be delivered stored and handled so as to preclude damage of any nature. manufactured materials, such as
cement and lime, shall be delivered and stored in their original containers, plainly marked with identification of material and maker. Materials in broken containers, or in packages showing water marks or other evidence of damage, shall not be used and shall be removed from the site.

B. All masonry shall be shipped stacked with hay or straw protection or other suitable protective device, and shall be similarly stacked off the ground on the site. In addition, all masonry stored on the site shall be protected from the weather and staining with the use of tarpaulins or other covering approved by the Government Site Representative.

PART 2 PRODUCTS

2.01 MATERIALS - MASONRY

A. Concrete Masonry Units (CMU)

1. CMU shall conform to ASTM C90, lightweight Grade N, Type I, hollow, load bearing units of 8-inch by 16-inch nominal face size and bed dimension as shown. Provide units with one, center, square edge, 3/8-inch by 3/8-inch vertical score.

2. CMU shall be free from substances that will cause staining or pop-outs, and shall be fine, even texture with straight and true edges. All units shall be air cured in covered storage for not less than 28 days before delivery.

3. Units shall be obtained from one manufacturer to insure even color and texture.

4. Provide special units required by the Drawings, including solid, corner, lintel, and jamb units.

5. Lightweight CMU shall be manufactured with lightweight aggregates conforming to ASTM C331, and the weight of each unit of listed bed dimensions shall not exceed the following: 4-in-20 pounds, 6-in-23 pounds, 8-in-30 pounds, 10-in-38 pounds, and 12-in-45 pounds. Unlisted CMU sizes shall not exhibit unit weight exceeding 105 pounds per cubic foot. Provide a scale at the job site for weighing.
2.02 FABRICATION OF REINFORCEMENT

A. Wall Reinforcement

1. Reinforcement shall be welded wire units prefabricated in straight lengths of not less than 10 feet with matching corner and tee units fabricated from cold-drawn steel wire complying with ASTM A82, with deformed continuous side rods and plain cross-rods and a unit width of 1-1/2 inch to 2 inches less than thickness of wall or partition. Units shall be galvanized after fabrication conforming to ASTM A153, Class B-2, 1.5 ounces per square foot.

2. Reinforcement shall be truss type, fabricated with single pair of galvanized 9-gauge side rods and continuous 9-gauge diagonal cross-rods spaced not more than 16 inches outside circumference.

3. Reinforcement shall be manufactured by Dur-O-Wal, Hohmann and Barnard, AA Wire Products, or equal.

B. Wall Ties and Anchors

1. Provide approved 3/16-inch diameter triangular ties with 1/4-inch diameter column anchors for welding to steel frame. Locate as shown.

2. Provide approved 16-gauge corrugated nonferrous masonry ties where and as shown. Fasten to steel as approved.

3. Provide and install miscellaneous anchors and attachment members, required both for the anchorage of work of this Section and that of other trades requiring attachment to masonry, which are not specifically provided under separate Sections.

4. All steel components shall be galvanized mill type conforming to ASTM A641, Class III.

5. Ties and anchors shall be manufactured by Dur-O-Wall, Hohmann and Barnard, AA Wire Products, or equal.
2.03 MORTAR AND GROUT MATERIALS

A. Portland cement shall conform to ASTM C150 Type II. Masonry cements shall NOT be used.

B. Lime for masonry mortar shall be hydrated, conforming to ASTM C207, Type S.

C. Sand shall be clean, durable particles, free from injurious amounts of organic matter.
   The sand shall conform to the limits of ASTM C144. Sand for grout shall conform to
   ASTM C144 or C33 as required.

D. Water shall be free from injurious amounts of oils, acids, alkalis, or organic matter and
   shall be clean and fresh.

E. Integral type waterproofing for use in all exterior mortar shall be metallic stearate type,
   Hydrocide Powder by Sonneborn Contech, Omicron Mortarproofing by Master
   Builders Company, Integral Waterpeller by Euclid Chemical, or equal.

F. Nonshrink grout shall be Masterflow 713 as manufactured by the Master Builders
   Company, Euco N-S by Euclid Chemical Company, Five Star Grout by U.S. Grout
   Corporation, or equal. Grout shall attain a 28-day compressive strength of 6,800 psi.

2.04 MORTAR AND GROUT MIXES

A. Ingredients shall be accurately measured by volume in boxes especially constructed for
   the purpose. Measurement by shovel will not be allowed. Measure materials in a
   damp, loose condition.

B. Mortar shall be mixed by placing one-half of the water and sand in the operating
   mixer. Then add the cement, lime, and the remainder of the sand and water.

C. Tooling shall be done when the mortar is partially set but still sufficiently plastic to
   bond. All tooling shall be done with a tool which compacts the mortar, pressing the
   excess mortar out of the joint rather than dragging it out. Joints which are not tight at
   the time of tooling shall be raked out, pointed, and then tooled.
D. Unless otherwise specified or detailed on the plans, in hollow unit masonry the horizontal and vertical mortar joints shall be 3/8" thick with full mortar coverage on the face shells and on the webs surrounding cells to be filled.

E. Vertical head joints shall be buttered well for a thickness equal to the face shell of the unit and these joints shall be shoved tightly so that the mortar bonds well to both units. Joints shall be solidly filled from the face of the block to at least the depth of the face shell.

F. Lintels, capping units, and all bearing plates set by the mason shall be set in a full bed of mortar.

G. When control joints are required, they shall be as detailed on the plans.

H. All masonry slots, chases, or openings required for the proper installation of the work of other Sections shall be constructed as indicated on the Drawings or in accordance with information furnished before the work is started at the points affected. No chase shall cut into any wall constructed of hollow units after it is built, except as directed and approved by the Government Site Representative.

I. Surfaces shall be brushed as work progresses and maintained as clean as it is practicable. Unfinished work shall be raked back where possible, and toothed only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind and before continuing work previously laid shall be swept clean. The tops of walls or other unfinished work shall be protected against all damage by frost or the elements by means of waterproof paper, tarpaulins, boards or other means approved by the Government Site Representative.

J. Build in all miscellaneous items to be set in masonry for which placement is not specifically provided under separate Divisions, including reglets, lintels, ties, electrical panel boxes, sleeves, vents, grilles, anchors, grounds, and exterior electric conduits and fixtures, and cooperate with other trades whose work is to be coordinated with the work under this Section.

K. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.
L. All ties and reinforcing for masonry shall be furnished and installed under this Section. Locate at 16-inch outside circumference, measured vertically.

M. Build in and grout fully all vertical wall reinforcing as shown.

N. Bed and grout for items coming in contact with masonry where grouting is required, including, but not limited to, door bucks and frames set in masonry. Install all anchor bolts, base plates, and seats in masonry walls, and build in all items required for the completion of the building as they apply to masonry.

O. All door and window frames shall be caulked at the masonry juncture on the inside and outside surfaces with material in accordance with Federal Specification TT-5-1657. Caulking shall be gray in odor. Apply only after surfaces are free from dirt, grease, moisture, and other foreign matter.

3.03 REPAIR, POINTING, AND FINAL CLEANING

A. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progresses to reduce need for cleaning at completion of the work.

B. Where ordered, remove masonry units which are loose, chipped, broken, stained, or otherwise damaged, and units which do not match adjoining units, and install new units in fresh mortar or grout, pointed to eliminate, as approved by the Government Site Representative, evidence of replacement.

C. Pointing

1. During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar matching color as approved by the Government Site Representative and tool to match. Point-up all joints at corners, openings and adjacent work to provide a neat, uniform appearance and properly prepare joints for application of sealants where required.

2. Before final cleaning, repoint all unsatisfactory joints as specified above and as required by the Government Site Representative.
D. Final Cleaning Masonry

1. Allow mortar to set 28 days minimum before attempting cleaning. The Government Site Representative's acceptance of sample cleaning shall be obtained before proceeding to clean remainder of masonry work. A minimum of 1 week is required to evaluate effectiveness of cleaning and affect on masonry and mortar. Upon acceptance, all masonry shall be cleaned by the same method to the satisfaction of the Government Site Representative.

2. Acid solutions shall not be used for cleaning CMU or glazed CMU. Upon completion of the work, all surfaces of CMU and glazed units shall be washed with soap powder and warm water, applied with a scrubbing brush, and then rinsed thoroughly with clear water. Other cleaning methods may be ordered to obtain required appearance. Metal cleaning tools and brushes or abrasive powders shall not be used on glazed surfaces.

3. Masonry areas not satisfactorily cleanable will be ordered replaced at no extra cost.

END OF SECTION
DIVISION 5

Metals
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install all miscellaneous metal as shown on the Drawings and specified herein.

1.02 RELATED WORK NOT INCLUDED

A. Masonry reinforcement, and masonry ties are included in Section 4200.
B. Structural steel is included in Division 13.
C. Hollow metal doors and frames are included in Section 08110.
D. Anchor bolts for equipment are included in the respective Sections of Division 15.

1.03 SUBMITTALS

A. Submit to the Government Contracting Officer, as provided in Section 01300, shop drawings, showing sizes of members, method of assembly, anchorage, and connection to other members.

1.04 COORDINATION

A. The work of this Section shall be completely coordinated with the work of other Sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.
B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.
1.05 FIELD MEASUREMENTS

A. Field measurements shall be taken at the site to verify or supplement indicated dimensions and to insure proper fitting of all items.

1.06 REFERENCE SPECIFICATIONS

A. Unless otherwise specified, materials shall conform to the following:

<table>
<thead>
<tr>
<th>Material</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Steel</td>
<td>ASTM A36</td>
</tr>
<tr>
<td>Structural Tubing</td>
<td>ASTM A500, Grade B</td>
</tr>
<tr>
<td>Welded and Seamless Steel Pipe</td>
<td>ASTM A53</td>
</tr>
<tr>
<td>Gray Iron Castings</td>
<td>ASTM A48, Class 30</td>
</tr>
<tr>
<td>Galvanizing</td>
<td>ASTM A123</td>
</tr>
<tr>
<td>Galvanizing, hardware</td>
<td>ASTM A153</td>
</tr>
<tr>
<td>Aluminum (Standard Shapes)</td>
<td>6061 T6</td>
</tr>
<tr>
<td>Aluminum (Extruded Pipe)</td>
<td>6063 T6</td>
</tr>
<tr>
<td>Aluminum Sheet, Plate, and Rolled Shapes</td>
<td>6061 T6</td>
</tr>
<tr>
<td>Anchor Bolts and Nuts</td>
<td>ASTM A307</td>
</tr>
<tr>
<td>Stainless Steel Bolts, Bars, and Shapes</td>
<td>AISI, Type 304</td>
</tr>
<tr>
<td>Stainless Steel Plate and Sheet</td>
<td>AISI, Type 302</td>
</tr>
<tr>
<td>Welding Rods for Steel</td>
<td>AWS Spec. for Arc Welding (Type E70XX)</td>
</tr>
<tr>
<td>High Strength Steel Bolts, Nuts, and Washers</td>
<td>ASTM A325F Mechanically Galvanized per ASTM B454</td>
</tr>
</tbody>
</table>

PART 2 PRODUCTS

2.01 ANCHORS, BOLTS, AND FASTENING DEVICES

A. Anchors, bolts, etc, shall be furnished as necessary for installation of the work of this Section.

B. Compound masonry anchors shall be of the type shown or required and shall be equal to Star Slug in compounded masonry anchors manufactured by Star Expansion.
Industries, equal by Phillips Drill Company, Rawlplug, or equal. Anchors shall be minimum “two unit” type.

C. The bolts used to attach the various members to the anchors shall be the sizes shown or required. Aluminum and stainless steel shall be attached to concrete or masonry by means of stainless steel machine bolts and iron or steel shall be attached with steel machine bolts unless otherwise specifically noted.

D. For structural purposes, unless otherwise noted, expansion bolts shall be Phillips Drill Company “Wedge Anchors,” or Hilti “Kwik-Bolt” or approved equal. When length of bolt is not called for on the Drawings, the length of bolt provided shall be sufficient to place the wedge portion of the bolt a minimum of 2 inch behind the reinforcing steel within the concrete. Material shall be galvanized steel unless otherwise noted on the Drawings.

2.02 STEEL ITEMS

A. Manhole type rungs for setting into cast-in-place concrete shall be stainless steel as detailed.

B. Miscellaneous steel pipe for sleeves and lifting attachments and other uses as required shall be Schedule 40 pipe fabricated according to the details as shown on the Drawings.

C. Miscellaneous steel shall be fabricated and installed in accordance with the Drawings and shall include: beams, angles, support brackets, and accessories; hold down straps and lugs; splice plates, anchor bolts (except for equipment furnished in Division 15); and any other miscellaneous steel called for on the Drawings and not otherwise specified.
HANDRAILINGS, GRATING, AND STAIR TREADS

A. Steel Handrail

1. Railings shall be a welded, 1-1/2-inch IPS, Schedule 40 steel pipe system as shown. Pipe shall be per ASTM A-53.

2. Welds shall be circumferential ground smooth and even to produce a railing that is neat in appearance and structurally sound as approved.

3. Form bends to the dimensions shown for the angles required by the project conditions. No distortion of the circular railing shape will be allowed.

4. Spacing of posts shall be as approved on shop drawings, but in all cases shall be uniform and shall be placed as shown or at 5-foot-0-inches outside circumference maximum. Shorter spacing shall be used where required to maintain the maximum spacing.

5. All railings shall be erected to line and plumb. Field splicing and expansion compensation shall be accomplished using internal splice sleeves, welded one end, set screw fastened one end where shown or rivet fastened. Make provisions for removable railing sections as detailed and where shown.

6. Where railing is top mounted in concrete, the posts shall be set into sleeves of same material as handrailing and firmly grouted with portland cement grout as specified in Section 04200. Post collars shall be placed on the posts and fastened in place as detailed on approved shop drawings.

7. Where railing is supported from structural members, the connection shall be as detailed on the Drawings or shall be of approved sockets, flanges, and brackets, or another approved means which will provide neat and substantial support.

8. All railing shall be properly protected by paper, or by an approved coating or by both against scratching, splashes or mortar, paint, or other defacements during transportation and erection and until adjacent work by other trades has been completed.
B. Bar Gratings

1. Steel bar grating shall be manufactured by the following:
   a. IKG Industries
   b. Borden Metal Products Company
   c. Blaw-Knox Equipment, Incorporated
   d. Hendrick Manufacturing Company
   e. Other approved equivalent

2. Grating shall be pressure locked or welded.

3. Provide perimeter bars.

4. Grating shall be prime painted and tack welded to steel supports.

5. Provide band bars welded to grating wherever two or more main bars are cut. Band bars shall be of the same dimension as the carrier bars.

6. Grating bar pattern shall be rectangular.

7. Grating shall support 150 psf with a maximum deflection of 1/4 inch.

C. Grating Tread Stairs

1. Steel stairs with grating treads shall have steel channel stringers, steel pipe railings and other components.

2. Steel Grating treads and platforms shall be as manufactured by the following:
   a. Borden Metal Products Company
   b. Blaw-Knox Equipment Company
   c. Owner approved equivalent

3. Gratings at stair treads and platforms shall have 1 inch by 3/16 inch bearing bars for spans up to 3 feet, and 1-1/2 inches by 3/16 inch bearing bars for spans up to 4 feet. Bearing bars shall be spaced 1-3/16 inches on center, cross bars 4 inches on center.
4. Gratings shall be pressure locked or welded. Grating treads shall be supported at ends on steel angle supports or by carrier plates and shall be securely welded to same.

5. Treads and edges of platforms shall have cast abrasive nosing. Nosing shall be supported on steel angle. Nosing and support angle shall extend full width between stringers. Support angle shall be welded at ends to stringers and at intermediate points to grating tread or platform. Welds at grating shall be spaced not more than 12 inches on center.

6. Top of cast abrasive nosing shall be flush with top surface of grating. Treads with nosings that extend above or below surface of grating will be rejected.

7. Stairs shall have railings as specified under the heading "Railings."

PART 3 EXECUTION

3.01 FABRICATION

A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability.

B. Connections and accessories shall be of sufficient strength to safely withstand stresses and strains to which they will be subjected. Steel accessories and connections to steel or cast iron shall be steel, unless otherwise specified. Threaded connections shall be made so that the threads are concealed by fitting.

C. Welded joints shall be rigid and continuously welded or spot welded as specified or shown. The face of welds shall be dressed flush and smooth. Exposed joints shall be close fitting and jointed where least conspicuous.

D. Welding of parts shall be in accordance with the Standard Code for Arc and Gas Welding in Building Construction of the AWS and shall only be done where shown, specified, or permitted by the Government Site Representative. All welding shall be done only by welders certified as to their ability to perform welding in accordance with
the requirements of the AWS Code. Component parts of built-up members to be welded shall be adequately supported and clamped or held by other adequate means to hold the parts in proper relation for welding.

E. Welding of aluminum work shall be on the unexposed side as much as possible in order to prevent pitting or discoloration.

G. All aluminum finish exposed surfaces, except as specified below, shall have manufacturer's standard cleaned and degreased mill finish. Aluminum handrails shall be given an anodic oxide treatment in accordance with the Aluminum Association Specification AA-C22-A31.

G. All steel finish work shall be thoroughly cleaned, by effective means, of all loose mill scale, rust, and foreign matter before shipment and shall be given one shop coat of primer compatible with finish coats specified in Painting Section after fabrication but before shipping. Paint shall be applied to dry surfaces and shall be thoroughly and evenly spread and well worked into joints and other open spaces. Abrasions in the field shall be touched up with primer immediately after erection. Final painting is specified in Division 9, Painting Section.

H. Galvanizing, where required, shall be the hot-dip zinc process after fabrication. Following all manufacturing operations, all items to be galvanized shall be thoroughly cleaned, pickled, fluxed, and completely immersed in a bath of molten zinc. The resulting coating shall be adherent and shall be the normal coating to be obtained by immersing the items in a bath of molten zinc and allowing them to remain in the batch until their temperature becomes the same as the bath. Coating shall be not less than 2 ounces per square foot of surface.
A. Install all items furnished except items to be embedded in concrete or other masonry which shall be installed under Division 3 and Division 4, respectively. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown. Fastening to wood plugs in masonry will not be permitted. All dimensions shall be verified at the site before fabrication is started.

B. All steel surfaces to come in contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bitumastic troweling mastic applied in accordance with the manufacturer's instructions prior to installation.

C. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc-chromate primer followed by two coats of aluminum metal and masonry paint to the dissimilar metal.

D. Where aluminum contacts masonry or concrete, apply a heavy coat of approved alkali resistant paint to the masonry or concrete.

E. Where aluminum contacts wood, apply two coats of aluminum metal and masonry paint to the wood.

END OF SECTION
DIVISION 6

Wood and Plastic
SECTION 06100
CARPENTERY WORK

PART 1   GENERAL

1.01  SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals necessary to install all items of rough carpentry work complete as shown and as specified herein.

B. Set in place, all pressed metal frames which are to be built into walls. Install pressed metal frames which are to be installed in concrete and steel openings. Install hollow metal doors and finish hardware furnished under other Sections.

1.02  RELATED WORK NOT INCLUDED

A. Wood forms required for concrete work are included in Section 03300.

B. Anchor bolts and other metal appurtenances except as specified herein are included in Section 05500.

C. Metal doors and frames are furnished under Section 08110.

D. Finish hardware is furnished under Section 08710.

1.03  SUBMITTALS

A. Submit to the Government Contracting Officer as provided in Section 01300, complete shop drawings showing details of fabrication, and erection of all finish carpentry items and material furnished under this Section.
PART 2 PRODUCTS

2.01 MATERIALS

A. All lumber shall be of sound stock, delivered dry, and shall be fully protected at all times from injury and dampness. Split, broken, or otherwise damaged pieces will not be allowed in the work.

B. Wood for blocking, and nailers shall be Construction Grade, Douglas Fir, Southern Pine, or Ponderosa Pine. Wood members that will contact masonry or concrete shall be pressure treated with 100 percent oxide pure chromated copper arsenate and meeting AWPA Standard P-5. Minimum net retention of solid preservative shall be 0.40 pound per cubic foot.

C. Wood for Effluent Baffle Boards shall be as shown pressure treated with Fed. Spec. TT-C-645 creosote to a minimum net retention of 12 pounds per cubic foot.

D. All treatment shall be performed in accordance with the requirements of the Standard Specifications of the American Wood Preservers Association for treating wood. Apply a heavy coat of the same preservative used in treating to all surfaces cut after treatment.

E. Nails, spikes, bolts, nuts, and washers where sizes are not indicated or specified, shall be of suitable size and number as approved to securely fasten and hold members in place. Hot dip galvanize after fabrication.

F. All plywood shall be Structural Grade I.

PART 3 EXECUTION

3.01 INSTALLATION

A. All rough carpentry shall be accurately cut, fitted, and installed as detailed.

B. Anchors shall be installed, where indicated or required, to anchor carpentry or other items securely to masonry or concrete.
C. Forms for structural concrete work shall be as specified under Division 3. Provide all other miscellaneous wood form work as may be required for the completion of the work.

D. Temporary wood doors and cloth or transparent plastic covered frames shall be provided for exterior wall openings during winter construction or as required by the Government Site Representative.

E. Installation of Hollow Metal Doors, and Finish Hardware

1. Doors, and finish hardware will be furnished under Division 8, and shall be installed under the work of this Section, except where specifically designated otherwise herein.

2. As soon as the hardware is delivered to the job site, receive, verify and check each set, and report to the Government Contracting Officer any defect or shortage. Give notice to the hardware supplier for all such items which may be defective or missing. Provide a receipt to the hardware supplier for all such items as are found to be correct.

3. Finish hardware, after checking, shall be the responsibility of the Contractor until it is installed and the project is accepted in its entirety.

4. Hardware shall be attached and placed by skilled mechanics in accordance with approved hardware templates provided with the hardware, and shall be accurately fitted and adjusted. Lever handles shall be kept covered with heavy cloth, and other hardware shall be protected from damage until final acceptance of the entire project.

5. Set each edge and joint of threshold in a seal strip of polyurethane sealant. Grout remainder of threshold in mortar.

6. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
7. Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items in such space or area. Clean and relubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

END OF SECTION
DIVISION 8

Doors and Windows
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to deliver the following as shown and as specified herein:

1. Steel hollow-metal doors.
2. Pressed-metal doors.
3. All fasteners, frame closure pieces, system reinforcing and appurtenances required.
4. Doors, frames, and components shall be galvanized steel.

1.02 RELATED WORK NOT INCLUDED

A. Installation of doors is included in Section 06100. Building-in of frames in masonry is included in 04200, and installation of frames in completed openings is included in Section 06100 but as specified herein.

B. Painting is included in Section 09902.

C. Finish hardware is included in Section 08710.

1.03 SUBMITTALS

A. Submit to the Government Contracting Officer as provided in Section 01300, shop drawings of all metal doors, frames, panels, and appurtenances.

1. Shop drawings shall show elevations and details of each frame type, schedule of doors and frames, door elevations and details, conditions at openings with various
wall thicknesses and materials, location and installation requirements for hardware, thickness of materials, joints and connections and trim.

2. Where approved to be fabricated in more than one piece, locate and detail field splices and indicate complete instructions for making field splices.

B. Hardware templates shall be furnished to the door manufacturer by the Contractor for correct hardware alignment and reinforcing.

C. Provide samples and certification as follows:

1. Door frame corner with 6-inch long legs showing construction with the galvanized material specified, welding, touch-up and priming.

2. Door panel corner, 6-inch square, showing door and insulating materials, construction and finishing as specified above.

3. Provide certification as approved that all materials, and construction requirements herein specified will be met in the project.

1.04 QUALITY ASSURANCE

A. Provide custom hollow metal work manufactured by a single firm specializing in the production of this type of work, unless otherwise acceptable to the Government Site Representative.

B. Provide custom hollow metal work by one of the following or equal:

1. Ceco Door Products

2. Republic Doors - Frames

C. Provide fire-rated hollow metal doors and frames investigated and tested as fire door assemblies, complete with type of fire door hardware to be used. Identify each fire door and frame with Underwriters Laboratories labels, or equal, indicating applicable fire rating of both door and frame. Construct assemblies to comply with NFPA Standard No. 80, and as herein specified.
1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original unopened and undamaged packages with labels legible and intact. Doors and panels shall be individually wrapped in corrugated cardboard with wood strips on vertical edges and banded with metal straps. Store materials in unopened packages in a manner to prevent damage from the environment and construction operations. Handle in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized steel sheets - Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A526, with ASTM A525, G90 zinc coating, mill phosphatized.

B. Zinc-rich primer - 95 percent metallic zinc duct primer in a vehicle compatible with the specified painting system. Apply to properly prepared substrates where galvanizing is damaged by fabrication.

C. Supports and anchors - Fabricate of not less than 16-gauge sheet metal. Galvanize after fabrication units complying with ASTM A153, Class B.

D. Inserts, bolts and fasteners - Hot-dip galvanize, complying with ASTM A153, Class C or D as applicable.

2.02 FABRICATION, GENERAL

A. Fabricate metal units to be rigid, neat in appearance, and free from defects, warp, or buckle. Accurately form metal to required sizes and profiles. Fit and assemble units in the manufacturer's plant including units which are approved to be partially disassembled and field spliced. Weld exposed joints continuously; grind, dress, and make smooth, flush, and invisible. Metallic filler to conceal manufacturing defects is not acceptable. Clearly identify work that cannot, where approved, be permanently factory assembled before shipment, to assure proper assembly at the project site.
B. Exposed fasteners - Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

C. Prepare metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.

D. Reinforce metal units to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.

E. Shop Painting

1. Clean, treat, and paint exposed galvanized surfaces of fabricated metal units.

2. Clean steel surfaces of mill scale, rust, oil, grease, grit, and other foreign materials and apply approved zinc-rich primer to galvanized surfaces damaged in fabrication.

3. Apply pretreatment to cleaned metal surfaces, using cold phosphate solution (SSPC-PT2), hot phosphate solution (SSPC-PT4) or basic zinc chromate-vinyl butyral solution (SSPC-PT3).

4. Apply one full shop coat of prime paint within time limits recommended by pretreatment manufacturer. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 2.0 mils.
2.03 DOORS

A. General

1. Provide flush design doors, 1-3/4-inch thick, seamless hollow construction, unless otherwise indicated.

2. For single-acting swing doors, bevel both vertical edges 1/8 inch in 2 inches.

3. Provide filler of mineral-wool or other approved insulating material solidly packed full door height to fill voids between inner core reinforcing members. No asbestos products will be allowed. Provide a "U" factor of 0.16 maximum for exterior doors.

B. Galvanized Steel Doors

1. Fabricate doors of two outer, galvanized, stretcher-leveled steel sheets not less than 16 gauge. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges. Provide weep hole openings in the bottom of doors to permit escape of entrapped moisture.

2. Reinforce inside of doors with vertical galvanized sheet steel sections not less than 22 gauge. Space vertical reinforcing 6-inch outside circumference and extend full door height. Spot-weld at not more than 5-inch outside circumference to both face sheets.

3. Reinforce tops and bottoms of doors with 16 gauge horizontal steel channels welded continuously to outer sheets. Close top and bottom edges to provide weather seal, as integral part of door construction or by addition of inverted steel channels.

4. Provide Z or L shape astragals of 14 gauge galvanized steel at double exterior doors. Screw fasten to lead edge of active leaf.

C. Finish hardware reinforcement - Reinforce doors using galvanized steel for required finish hardware, as follows:
1. Hinges - Steel plate 3/16-inch thick by 1-1/2-inch wide by 6 inches longer than hinge, secured by not less than 6 spot-welds.

2. Mortise locksets and dead bolts - 14 gauge steel sheet, secured with not less than 2 spot-welds.

3. Cylinder locks - 12 gauge steel sheet, secured with not less than 2 spot-welds.

4. Flush bolts - 12 gauge steel sheet, secured with not less than 2 spot-welds.

5. Surface-applied closers - 12 gauge steel sheet, secured with not less than 6 spot-welds.

D. Miscellaneous steel shall be fabricated and installed in accordance with the Drawings and shall include: beams, angles, support brackets, and accessories; hold down straps and lugs; splice plates, anchor bolts (except for equipment furnished in Division 15); and any other miscellaneous steel called for on the Drawings and not otherwise specified.

2.04 FRAMES

A. Provide pressed metal frames for doors.

B. Fabricate frames of full-welded unit construction, with corners mitered, reinforced, continuously welded full depth and width of frame.

C. Form frames of 14 gauge galvanized steel sheets.

D. Finish hardware reinforcement - Reinforce frames using galvanized steel for required finish hardware, as follows:

1. Hinges and pivots - Steel plate 3/16-inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot-welds.

2. Strike plate clips - Steel plate 3/16-inch thick by 1-1/2 inches wide by 3 inches long.
3. Surface-applied closers - 12 gauge steel sheet, secured with not less than 6 spot-welds.

E. Jamb anchors - Furnish jamb anchors as required to secure frames to adjacent construction, formed of not less than 18 gauge galvanized steel.

1. Masonry construction - Adjustable, flat, corrugated, or perforated, t-shaped to suit frame size, with leg not less than 2 inches wide by 10 inches long. Provide U.L. approved fixed anchors at labeled openings. Furnish at least three anchors per jamb.

F. Floor anchors - Provide floor anchors for each jamb and mullion which extends to floor, formed of not less than 14 gauge galvanized steel sheet, as follows:

1. Monolithic concrete slabs - Clip type anchors, with two holes to receive fasteners, welded to bottom of jambs and mullions.

2. Separate finish (seamless flooring areas) concrete slabs - Adjustable type with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

G. Head strut supports - Provide 3/8-inch by 2-inch vertical steel struts extending from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable bolted anchorage to frame jamb members.

H. Head reinforcing - For frames over 4 feet 0 inches wide in masonry wall openings, provide continuous steel channel or angle stiffener, not less than 12 gauge for full width of opening, welded to back of frame at head.

I. Spreader bars - Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

J. Plaster guards - Provide 26 gauge galvanized steel plaster guards or dust cover boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware installation.
2.06 STOPS AND MOLDINGS

A. Provide stops and moldings around solid and glazed panels in hollow metal doors and units and in frames to receive doors, where indicated and as shown.

B. Form fixed stops and moldings integral with frame, unless otherwise indicated.

C. Provide removable stops and molding where indicated or required, formed of not less than 20-gauge steel sheets matching steel of frames. Secure with countersunk machine screws spaced uniformly not more than 12 inches outside circumference. Form corners with butted hairline joints.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hollow metal units and accessories in accordance with approved shop drawings, manufacturer's data, and as herein specified.

B. Setting masonry anchorage devices - Provide masonry anchorage devices where required for securing hollow metal frames to in-place concrete construction. Set anchorage devices opposite each anchor location, in accordance with details on shop drawings and anchorage device manufacturer’s instructions. Leave drilled holes rough, not reamed, and free from dust and debris.

C. Steel construction - Drill and tap for anchorage as shown on approved shop drawings.

D. Placing Frames - Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

1. In masonry construction, coordinate frame setting with the building of masonry walls.
2. Make field splices in frames as detailed on final approved shop drawings, welded and finished to match factory work.

3. Remove spreader bars only after frames or bucks have been properly set and secured.

3.02 ADJUSTMENT AND TOUCH-UP

A. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

B. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

END OF SECTION
PART 1   GENERAL

1.01   SCOPE OF WORK

A. Furnish and deliver to the project site all finish hardware for hollow metal doors and additional padlocks as hereinafter specified and scheduled.

B. The schedule included herein designates the type and quality of the hardware desired. The brand of hardware furnished shall be equivalent to the brand scheduled.

C. Furnish all templates and schedules required by the manufacturers of the metal doors and frames to enable the manufacturers to make proper provision in their work to receive the finish hardware. All locks, lock strikes, and flush bolts shall be made to ANSI standard dimensions.

1.02   RELATED WORK NOT INCLUDED

A. Installation of hardware is included under Section 06100 as specified.

1.03   SUBMITTALS

A. Samples

1. If required by the Government Project Manager, a sample of each item of hardware proposed for use shall be submitted for approval not later than 10 days after requested.

B. Hardware Schedules

1. Submit to the Government Project Manager a complete hardware schedule as provided in Section 01300 for shop drawings.
2. No templates shall be distributed until the hardware schedule has been approved by the Government Project Manager.

3. Provide approved physical hardware items to door manufacturers as required for fabrication onto doors.

1.04 PRODUCT HANDLING

A. Packing and Marking

1. All hardware shall have the required screws, bolts and fastenings necessary for proper installation, wrapped in paper and packed in the same package as the hardware. Each package shall be legibly labeled, indicating that portion of the work for which it is intended.

1.05 QUALIFICATIONS

A. The hardware supplier shall have in his employ one or more members of the American Society of Architectural Hardware Consultants, who shall be responsible for the preparation and execution of the work of this Section.

PART 2 PRODUCTS

2.01 MATERIALS

A. All hardware shall be best grade, entirely free from imperfections in manufacture and finish. Qualities, weights, and sizes specified herein are the minimum that will be accepted. All U.L. labeled doors shall have U.L. approved hardware.

B. Hardware Items

1. Hinges - Stainless steel, Stanley FBB191, 4-1/2 x 4-1/2 interior and FBB199, 5 x 4-1/2 exterior. Equals - Hager, McKinney.

2. Locksets - Sargent 8100 Series, with LNH level handle and rosette with wrought box strike, stainless steel, six pin cylinders. Furnish in 8105 operation unless otherwise scheduled. Equals - Corbin, Russwin.
3. Door Closers - Sargent 250 Series, with rust inhibitor in hydraulic fluid, exterior primed compatibly to receive finish paints. On plastic covers provide no prime paint. Provide with cushion stop arm where no separate stop is provided and other arm functions as scheduled. Equals - LCN4000 Series, Norton 7700 Series.

4. Kick Plates - Stainless steel, 8-inch high x 0.050 inch thick x 2-inch less width of door (LWOD), 1-inch LWOD, at double doors.

5. Stops - Ives 408-1/2 - wall type and where floor type required, Ives 436 and 438 as required by floor condition. Equals - Baldwin, Quality.


8. Silencers - Glynn-Johnson GJ 64. Equals - Baldwin, Quality.


C. Closers shall be sized as recommended by manufacturer and as approved for size and location of door served.

D. On exterior doors, provide hinges with pins not removable when door is closed. Provide 1/2 pair hinges for each 2 foot 6-inch or part thereof of door height.
E. Provide type of threshold required by the Door Schedule for particular doors and provide weather seals at exterior doors and where scheduled.

2.02 FINISHES

A. Base metal for Hardware Items 1, 2, 4, 10 and 11 shall be stainless steel. Base metal for Hardware Items 5, 6 and 12 shall be bronze or brass.

B. Finish

1. Stainless steel finish shall be US32D.
2. Chrome plated, bronze or brass finish shall be US26D.

2.03 KEYING

A. All cylinder locks including padlocks shall be masterkeyed in one new set. All cylinders shall be construction keyed for Contractor's use during construction period. Install permanent cylinders when directed.

B. Furnish:

1. Three masterkeys
2. Two change keys with each lock
3. Three construction day keys

END OF SECTION
SECTION 08800
GLAZING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to install glazing as shown and as specified herein.

1.02 SUBMITTALS

A. Submit to the Government Project Manager two representative samples of each type glazing material specified below. Provide samples of glass in 12-inch square minimum size.

Resubmit any or all as required until approved.

B. Submit to the Government Contracting Officer, as provided in Section 01300, full size shop drawings showing step-by-step glass setting and sealing procedures. Submit certification that wired glass is U.L. or equal tested and approved.

1.03 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this Section shall be delivered, stored and handled so as to preclude damage of any nature. All glass shall be delivered and stored in its original container, plainly marked with identification of material and maker. Materials in broken containers or in packages showing water marks or other evidence of damage shall not be used and shall be removed from the site.
PART 2 PRODUCTS

2.01 MATERIALS

A. Each piece of glass shall bear the manufacturer’s label showing the strength, grade, thickness, type, and quality of the glass, and all labels shall remain in place until the glass has been set and inspected by the Government Site Representative except that safety and insulating glass shall have permanently etched labels. When glass is not cut to size by the manufacturer and is furnished from local stock, the glass and glazing subcontractor shall submit an affidavit stating the strength, grade, thickness, type, quality, and manufacturer of the glass furnished.

B. Insulating glass for use in glazed exterior windows and sidelights shall be Twindow Units by PPG Industries, equal by L.O.F., Ford Glass or equal carrying the manufacturer’s 10 year guarantee. The units shall consist of two lights of glass, permanently and hermetically sealed together at edges with continuous spacers and sealant to provide a dehydrated air space with -60°F dew point. The units shall be provided in thickness consisting of two lights, 1/4-inch float glass with a 1/2-inch air space. Provide outside light in PPG Solarban 560-20 or equal as specified above, to provide a silver-ice crystal color and inside light clear.

C. All non-labeled door glass and sidelight glass shall be clear tempered glass, 1/4-inch thick herculite by PPG industries, equal by L.O.F., A.F.G., or equal. Exterior sidelights shall be tempered insulating glass as specified above.

D. All labeled door glass shall be 1/4-inch thick clear polished diamond welded wired glass, U.L. listed.

E. Glazing compound shall be 999 Glazing Silicone by Dow, equal by General Electric, Sonneborn or equal.

F. Glazing tape shall be Tremco No. 440, Pecora Extru-Seal Butyl Rubber Tape or Dap Inc. Butyl Rubber Sealing Tape or equal. Tape shall be compatible with the glazing compound.

G. Setting blocks, 85 plus or minus 5 durometer, and spacer blocks, 50 durometer, shall be closed cell neoprene.
H. Glazing strips for hollow metal door and bead glazing, shall be adhesive faced closed cell PVC foam strip, 1/8-inch thick, 32 durometer hardness.

I. Glazing compound for labeled construction glazing shall meet NFPA requirements for a hard setting glazing compound with 90 percent inert and non-flammable components as approved.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. All glazing work shall be performed in accordance with the standards of the Flat Glass Marketing Association's Glazing Manual, latest revision, unless otherwise noted or specified, and shall also conform to the approved shop drawings and the manufacturer's glazing instructions.

2. All frame elements shall have been painted where required and shall be thoroughly cleaned before glazing commences.

B. Exterior Glazing

1. Set tape 1/8-inch down from top of fixed bead.

2. Run a bead of approved gun-grade sealant from base of tape to bottom of glazing pocket.

3. Place setting blocks, insert glass and press against tape and sealant until continuous perimeter contact is made.

4. Run a heel bead of approved sealant along exposed edge of glass.

5. Apply glazing bead.

6. Install spacer between glazing bead and glass.
7. Run a continuous finish bead of sealant to fill voids above spacers on interior side and to fill void above tape on exterior side.

C. Door and Interior Glazing - Non-Labeled Openings

1. After doors, rabbets and glazing beads for pressed metal work have been painted, install continuous glazing strip against rabbet.

2. Set glass in place on setting blocks and install another continuous glazing strip around perimeter of glass.

3. Install glazing beads, setting against glazing strips, firmly, in order to place a small amount of pressure against the strips.

D. Labeled Opening Glazing

2. Set glass using setting blocks.
3. Face glass in the same compound and set beads.
4. Tool compound flush and full between glass and metal surrounds, adding compound as required.

3.02 PROTECTION AND CLEANING

A. Clean and remove all labels from all glass when directed and clean glazing compound from frames around glass installed under this Section upon completion of the work. All defective or broken glass and glass broken because of faulty setting shall be replaced under this Section.

B. All glass shall be protected under this Section from accidental damage with tapes or streamers attached to the sash or frame. No tape or streamer shall contact the glass.

END OF SECTION
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and appurtenances required to paint the Surge/Equalization Tank, Dirty Backwash Surge Tank, Final Effluent Clearwell, and Air Stripper System Sump as specified herein.

B. The Contractor shall have a qualified rigger on the job at all times that rigging is being used. The rigger shall show proof of his qualifications to the NUS Contracting Officer prior to start of the job and shall have his license with him at all times. The foreman in charge shall have all rigging inspected by the rigger prior to use.

1.02 SUBMITTALS

A. The Contractor shall submit to the Contracting Officer in writing, composition of paint to be used, directions for use and all other information required.

B. Paint shall be delivered to the job site in sealed labeled containers. No paint manufactured more than 6 months prior to use will be accepted. All colors, unless specified herein, will be selected by the NUS Contracting Officer. The manufacturer's color chart shall be submitted to the NUS Contracting Officer by the Contractor. The color selected may not necessarily conform to the manufacturer's color chart and any tinting shall be done at no additional cost.

C. The Contractor shall submit to the NUS Contracting Officer, prior to painting, certification from the manufacturer showing that the quantity of each coating purchased and delivered to the jobsite is sufficient to properly coat all surfaces with minimum thicknesses as specified herein. Such certification shall include the square footage as given to the manufacturer by the Contractor.
PART 2 PRODUCTS

2.01 MATERIALS

A. All coatings shall be as specified in Part 3, or approved equal.

PART 3 EXECUTION

3.01 APPLICATION

A. Painters employed in the work shall be thoroughly experienced in applying paint systems to steel storage tanks. The Contractor shall submit to the Contracting Officer evidence of satisfactory application of paint systems to steel storage tanks, including a listing of tanks so painted.

B. Attention is directed to the toxic and highly flammable solvents used in vinyl paints. Necessary precautions shall be taken to ensure that safe working conditions are maintained during use. Adequate ventilation shall be provided to prevent dangerous concentrations of solvents in the air. No smoking or open flames shall be allowed. It shall be the Contractor's responsibility to enforce rigidly all required safety measures.

C. After the steel storage tanks are tested and made watertight, all surfaces, interior and exterior, and all component parts shall be painted and provided with a coating or surfacing, as specified.

D. The paint shall be applied and all painting shall be done in accordance with SSPC Paint Application No. 1 for Shop, Field, and Maintenance Painting, and AWWA Standard D102. No more thinner shall be used than recommended by the manufacturer. Each coat of paint shall be cross-sprayed to obtain the required minimum dry film thickness. Each stroke of the spray gun shall overlay the previous stroke so that a continuous wet film is obtained on the surface. No painting shall be done unless the ambient air temperature measured in the shade is at least 40°F. Paint shall not be applied when the temperature is expected to drop to 32°F before the paint has dried. Care shall be exercised to avoid painting under any conditions which cause the presence of a thin film of condensation on the metal.
E. The prime coats specified shall be applied on the same day, and within 4 hours of the time that an area is cleaned. Prime coats applied to all weld seams, weld scars, etc., shall be brush applied.

3.02 PAINTING EXTERIOR SURFACES

A. Included in this paragraph is the field painting of the exterior of the Surge/Equalization Tank, Dirty Backwash Surge Tank, and Final Effluent Clearwell.

B. All exterior surfaces shall be field sandblasted according to SSPC-SP No. 10, Near White Blast Cleaning Specifications.

C. Field Painting System

1. **Prime Coat.** Pennsbury 51-P-1 PONAMID Primer applied to a D.F.T. of 2.0 to 3.0 mils.

2. **Intermediate Coat.** Pennsbury 51-P-1 PONAMID Primer applied to a D.F.T. of 2.0 to 3.0 mils.

3. **First Field Coat.** Pennsbury 54 Series PONAMID H-B applied to a D.F.T. of 2.5 to 4.0 mils.

4. **Second Field Coat.** Pennsbury 40 Series PENNOPOL URETHANE applied to a D.F.T. of 1.5 to 2.0 mils.

D. The total dry film thickness to this four-coat system shall range between 8.0 to 12.0 mils.

E. Finish color shall be white unless otherwise approved by the NUS Contracting Officer. Intermediate coat shall be shaded close to finish color.

3.03 VINYL PAINTING OF INTERIOR SURFACES

A. Included in this paragraph is the field painting of the interior of the Dirty Backwash Surge Tank, and Final Effluent Clearwell.
B. All interior surfaces shall be sandblasted according to SSPC-SP No. 10, Near White Blast Cleaning Specifications.

C. Field Painting System

1. **Prime Coat.** Pennsbury 60-P-1 Vinyl Primer applied to a D.F.T. of 2.0 to 2.5 mils.

2. **Intermediate Coat.** Pennsbury 61-G-149 High Build Vinyl applied to a D.F.T. of 2.0 to 2.5 mils.

3. **First Finish Coat.** Pennsbury 61-W-23 High Build Vinyl applied to a D.F.T. of 2.0 to 2.5 mils.

4. **Second Finish Coat.** Pennsbury 60-L-310 Vinyl Topcoat applied to a D.F.T. of 1.5 to 2.5 mils.

D. The total dry film thickness of this four-coat system shall range between 6.5 and 10.0 mils.

3.04 POLYURETHANE PAINTING OF INTERIOR SURFACES

A. Included in this paragraph is the field painting of the interior of the Surge/Equalization Tank.

B. All interior surfaces shall be sandblasted to SSPC-SP-5-63, white metal condition.

C. Field Painting System

1. **Prime Coat.** Permite PCS-10108 epoxy urethane primer applied to a D.F.T. of 3.0 mils minimum. Allow to cure a minimum of 4 hours.

2. **First Finish Coat.** Permite PCS-10506 glass-filled polyester polyurethane applied to a D.F.T. of 2 mils minimum. Allow to cure a minimum of 4 hours.

D. The minimum dry film thickness for total system shall not be less than 7 mils.

E. The total system shall be allowed to cure for a minimum of 7 days at 70°F before the tank is filled.

3.05 PAINTING INSPECTION

A. Surface preparation and painting shall be inspected by an NUS paint inspector as the work progresses. Normal inspection shall include the adequacy of equipment and materials sufficient to secure a satisfactory quality of work and maintain suitable progress, the acceptability of surface preparation and the application of paints. Normal and routine inspection does not include time required for inspection resulting from inadequate materials and equipment, repairs of defective work, improper material and workmanship, failure to comply with the specifications or directions of the NUS Contracting Officer or failure to keep the Paint Inspector informed of the work schedule.

B. The Contractor shall keep the Paint Inspector fully informed of the work schedule. Failure on the part of the Contractor to keep the Inspector so informed may be sufficient cause for requiring the Contractor to do additional cleaning or painting of uninspected areas as directed by the NUS Contracting Officer.

C. Determination of a paint thickness shall be made by the Paint Inspector using a coating thickness gauge such as the "Elcometer."

D. The Contractor shall maintain adequate and secure rigging facilities for use by the Paint Inspector. Scaffolding, boatswains chair, or other rigging removed prior to inspection shall be replaced at the Contractor's expense as required by the Paint Inspector for thorough inspection of the work.

E. Surfaces shall be kept under cover from sunlight between coatings. All surfaces exposed to sunlight for a period exceeding 60 days shall be slightly roughened by a light whip-blast prior to applying subsequent coatings.

F. At the completion of the painting, coating or surfacing all spots of the material used shall be removed from masonry and metal surfaces, and other items, and the structures and appurtenances left with a clean, neat, and finished appearance. The Contractor
shall remove from the premises all rubbish and equipment required to accomplish the work.
SECTION 09901
SURFACE PREPARATION AND SHOP PAINTING

PART 1  GENERAL

1.01  SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required for the surface
preparation priming and painting of shop fabricated items including tanks, mechanical
equipment, valves and other ferrous metal components.

1.02  RELATED WORK NOT INCLUDED

A. Field painting is included in Section 09902.

1.03  SUBMITTALS

A. Submit to the Government Contracting Officer, as provided in Section 01300 for shop
drawings, manufacturer’s specifications and data on the proposed primers and
detailed surface preparation, application procedures, and dry mil thicknesses.

PART 2  PRODUCTS

2.01  MATERIALS

A. All painting materials shall be fully the equal to those manufactured by the Tnemec
Company, Inc., Valspar Company, or the Carboline Company. The painting schedule
has been prepared on the basis of Tnemec products (unless otherwise noted) and
Tnemec recommendations for application. No brand other than those named will be
considered for approval unless the brand and type of paint proposed for each item in
the following schedule, together with sufficient data substantiated by certified tests
conducted at no expense to the Government to demonstrate its equality to the paint(s)
named, is submitted to the Government Contracting Officer in writing for approval
within 30 days after the signing of the General Contract. The type and number of tests
performed shall be subject to the Government Contracting Officer’s approval.
B. Submerged Ferrous Surfaces. Shop primer shall be one coat of Tnemec Series 66-1255 (beige) primer, dry film thickness 3.0 to 5.0 mils, by Tnemec Company, or equal by Carboline, Valspar, or equal. Shop paint shall be one coat of Tnemec Series 104-HS-AA-90 (white), dry film thickness 6.0 to 8.0 mils, by Tnemec Company or equal by Carboline, Valspar, or equal.

C. Non-Submerged Surfaces. Shop primer shall be one coat of Tnemec Series 66-1255 primer (beige), dry film thickness 3.0 to 5.0 mils, by Tnemec Company, or equal by Carboline, Valspar, or equal. Shop paint shall be one coat (spray) or two coats (roller) of Tnemec Series 66 of the appropriate color, dry film thickness of 4.0 to 6.0 mils or equal.

D. Mechanical Equipment and Valves. Shop primer shall be one coat Tnemec Series 37-78 (gray) Chem-Prime, dry film thickness 2.5 to 3.5 mils, or equal. Shop paint shall be one coat (spray) or two coats (roller) Tnemec Series 66 of the appropriate color, dry film thickness 4.0 to 5.0 mils, or equal.

E. Non-Painted Surfaces. Gears, bearings surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during all periods of storage and erection and shall be satisfactory to the Government Site Representative up to the time of the final acceptance test.

F. Compatibility of Coating Systems. Shop painting shall be done with primers that are guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats specified in Section 09902 for use in the field and which are recommended for use together.
PART 3 EXECUTION

3.01 APPLICATION

A. Surface Preparation

1. Submerged components scheduled for priming and painting, as defined above, shall be sandblasted clean in accordance with SSPC-SP-10 near-white, immediately prior to priming.

2. Non-submerged components scheduled for priming and painting, as defined above, shall be sandblasted clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming.

3. Mechanical equipment and valves scheduled for priming and painting as defined above shall be cleaned in accordance with SSPC-SP3 power tool cleaning immediately prior to priming.

4. Surfaces shall be dry and free of dust, oil, grease, and other foreign material before priming.

5. Shop primer and paint in accordance with approved manufacturer's recommendations.

B. Non-Painted Surfaces. Apply approved coating per manufacturer's recommendations.

END OF SECTION
PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all materials, labor, equipment, and incidentals required to perform all the painting necessary to complete this Contract in its entirety.

B. It is the intent of these Specifications to paint all exposed structural and miscellaneous steel; steel doors; steel door frames, door closers, and surface sound/weather seals; hatch covers, steel louvers, mechanical and electrical equipment, posts, steel tanks inside the building, pipe, fittings, and valves; structural steel components; building columns; concrete block walls, all as specified in the attached painting and color schedules and all other work obviously required to be painted unless otherwise specified. Provide title signage on pipes, equipment, and components as specified herein. Minor items not mentioned in the schedule of work shall be included in the work of this Section where they come within the general intent of the Specifications as stated herein.

C. The following items will not be painted:

1. Concrete (unless otherwise specified in the painting and color schedules).

2. Finish hardware unless specifically noted otherwise.

3. Factory prefinished architectural components.

4. Packing glands and other adjustable parts and name plates of mechanical equipment.

5. Parts of buildings not exposed to sight, unless specifically noted otherwise.

6. Furniture.
7. Maintenance equipment.

8. Mechanical equipment which has been finished painted in the factory as specified in Divisions 11 and 15.

1.02 RELATED WORK NOT INCLUDED

A. Valve identification is included in Section 01170.

B. Shop priming and painting and surface preparation of equipment and piping are specified in Section 09901 and included in the respective Section with the item to be primed.

PART 2 PRODUCTS

2.01 MATERIALS

A. All painting materials shall be fully the equal to those manufactured by the Tnemec Company, Inc., Valspar Company, or the Carboline Company. The painting schedule has been prepared on the basis of Tnemec products (unless otherwise noted) and Tnemec recommendations for application. No brand other than those named will be considered for approval unless the brand and type of paint proposed for each item in the following schedule together with sufficient data substantiated by certified tests conducted at no expense to the Government, to demonstrate its equality to the paint(s) named is submitted to the Government Contracting Officer in writing for approval within 30 days after the signing of the General Contract. The type and number of tests performed shall be subject to the Government Contracting Officer's approval.

B. All painting materials shall be delivered to the mixing room in unbroken packages, bearing the manufacturer's brand and name. They shall be used without adulteration and mixed, thinned, and applied in strict accordance with manufacturer's directions for the applicable materials and surface and with the Government Contracting Officer's approval before using.
C. Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with the finish paints to be used. Refer to Section 09901 for special primers.

D. No paint containing lead will be allowed. Oil shall be pure boiled linseed oil.

E. Work areas will be approved by the Government Site Representative for storage and mixing of all painting materials. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations. Proper containers outside of the buildings shall be provided and used for painting wastes, and no plumbing fixture shall be used for this purpose.

2.02 COLOR CODING FOR PIPES AND ACCESSORIES

A. When color coding is specified, it shall consist of color code painting and identification of all exposed conduits, trough lines and pipelines for the transport of gases, liquids or semi-liquids, and including accessories such as pumps and valves. See Color Schedule attached at the end of this Specification.

B. All hangers and pipe support floor stands shall be painted the same color and with the same paint as the pipe it supports. The piping shall be painted up to but not including the flanges attached to the mechanical equipment nor the flexible conduit connected to electrical motors.

C. The color code establishes, defines, and assigns a definite color for each category of pipe or each system. Pipe lines which are not listed on the Color Schedule shall be assigned a color by the Government Site Representative and shall be treated as an integral part of the Contract.

D. All pipes and equipment shall be painted according to Color Schedule attached. Valves and fittings shall be painted in the color of the main body of the pipe.

2.03 LETTERING OF TITLES

A. The name of the materials in each pipeline and alongside this an arrow indicating the direction of flow of fluids, shall be indicated on each pipe system. Titles shall not be located more than 26 linear feet apart and shall also appear directly adjacent to each
side of any wall the pipeline breaches, adjacent to each side of the valve regulator, flowcheck, strainer-cleanout, and all pieces of equipment.

B. Titles shall identify the contents by complete name as shown on Drawings and as approved at least once in each space through which it passes and thereafter by generally recognized abbreviations, letters or numerals as approved. Identification title locations shall be determined by the Government Site Representative, but in general, they shall be placed where the view is unobstructed and on the two lower quarters of pipe or covering where they are overhead. Title should be clearly visible from operating positions especially those adjacent to control valves.

C. Numbers and letter shall be die-cut from 3.5 mil vinyl film and prespaced on carrier tape. Adhesive and finish surface shall be protected with one piece removable liners. Color shall be white or black as approved depending on substrate color.

D. Letter size shall be as indicated in the following table:

<table>
<thead>
<tr>
<th>OUTSIDE DIAMETER OF PIPE OR COVERING</th>
<th>SIZE OF LEGEND LETTERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4-inch to 1-1/4-inch</td>
<td>1/2-inch</td>
</tr>
<tr>
<td>1-1/2-in to 2-inch</td>
<td>3/4-inch</td>
</tr>
<tr>
<td>2-1/2-in to 6-inch</td>
<td>1-1/2-inch</td>
</tr>
<tr>
<td>8-in to 10-inch</td>
<td>2-1/2-inch</td>
</tr>
<tr>
<td>Over 10-inch</td>
<td>3-inch</td>
</tr>
</tbody>
</table>

E. The system for preparation and application of letters shall be Type B a.s.i/2 by Architectural Signing Inc., Marina Del Rey, California; Architectural Graphics Inc., Norfolk, Virginia; Andco Industries Corporation, Greensboro, North Carolina; or equal. Letter type shall be Optima Bold, upper case. Grid 2 spacing shall be employed. Arrow shall match as approved, letter type and size. The instructions of the manufacturer shall be followed in respect to storage, surface preparation and applications of letters.

2.04 TITLES FOR EQUIPMENT, TANKS, AND COMPONENTS

A. Titles, in text as shown for each piece and as approved, shall be provided on all equipment, interior tanks and components using 1 inch high Optima Bold upper case, Grid 2 spacing, white or black in color as approved depending on substrate. Titles shall be mounted at eye level on machines where possible or at the uppermost broad
vertical surface of low equipment. Where more than one piece of the equipment item to be titled exists, the items shall be numbered consecutively as indicated on the mechanical drawings or as directed by the Government Site Representative; for example Pump No. 1, Pump No. 2, etc. Titles shall be composed in more than one line if required and shall be composed and justified on the left-hand side as approved. Provide titles also on factory painted and on nonpainted pieces.

2.05 METAL TAGS

A. For pipelines smaller than 3/4-inch in diameter, securely fasten metal tags, 2-1/2-inch by 1/2-inch, of 17 Birmingham Metal Gauge Brass with lettering etched and filled with enamel. Tags shall be approved by the Government Site Representative.

2.06 EXTRA PAINT

A. Furnish one unopened gallon can of each type and each color of paint used.

PART 3 EXECUTION

3.01 PREPARATION OF SURFACES

A. All surfaces to be painted shall be prepared as specified herein and shall be dry and clean before painting.

B. All metal welds, blisters, etc., shall be ground and sanded smooth. All pits and dents shall be filled and all imperfections shall be corrected so as to provide a smooth surface for painting. All rust, loose scale, oil, tar and asphalt bearing coatings, grease and dirt shall be removed by use of approved solvents, wire brushing, grinding or sanding.

C. Submerged ferrous metals surfaces will be sandblasted clean in accordance to SSPC-SP-10 near-white prior to priming.

D. Non-submerged ferrous metal surfaces will be sandblasted clean in accordance to SSPC-SP-6 commercial grade prior to priming.

E. Mechanical equipment, piping, valves, and structural steel components will be cleaned in accordance to SSPC-SP3 power tool cleaning prior to priming.
3.02 PAINTING SCHEDULE

A. All colors will be selected by the Government Project Manager based on the Color Schedule.

B. The following types of paints by Tnemec Company have been used as a basis for the paint schedule:

1. Series 54-562 filler.
2. Series 37-78 Chem-Prime primer.
3. Hi-build Epoxoline (Series 66) - polyamide cured epoxy.

C. The following surfaces shall have the types of paint scheduled below applied at the dry film thickness (DFT) in mils per coat noted:

1. Submerged Ferrous Metal Surfaces

   One coat Series 66-1255 (beige) on properly prepared unprimed metal or touch-up (3.0-5.0 DFT).

   One coat (spray) or two coats (roller) Series 104-HS AA90 (white) (6.0-8.0 DFT).

2. Nonsubmerged Ferrous Metal Surfaces

   One coat Series 66-1255 (beige) (3.0-5.0 DFT).

   One coat (spray) or two coats (roller) Series 66 of the appropriate color (4.0-5.0 DFT).

3. Mechanical Equipment, Piping, Valves, Structural Steel Members

   One coat Series 37-78 (grey) Chem-Prime (2.5-3.5 DFT).

   One coat (spray) or two coats (roller) Series 66 of the appropriate color (4.0-6.0 DFT).
4. Concrete Blocks

One coat Series 54-562 filler at the rate of 80 to 100 feet\(^2\) covered per gallon.

One coat (spray) or two coats (roller) Series 66 of the appropriate color (4.0-6.0 DFT).

3.03 WORKMANSHIP

A. General

1. At the request of the Government Contracting Officer, samples of the finished work prepared in strict accordance with these Specifications shall be furnished and all painting shall be equal in quality to the approved samples. Finished areas shall be adequate for the purpose of determining the quality of workmanship. Experimentation with color tints shall be furnished to the satisfaction of the Government Contracting Officer where standard chart colors are not satisfactory.

2. Protection of furniture and other movable objects, equipment, fittings, and accessories shall be provided throughout the painting operation. Canopies of lighting fixtures shall be loosened and removed from contact with surface, covered and protected and reset upon completion. Remove all electric plates, surface hardware, etc., before painting, protect and replace when completed. Mask all machinery name plates and all machined parts not receiving a paint finish. Dripped or spattered paint shall be promptly removed. Lay drop cloths in all areas where painting is being done to adequately protect flooring and other work from all damage during the operation and until the finished job is accepted.

3. On metal surfaces apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by brush. Deficiencies in film thickness shall be corrected by the application of an additional coat(s). On masonry, application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous
surfaces, it shall be the painter's responsibility to achieve a protective and
decorative finish either by decreasing the coverage rate or by applying additional
coats of paint.

B. Field Priming

1. Steel members, metal castings, mechanical and electrical equipment and other
metals which are shop primed before delivery at the site will not require a prime
coat on the job. All piping and other bare metals to be painted shall receive one
coat of primer before exposure to the weather, and this prime coat shall be the
first coat as specified in the painting schedule.

2. Equipment which is specified to receive a baked-on enamel finish or other factory
finish shall not be field painted unless the finish has been damaged in transit or
during installation. Surfaces that have been shop painted and have been
damaged, or where the shop coat or coats of paint have deteriorated, shall be
properly cleaned and retouched before any successive painting is done on them in
the field. All such field painting shall match as nearly as possible the original
finish.

3. Equipment shipped with a protective shop painting coat or coats shall be touched
up to the satisfaction of the Government Site Representative with primers as
recommended by the manufacturer of the finish paint.

C. Field Painting

1. All painting at the site shall be designated as Field Painting and shall be subject to
the approval of the Government Site Representative, and only skilled painters and
specialists, where required, shall be used on the work.

2. All paint shall be at room temperature before applying, and no painting shall be
done when the temperature is below 60°F, in dust-laden air, when rain or snow is
falling, or until all traces of moisture have completely disappeared from the
surface to be painted.
3. Successive coats of paint shall be tinted so as to make each coat easily distinguishable from each other with the final undercoat tinted to the approximate shade of the finished coat.

4. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with No. 00 sandpaper or equal to remove defects and provide a smooth even surface. Top and bottom edges of doors shall be painted and all exterior trim shall be back-primed before installation.

5. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. Materials subject to weather shall be primed coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.

6. All painting shall be performed by approved methods with number of coats modified as required to obtain the total dry film thickness specified. Spray painting shall be performed specifically by methods submitted and as approved by the Government Contracting Officer.

7. All surfaces to be painted as well as the atmosphere in which painting is to be done shall be kept warm and dry by heating and ventilation, if necessary, until each coat of paint has hardened. Any defective paint shall be scraped off and repainted in accordance with the Government Site Representative’s directions.

8. Before final acceptance of the work, all damaged surfaces of paint shall be cleaned and repainted as directed by the Government Site Representative.

3.04 CLEANUP

A. At all times keep the premises free from accumulation of waste material and rubbish caused by employees or work. At the completion of the painting, remove all tools, scaffolding, surplus materials, and all rubbish from and about the buildings, and leave the work “broom clean” unless more exactly specified.

B. Upon completion, remove all paint where it has been spilled, splashed, or spattered on all surfaces, including floors, fixtures, equipment, furniture, etc., leaving the work ready for inspection.
## 4.01 INTERIOR PAINTING

<table>
<thead>
<tr>
<th>Item</th>
<th>Number/Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gyp. board walls</td>
<td>BF82 Cloud</td>
</tr>
<tr>
<td>P. M. Frames</td>
<td>BF82 Cloud</td>
</tr>
<tr>
<td>H. M. Doors</td>
<td>BU20 Parrot Green</td>
</tr>
<tr>
<td>Concrete and Plaster Ceilings</td>
<td>BF82 Cloud</td>
</tr>
<tr>
<td>CMU Walls</td>
<td>BF82 Cloud</td>
</tr>
<tr>
<td>Stl. Stairs and Handrails</td>
<td>BU 57 Safety Yellow</td>
</tr>
<tr>
<td>Columns, Beams, and Girts</td>
<td>BF82 Cloud</td>
</tr>
<tr>
<td>Concrete Walls</td>
<td>BF82 Cloud</td>
</tr>
</tbody>
</table>

## 4.02 PIPING SYSTEMS

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<tr>
<th>Item</th>
<th>Number/Color</th>
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<tr>
<td>Plant Influent System</td>
<td>AV22 Emerald</td>
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<tr>
<td>Stripper Effluent System</td>
<td>AU52 Beryl</td>
</tr>
<tr>
<td>Filter Effluent System</td>
<td>AX72 Aqua Sky</td>
</tr>
<tr>
<td>Carbon Adsorption Effluent System</td>
<td>BF22 Shale</td>
</tr>
<tr>
<td>Plant Effluent System</td>
<td>BB42 Clear Sky</td>
</tr>
<tr>
<td>Backwash Water System</td>
<td>AH22 Buffalo</td>
</tr>
<tr>
<td>Compressed Air System</td>
<td>BR18 Safety Blue</td>
</tr>
<tr>
<td>Carbon Slurry System</td>
<td>BG32 Cinder</td>
</tr>
<tr>
<td>Thickened Backwash Sludge System</td>
<td>AJ12 Weathered Bark</td>
</tr>
<tr>
<td>Air Stripper System</td>
<td>BA72 Lakeland</td>
</tr>
<tr>
<td>Backwash Air System</td>
<td>BA72 Lakeland</td>
</tr>
</tbody>
</table>

END OF SECTION