UNITED STATES
DEPARTMENT OF
AGRICULTURE

FOREST SERVICE

REGION 2

PIKE - SAN ISABEL
NATIONAL
FORESTS &
CIMARRON AND
COMANCHE
NATIONAL
GRASSLANDS

PIKES PEAK,
SOUTH PARK, &
SOUTH PLATTE
RANGER DISTRICTS

Pike Underground Utilities Upgrade

Project Manual

May 1, 2026

SECTION 001500
PIKE UNDERGROUND UTILITES UPGRADE

LIST OF DRAWINGS AND SPECIFICATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. List of Contract Drawings:

1. Index of Sheets:

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T1.2	General Notes
C1.1	Lake George Site Plan: Replacement Sewer Lines
C1.2	Section Detail: LG Office Sewer Lines
C1.3	Section Detail: LG Sepic System
C2.1	MFC Site Plan: Replacement Sewer Lines
C2.2	MFC Site Plan: Replacement Hydrants
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C3.1	Fairplay WC Site Plan: Replacement Waterline
C4.1	AG Ranch WC Site Plan: Septic Tank Replacement
D1.1	Details: Lake George Septic
D1.2	Details: Lake Geroge Septic 2
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D1.4	Details: AG Ranch Septic Tanks
14	**Total Plan Sheets in this Contract**

B. List of Contract Specifications

1. Index of Specifications

DIVISION 1 - GENERAL REQUIREMENTS

Section 001500	List of Drawings and Specifications
Section 010150	General Requirements
Section 010250	Definition of Items and Measurement and Payment
Section 011500	Hazardous Materials Requirements
Section 014000	Quality Requirements

DIVISION 2 – EXISTING CONDITIONS

Section 024119	Selective Demolition

DIVISION 22 - PLUMBING

Section 221316	Sanitary Waste Piping

DIVISION 26 - ELECTRICAL

Section 260500	Electrical Materials and Methods

DIVISION 31 - EARTHWORK

Section 311100	Clearing and Grubbing
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Section 312317	Trenching, Bedding, and Backfill for Utilities
Section 312500	Temporary Erosion and Sedimentation Control

DIVISION 32 – EXTERIOR IMPROVEMENTS

Section 321313	Concrete for Minor Structures
Section 329219	Seeding

DIVISION 33 - UTILITIES

Section 331116	Water Distribution
Section 331219	Water Hydrants
Section 333110	Sanitary Sewerage

END OF SECTION 001500

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SECTION 010150
GENERAL REQUIREMENTS

PART 1 – SUMMARY OF WORK

1.1 DESCRIPTION

A. Work for this project requires the contractor to be responsible for supplying all labor, materials, equipment, utilities, miscellaneous items, freight and delivery and all necessary valid licenses and permits for the following:

1. Waste Water System:
   a. Replace sewer lines in new locations
   b. Replace septic tanks in specified location
   c. Install new leach field as shown
2. Water System:
   a. Replace existing hydrants (Monument only)
   b. Replace water line (Fairplay)

1.2 LOCATION

A. This project is located at the following sites:
1. Fairplay Work Center, Fairplay, Colorado
2. Lake George Work Center, Lake George, Colorado.
3. Monument Fire Center, Monument, Colorado.
4. AG Ranch Work Center, Shawnee, Colorado

1.3 GENERAL SITE CONDITIONS AND WEATHER

A. The elevation of Fairplay Work Center, Lake George Work Center, Monument Fire Center, and AG Ranch are approximately 10,000, 8,100, 7,100 and 8,100 feet above mean sea level, respectively. The project sites are open year around.

1.4 USE OF PREMISES

A. Use of Site: Confine constructions operations to immediate area of work. Do not disturb portions of Project site beyond areas in which the Work is indicated.

B. Full Government Occupancy: Except as defined in “Work Restrictions” in this section, the government will occupy the site and buildings during entire construction period. Cooperate with Government during construction operations to minimize conflicts and facilitate Government usage. Perform the Work so as not to interfere with Government's day-to-day operations.

C. Driveways and Entrances: Keep driveways, parking areas, loading areas and entrances serving premises clear and available to Government, Government's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of

materials. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Government and authorities having jurisdiction.

1. Schedule deliveries to minimize use of driveways and entrances.
2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 WORK RESTRICTIONS

A. Nonsmoking Buildings: Smoking is not permitted within the buildings or within 25 feet (8 m) of entrances, operable windows, or outdoor air intakes.

B. Do not schedule work during holidays, weekends, or between 6:00 PM to 7:00 AM without written approval from the Contracting Officer.

C. Minimize the length of time the Work Center water distribution system is non-operational. Where possible, install the new water distribution system while the existing water service is operational.

D. Coordination of work with other Contractors:
   1. If required, coordinate construction schedule and work activities with the other contractors and Contracting Officer to prevent delays or work stoppages to either contract.
   2. Notify the Contracting Officer if conflicts cannot be resolved.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Provide adequate signing and barricades and take necessary safety measures to protect the public during all construction operations. Minimize disturbance of all undisturbed areas.

B. Protect trees and vegetation within project area from damage

1.7 FIELD VERIFICATION

A. Field verify all new and existing dimensions affecting the work of this contract before ordering products.

B. Contact "One-Call" at 811 prior to initiating excavation work to locate utility companies buried utilities. Additionally, obtain the services of a utility locating company to locate other buried utilizes including government owned utilities. Do not initiate any excavation work until utilities have been located and marked.

C. Existing buried utilities are shown on the drawings as accurately as existing records permit. Use caution when excavating in areas where buried utilities are anticipated. Repair any damage to buried utilities caused through work associated with this contract.

PART 2 – ACCIDENT PREVENTION

2.1 DESCRIPTION

A. This section consists of establishing an effective accident prevention plan and providing a safe environment for personnel and visitors.

2.2 SUBMITTALS

A. Accident Prevention Plan: Before on-site work begins, submit a company approved accident prevention plan. This plan will be posted in the contract file. Design the plan to address Federal, State, and Local Occupational Safety and Health requirements that apply to this project. Notice to proceed will not be made until the plan is received. As a minimum the plan shall include:

1. Name, position title and contact information of company executive responsible for approving the Accident Prevention Plan.
2. Name and contact information of supervisor responsible to carry out the plan.
3. Outline of each phase of the work, the hazards associated with each major phase, and the methods proposed to ensure property protection and safety of the public, government personnel, and the Contractor's employees. Identify the work included under each phase by reference to specification section or division numbers.
4. Contingency plans for emergency situations such as medical, fire, hazard material spills and other contract assessed hazard prevention and abatement requirement needs that apply to this project.

B. Certificates: Provide certificates from a mechanic that all mechanical equipment has been inspected and meets OSHA requirements.

C. Submit a copy of test reports, as required by OSHA, for personnel working with hazardous materials.

D. Submit a brief report of safety meetings and of inspections within 7 days of the meeting or inspection. Include a list of attendees.

E. Upon request, submit proof of employees' qualifications to perform assigned duties in a safe manner.

2.3 ACCIDENT REPORTING

A. Accidents: Report accidents immediately to the CO and assist the CO and other officials as required in the investigation and documentation of the accident.

2.4 FIRST AID FACILITIES

A. Provide adequate facilities for the number of employees and the type of construction at the site.

2.5 PERSONNEL PROTECTIVE EQUIPMENT

A. Meet requirements of NIOSH and MSHA, where applicable, as well as ANSI.

2.6 EMERGENCY INSTRUCTIONS

A. Post telephone numbers and reporting instructions for ambulance, physician, hospital, fire department, and police in conspicuous locations at the work site.

2.7 PROTECTIVE EQUIPMENT

A. Inspect personal protective equipment daily and maintain in a serviceable condition. Clean, sanitize, and repair, as appropriate, personal items before issuing them to another individual.

B. Inspect and maintain other protective equipment and devices before use and on a periodic basis to ensure safe operation.

2.8 SAFETY MEETINGS

A. As a minimum, conduct weekly 15-minute "toolbox" safety meetings. These meetings shall be conducted by a foreman and attended by all construction personnel at the worksite.

2.9 HARD HATS AND PROTECTIVE EQUIPMENT AREAS

A. Designate and post a hard hat area.

B. It is the Contractor's responsibility to require all those working on or visiting the site to wear hard hats and other necessary protective equipment at all times. As a minimum, provide two hard hats for use by visitors. Change liners before reissuing hats.

2.10 TRAINING

A. First Aid: Provide adequate training to ensure prompt and efficient first aid.

B. Hazardous Material: Train and instruct each employee exposed to hazardous material in safe and approved methods of handling and storage. Hazardous materials are defined as explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful substances that could cause death or injury.

PART 3 – SUBMITTAL PROCEDURES

3.1 DESCRIPTION

A. This section includes administrative, procedural, and construction schedule requirements for submittals.

3.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Contracting Officer's (CO's) responsive action.

B. Informational Submittals: Written information that does not require CO's approval.

C. Electronic Submittals: Transmit submittals in electronic (PDF) format using Submittal Exchange, a website service designed specifically for transmitting submittals.

1. Electronic submittal process is not intended for color samples, color-charts, or physical material samples. For these items, submit actual items.

3.3 PROCEDURES

A. General: The following procedure requirements pertain to all submittals regardless of the method utilized for submission.

1. Review each submittal and check for compliance with the Contract Documents. Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
2. Contracting Officer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
3. Submittals not required by the Contract Documents will not be reviewed and may be discarded.
4. Use only final submittals with mark indicating action taken by CO in connection with construction.

B. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on CO's receipt of submittal.

1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. CO will advise Contractor when a submittal being processed must be delayed for coordination.
2. If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Allow 10 working days for processing each re-submittal.
4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

C. Identification: Stamp each submittal with a uniform approval stamp. Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 2 by 3 inches on label or beside title block to record Contractor's review and approval markings and action taken by CO.

3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name and address of Contractor.
    d. Name of manufacturer.
    e. Unique identifier, including revision number.
    f. Number and title of appropriate Specification Section.
    g. Drawing number and detail references, as appropriate.
    h. Other necessary identification.

D. Electronic Submittal Procedures: Utilize electronic submittal procedure.

1. Preparation of Submittals: Use any or all of the following options:

    a. The General/Prime Contractor is to provide submittals to the Contracting Officer in electronic format (PDF) via an online construction management website operated by the Contractor, or via email.

2. Before submitting submittals to the Contracting Officer, apply electronic approval stamp certifying the submittal complies with the requirements of the Contract Documents including verification of manufacturer/product, dimensions, and coordination of information with other parts of the work.
3. Government review comments will be electronically and returned to the General/Prime Contractor.
4. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the General/Prime Contractor. Use only final submittals with mark indicating action taken by Contracting Officer in connection with construction.
5. Submit electronic copies of the final reviewed submittals at project closeout for record purposes in accordance with “Closeout Procedures” in this section.

3.4 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections. Submit Action Submittals, except for Application for Payment, electronically.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Manufacturer's catalog cuts.
e. Wiring diagrams showing factory-installed wiring.
f. Compliance with recognized trade association standards.
g. Compliance with recognized testing agency standards.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale in electronic format. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Include the following information, as applicable:

a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams: Differentiate between manufacturer installed and field installed wiring. Show field-installed wiring, including power, signal, and control wiring.
f. Notation of dimensions established by field measurement.

D. Requests for Information (RFI's): Immediately on discovery of the need for additional information or interpretation of the Contract Documents, prepare and submit an RFI in electronic form.

1. RFI's submitted by entities other than the Contractor shall not be accepted.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
3. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

a. Project name.
b. Project number.
c. Date.
d. Name of Contractor.
e. Name of Contracting Officer.
f. RFI number, numbered sequentially.
g. RFI subject.
h. Specification Section number and title and related paragraphs, as appropriate.
i. Drawing number and detail references, as appropriate.
j. Field dimensions and conditions, as appropriate.
k. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
l. Contractor's signature.

m. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

1) Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

4. CO's Action: CO will review each RFI, determine action required, and respond. Allow seven (7) working days for CO's response for each RFI. RFIs received by CO after 1:00 p.m. will be considered as received the following working day.

a. CO's action may include a request for additional information, in which case CO's time for response will date from time of receipt of additional information.
b. CO's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Contracting Section "Contract Modification Procedures."

1) If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify CO in writing within 10 days of receipt of the RFI response.

5. On receipt of CO's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify CO within seven days if Contractor disagrees with response.
6. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

a. Project name.
b. Name and address of Contractor.
c. Name and address of Contracting Officer.
d. RFI number including RFIs that were dropped and not submitted.
e. RFI description.
f. Date the RFI was submitted.
g. Date CO's response was received.
h. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
i. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

E. Contractor Quality Control Submittals: Provide electronic Quality Control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

1. Certifications: Where other Sections of the Specifications require certification that a product, material or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

    a. Signature: Signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

2. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 01 Section "Quality Requirements."

F. Contractor Quality Control Plan: Comply with requirements specified in Division 01 Section "Quality Requirements." Provide in electronic format.

G. Application for Payment: Comply with requirements specified in the Contract Clauses and Division 01 Section "Definition of Items & Measurement and Payment". Provide in electronic format.

3.5 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections. Submit Informational Submittals electronically.

1. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Contractor's Quality Control Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at the site, and submit in electronic format to the CO at weekly intervals:

1. List of subcontractors at the site.
2. Approximate count of personnel at the site.
3. High and low temperatures, general weather conditions.
4. Accidents and unusual events.
5. Meetings and significant decisions.
6. Stoppages, delays, shortages, and losses.
7. Meter readings and similar recordings.
8. Emergency procedures.
9. Orders and requests of governing authorities.
10. Change Orders received, implemented.
11. Services connected, disconnected.
12. Equipment or system tests and startups.
13. Partial Completions, occupancies.
14. Substantial Completions authorized.

C. Cost Breakdown: Following award, provide a cost breakdown schedule listing main types of work with associated costs. Provide in electronic format.

D. Schedule of Values: Comply with requirements specified in the Contract Clauses. Provide in electronic format.

E. Accident Prevention Plan: Comply with requirements specified in Division 1 Section "Accident Prevention." Provide in electronic format.

F. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements. Provide in electronic format.

G. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements. Provide in electronic format.

H. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Provide in electronic format.

3.6 CONSTRUCTION SCHEDULE

A. General: This section includes preparation and submittal of Construction Schedules. Submit Construction Schedules electronically utilizing Submittal Exchange.

B. Procedures:

1. Within ten calendar days after date of Notice to Proceed, submit a detailed Construction Schedule setting forth requirements for complete execution of the work. Provide schedules in electronic format.

    a. Include a written summary narrative to explain basis of approach to work.

2. With each Progress Payment Request, submit an Updated Construction Schedule reflecting work progress to the end of the Progress Payment Request period. On each Updated Construction Schedule indicate:

    a. Actual start dates for work items started during the report period.
    b. The percent complete on activities that have actual start dates.
    c. Actual completion dates for work items completed during report period.
    d. Estimated remaining duration for work items in progress.
    e. Estimated start dates for work items scheduled to start during month following report period.
    f. Changes in duration of work items.

C. Schedule Requirements:

1. Schedule contract work and monitor progress using a Critical Path Method (CPM) or similar type scheduling system. Break the schedule into sub-activities to include as a minimum major suppliers, submittal approvals, and major trades.
2. Clearly indicate sequence of construction activities, grouped by base and optional items.

    a. For each base and contract awarded optional item show the start and completion of work items, their major components, and interim milestones.
    b. Identify and show activities for procurement, delivery, and installation of equipment and materials.
    c. Identify interdependence of procurement and construction activities.
    d. Identify dates for testing and inspections.

3. Prepare construction Schedule to complete the Work within the contract time requirement.

D. Reviews: The government will review and return the initial Construction Schedule submittal and subsequent schedules with comments. If revisions are noted or required, make revisions based upon comments and resubmit the Schedule.

PART 4 – TEMPORARY FACILITIES AND CONTROLS

4.1 DESCRIPTION

A. This section consists of requirements for temporary facilities and controls, including utilities, support facilities, and security and protection facilities.

4.2 UTILITIES

A. Water Service: Use of Government existing water service facilities will be permitted without metering and without payment of use charges, as long as facilities are cleaned and maintained in a condition acceptable to CO. At Substantial Completion, restore these facilities to condition existing before initial use.

B. Sanitary Facilities: The Contractor shall supply temporary sanitary facilities while working at the site. At Substantial Completion, these facilities shall be removed.

C. Electric Power and Lighting Service: Use of Government's existing electric power and lighting service will be permitted without metering and without payment of use charges, as long as equipment is maintained in a condition acceptable to CO.

D. Telephone Service: The Contractor is responsible for providing telephone service deemed necessary for the duration of the construction.

4.3 CONSTRUCTION WASTE DISPOSAL

A. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste.

B. Cleanup construction debris at the completion of each day's work. Do not use existing on-site trash receptacles for disposal or interim storage of construction debris.

C. Burning of construction debris is not allowed on lands administered by the Forest Service.

D. Dispose construction debris at an established Sanitary Landfill. Schedule disposal frequency to ensure waste containers are not overflowing.

4.4 STAGING AND SUPPORT FACILITIES INSTALLATION

A. Staging: An area at the project site will be made available for use as a staging area. Coordinate size and location of staging area with Contracting Officer prior to storing materials. Security and clean-up of staging and support facilities is the responsibility of the Contractor.

B. Storage: Confine storage of materials to storage areas. Coordinate on-site storage requirements with the Contracting Officer.

C. Field offices, recreational vehicle, and storage sheds: An area at the project site can be made available for locating a temporary field office, recreational vehicle parking, and storage sheds, if requested. The temporary facilities can remain on site during construction. Coordinate size and location of area with Contracting Officer prior to bringing in temporary facilities. Security and clean-up of temporary facility location is the responsibility of the Contractor.

4.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

C. Fire Protection:

1. Store combustible materials in containers in fire-safe locations.

2. Maintain unobstructed access to fire extinguishers, fire hydrants, fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
3. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

PART 5 – EXECUTION REQUIREMENTS

5.1 DESCRIPTION

A. This section consists of general procedural requirements governing execution of the Work including, but not limited to, the following:

1. General installation of products.
2. Progress cleaning.
3. Protection of installed construction.
4. Correction of the Work.

5.2 EXAMINATION

A. Existing Conditions: Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

B. Acceptance of Conditions: Examine areas, and conditions, with Installer. Record observations.

1. Examine roughing-in for electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

5.3 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly.

B. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to CO. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

5.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

B. Comply with manufacturer's written instructions and recommendations for installing products.

C. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

5.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

D. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

5.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

5.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

PART 6 – OPERATIONS AND MAINTENANCE MANUALS

6.1 DESCRIPTION

A. This Section consists of administrative and procedural requirements for operation and maintenance manuals.

6.2 SUBMITTALS

A. Submit two manuals in final form at least 15 working days before final inspection.

6.3 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data: Include emergency instructions and procedures, system and equipment descriptions, operating procedures, and sequence of operations.
2. Maintenance Data: Include manufacturer's information, list of spare parts, maintenance procedures, maintenance and service schedules for preventive and routine maintenance, and copies of warranties and bonds.

B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.

C. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Forest.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Cross-reference to related systems in other operation and maintenance manuals.

D. Table of Contents: List each product included in manual, identified by product name, indexed to content of volume, and cross-referenced to Specification Section.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

F. Content: Include operation and maintenance data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.

G. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Performance curves.
7. Engineering data and tests.
8. Complete nomenclature and number of replacement parts.

H. Source Information: For each product, list name, address, and telephone number of Installer or supplier.

I. Operating Procedures: Include startup, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.

J. Systems and Equipment Controls: Describe sequence of operation, and diagram controls as installed.

K. Maintenance Procedures: For each system, subsystem, and piece of equipment not part of a system, include manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment.

L. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

M. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

PART 7 – CLOSEOUT PROCEDURES

7.1 DESCRIPTION

A. This section consists of administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Final cleaning.

7.2 SUBSTANTIAL COMPLETION

A. Definition of Substantial Completion: The Date certified by the Contracting Officer when construction is sufficiently complete, in accordance with the Contract Documents, so the Government can occupy or utilize the Work or designated portion thereof for the use for which it is intended, as expressed in the Contract Documents.

B. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Contracting Officer (CO) of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, final certifications, and similar documents.
4. Obtain and submit releases permitting Government unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Government. Label with manufacturer's name and model number where applicable.
7. Complete startup testing of systems.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

C. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, CO will either proceed with inspection or notify Contractor of unfulfilled requirements. CO will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by CO, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

7.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit certified copy of CO’s Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by CO. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
2. Instruct Government personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, CO will either proceed with inspection or notify Contractor of unfulfilled requirements. CO will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

7.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

7.5 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for CO's reference during normal working hours.

B. Submit record documents for review prior to request for final inspection.

C. Record Drawings: Maintain and submit one electronic copy of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

    a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
    b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Mark record sets electronically in red. Use other colors to distinguish between changes for different categories of the Work at the same location.
3. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
4. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

7.6 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

C. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

2. Remove tools, construction equipment, machinery, and surplus material from Project site.
3. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Government property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 010150

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SECTION 010250
DEFINITION OF ITEMS
AND
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This section is to explain what is and what is not included in each pay item; the limits or cut-off points where one item ends and another begins; and method of measurements and basis of payment for work items listed in the Schedule of Items.

B. Work: Furnishing all labor, materials, equipment, and other incidentals necessary to successfully complete the project or any portion of it, and carrying out all duties and obligations imposed by the contract on the Contractor.

C. Payment: For each individual item listed here and in the Schedule of Items, payment shall be full compensation for all work related to the particular item in accordance with these specifications and as shown on the drawings.

D. Measurement and payment for contract work shall be made only for and under those items included in the Schedule of Items. All other work and materials shall be considered incidental or as included in the payment for items shown

1.2 UNITS OF MEASUREMENT

A. Payment shall be by units defined and determined according to U.S. Standard measure and by the following:

B. Lump Sum: Do not measure directly. The amount is complete payment for all work described in the contract and necessary to complete the work for that item.

C. Linear Feet (LF): Linear feet measured horizontally.

D. Square Feet (SF): Measured per square foot

E. Unit Price: Measured per unit

PART 2 - METHOD OF MEASUREMENT

2.1 GENERAL

A. One of the following methods of measurement for determining final payment is designated on the Schedule of Items for each pay item:

1. Actual Quantities (AQ): These estimated quantities which are determined from actual measurements of completed work.
2. Lump Sum Quantities (LSQ): These quantities denote one complete unit of work as required by or described in the contract, including necessary materials, equipment, and labor to complete the job. They shall be measured complete and in-place.
3. Unit Pricing (Unit): These items are based on a set price per unit of work completed.
4. Square Foot (SF): These items are measured per square foot of construction.

PART 3 – DEFINITION OF CONTRACT ITEMS

3.1 SCHEDULE OF ITEMS

A. The project Schedule of Items includes several sections to organize the work into Base Items and Optional Items.

1. Provide pricing for all items listed in the Schedule of Items.
2. Contract award will be made for all Base Items.
3. Optional Items will be awarded based on available project funding.

3.2 BASE ITEMS

A. Base Items (BI):
   1. Base Item No.1.A- Lake George Mobilization
      a. Measurement: This item is measured as a Lump Sum Quantity.
      b. Payment: The contract lump sum price as shown in the Schedule of Items includes all preparatory work and operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site (Lake George Work Center). This base item applies to work included in the base items only.
   2. Base Item No. 1.B- Lake George Installation of New Sewer Lines
      a. Measurement: This item is measured as a Lump Sum Quantity
      b. Payment: The contract lump sum price as shown in the Schedule of Items includes all excavation, grading, compaction, pipe laying and backfilling needed for the placement of pressurized and gravity sewer lines. This item also includes installation of tracer wire, warning tape and specified cleanouts.
   3. Base Item No 1.C- Lake George Field Construction
      a. Measurement: This item is measured as a Lump Sum Quantity
      b. Payment: The contract lump sum price as shown in the Schedule of Items included all excavation, grading, installation of *Quick 4 Standard Chamber* system, sand filter and distribution piping.
   4. Base Item No 1.D- Lake George Septic Tank Replacement
      a. Measurement: This item is measured as a Lump Sum Quantity

b. Payment: The contract lump sum price as shown in the Schedule of Items includes abandonment of existing septic tank and installation of new 2000-gallon 3 compartment septic/pump tank. Installation of underground electrical connection, pump and pump control box.

5. Base Item No. 2.A- Monument Fire Center Mobilization
   a. Measurement: This item is measured as a Lump Sum Quantity
   b. Payment: The contract lump sum price as shown in the Schedule of Items includes all preparatory work and operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site (Monument Fire Center). This base item applies to work included in the base items only.
6. Base Item No 2.B- Monument Fire Center Installation of New Sewer Line
   a. Measurement: This item is measured as a Lump Sum Quantity
   b. Payment: The contract lump sum price as shown in the Schedule of Items includes all excavation, grading, compaction, pipe laying and backfilling needed for the placement of the sewer lines. This item also includes installation of tracer wire, warning tape and specified cleanouts.
7. Base Item No 2.C - Monument Fire Center Yard Hydrant Replacement
   a. Measurement: This item is measured as a Lump Sum Quantity
   b. Payment: The contract unit price as shown in the Schedule of Items includes removal and replacement of the existing frost proof yard hydrant, including concrete pad, with a new yard hydrant (3/4" outlet) including connection to the existing water line and new concrete pad.
8. Base Item No 2.D - Monument Fire Center Fire Hydrant Replacement
   a. Measurement: This item is measured as a Lump Sum Quantity
   b. Payment: The contract unit price as shown in the Schedule of Items includes removal and replacement of the existing yard hydrant, including concrete pad, with a new frost proof fire hydrant (1-1/2" outlet) including connection to the existing water line and new concrete pad.
9. Base Item No 3.A_ Fairplay Work Center Mobilization
   a. Measurement: This item is measured as a Lump Sum Quantity
   b. Payment: The contract unit price as shown in the schedule of items includes all preparatory work and operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site (Fairplay Work Center). This base item applies to work included in the base items only.
10. Base Item No3.B- Fairplay Work Center Replacement of Waterline
    a. Measurement: This item is measured as a Lump Sum Quantity
    b. Payment: The contract unit price as shown in the schedule of items includes all excavation, grading, compaction, pipe laying and backfilling needed for the placement of the waterline. This item also includes installation of tracer wire, foam insulation and warning tape.

3.3 OPTION ITEMS

A. Option Items (OI):
   1. Option Item No 4.A- AG Ranch Mobilization
      a. Measurement: This item is measured as a Lump Sum Quantity
      b. Payment: The contract lump sum price as shown in the Schedule of Items includes all preparatory work and operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site (AG Ranch).
   2. Option Item No 4.B- AG Ranch Office Septic Tank Replacement
      a. Measurement: This item is measured as a Lump Sum Quantity
      b. Payment: The contract unit price as shown in the Schedule of Items includes removal and replacement of the septic tank that services the office. This item includes excavation, removal and disposal of the old tank and installation and backfill of the new 1500-gallon tank.
   3. Optional Item No 4.C- AG Ranch Bunkhouse Septic Tank Replacement
      a. Measurement: This item is measured as a Lump Sum Quantity
      b. Payment: This contract unit price as shown in the Schedule of Items includes removal and replacement of the septic tank that services the bunkhouse. This item includes excavation, removal and disposal of the old tank and installation and backfill of the new 1500-gallon tank.

END OF SECTION 010250

SECTION 011500
HAZARDOUS MATERIALS REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general administrative requirements and procedures in the event hazardous materials are discovered during the project.

1.2 SUBMITTALS

A. Material Safety Data Sheets (MSDS): Retain copies on site of all material safety data sheets for all applicable products, including but not limited to: paints, adhesives, mastics, solvents and finishes, etc. used during the construction work. Furnish copies of all MSDS's to the Government upon request and include in the Project Record Document submittal.

B. Certification: Submit written certification that no asbestos-containing materials or hazardous materials have been used or incorporated in the new Work. Submit certification prior to Final Completion.

1.3 QUALITY ASSURANCE

A. The Government is not aware of any lead-based paint or other hazardous materials in the buildings.

1.4 PROJECT/SITE CONDITIONS

A. If hazardous materials are discovered during the construction period that are not identified as part of this contract; immediately notify the Contracting Officer. Abatement measures will be taken by the Government under separate contract. The Contractor shall coordinate sequencing and scheduling with that of the hazardous materials abatement work.

B. Hazard Communication Requirements: Comply with mandatory federal rules and regulations concerning Hazardous Communication, specifically for those regulations contained in 29 CFR 1910.1200 Hazard Communication.

1. Contractor working at sites under the control of the Government shall make available to the CO, upon request, copies of the Hazard Communication Program used by their firm. In addition to this requirement, all regulations to Multi-employer workplaces shall be adhered to. These regulations are found in 29 CFR 1910.1200, (e) (2) (i) through (e) (4) specifically:

a. (e) (2) Multi-employer workplaces. Employers who produce, use or store hazardous chemicals at a workplace in such a way that employees of other employer(s) may be exposed (for example, employees of a construction contractor working on a site shall additionally ensure that the hazard communication programs developed and implemented under paragraph (e) include the following:

1) (e) (2) (i) The methods the employer will use to provide the other employer(s) with a copy of the material safety data sheet, or to make it available at a central location in the workplace, for each hazardous chemical the other employer(s)' employees may be exposed to while working;
2) (e) (2) (ii) The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and,
3) (e) (2) (iii) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.

b. (e) (3) the employer may rely on an existing hazard communication program to comply with these requirements, provided that it meets the criteria established in this paragraph (e)
c. (e) (4) The employer shall make written hazard communication program available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director, in accordance with the requirements of 29 CFR 1910.1200 (e).

2. The referenced regulations were excerpted from 29 CFR 1910.1200. This excerpt shall not be relied upon for compliance with mandatory federal, state and local regulations. Comply with all such regulations and shall be solely liable for insuring that all requirements under applicable regulations are met.

PART 2 – PRODUCTS – (NOT APPLICABLE)
PART 3 – EXECUTION

3.1 EXAMINATION

A. Stay alert to the possibility that the work may uncover asbestos base containing materials, lead based paint, or other hazardous materials. If suspected materials are found, notify the CO and stop all work in the area immediately. If the suspected materials prove to contain asbestos, lead based paint or other hazardous materials and are not identified for removal under this contract the Government will arrange to have the materials abated in a timely manner.

B. Comply with federal rules and regulations concerning working in areas where asbestos containing materials (ACMs) are identified and are disturbed by work associated with this contract.

END OF SECTION 011500

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SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control including preparing and executing a quality control program.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by CO.

1.3 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to CO for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum with reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to CO for a decision before proceeding.

1.4 SUBMITTALS

A. As specified in Division 1 Section “Submittal Procedures”.

B. Testing Agencies Qualification Data: Submit proof of qualifications and experience in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Quality Control Plan: At the time of the preconstruction conference, submit for approval a written Contractor Quality Control (CQC) plan.

1. The plan shall include:

a. A list of personnel responsible for quality control and assigned duties. Include each person's qualifications.
b. A copy of a letter of direction to the Contractor's Quality Control Supervisor outlining assigned duties.
c. Names, qualifications, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms.
d. Methods of performing, documenting, and enforcing quality control of all work.
e. Methods of monitoring and controlling environmental pollution and contamination as required by regulations and laws.

2. If the plan requires any revisions or corrections, the Contractor shall resubmit the plan within 10 days.
3. The Government reserves the right to require changes in the plan during the contract period as necessary to obtain the quality specified.
4. No change in the approved plan may be made without written concurrence by the Contracting Officer (CO).

D. Contractor's Quality Control Daily Reports: Submit showing all inspections and tests on the first workday following the date covered by the report.

E. Test Reports:

1. Submit Daily Test Information Sheets with Quality Control Daily Reports.
2. Submit failing test results and proposed remedial actions within four hours of noted deficiency.
3. Submit three copies of complete test results not later than three calendar days after the test was performed.
4. Test Reports shall be certified and include the following:

a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making tests and inspections.
f. Description of the Work and test and inspection method.
g. Identification of product and Specification Section.
h. Complete test or inspection data.
i. Test and inspection results and an interpretation of test results.
j. Ambient conditions at time of sample taking and testing and inspecting.
k. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting and reinspecting.

F. Off-Site Inspection Reports: Submit prior to shipment.

G. Permits, Licenses, and Certificates: For CO's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

E. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

F. Testing Laboratory and Equipment: All measuring devices, laboratory equipment, and instruments shall be calibrated at established intervals against certified standards in accordance with NBS requirements. Upon request, measuring and testing devices shall be made available for use by the Government for verification tests.

1.6 QUALITY CONTROL

A. Designate a Quality Control Supervisor with the following responsibilities:

1. Quality Control Supervisor shall be on the project site whenever contract work is in progress. The Contractor's Quality Control Supervisor may also perform the duties of Project Superintendent,
2. Complete Quality Control Daily Reports.
3. Have all work inspected and tested often enough to ensure that the quality of materials, workmanship, construction, finish, and functional performance is in compliance with applicable specifications and drawings.

4. Where testing services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
5. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
6. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
7. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
8. Cooperate with testing agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Provide the following:

    a. Access to the Work.
    b. Incidental labor and facilities necessary to facilitate tests and inspections.
    c. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
    d. Facilities for storage and field-curing of test samples.
    e. Preliminary design mix proposed for use for material mixes that require control by testing agency.
    f. Security and protection for samples and for testing and inspecting equipment at Project site.

B. Testing Agency Responsibilities: Cooperate with CO and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify CO and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Retest and re-inspect corrected work.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

PART 2 - PRODUCTS (NOT USED)
PART 3 – EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
2. Comply with the Contract Document requirements for Division 2 Section "Selective Demolition."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

3.2 OFF-SITE CONTROL

A. Inspect items that are fabricated or assembled off-site for quality control at the place of fabrication.

3.3 ON-SITE CONTROL

A. Notification:

1. Notify the CO at least 48 hours in advance of the preparatory phase meeting.
2. Notify the CO at least 24 hours in advance of the initial and follow-up phases.

B. Preparatory Phase: Perform before beginning each feature of work.

1. Review control submittal requirements with personnel directly responsible for the quality control work. As a minimum, the Contractor's Quality Control Supervisor and the foreman responsible for the feature of work shall be in attendance.
2. Review all applicable specifications sections and drawings related to the feature of work.
3. Ensure that copies of all referenced standards related to sampling, testing, and execution for the feature of work are available on site.
4. Ensure that provisions have been made for field control testing.
5. Examine the work area to ensure that all preliminary work has been completed.
6. Verify all field dimensions and advise the CO of discrepancies with contract documents.
7. Ensure that necessary equipment and materials are at the project site and that they comply with approved shop drawings and submittals.
8. Prepare a report on all preparatory phase activities and discussions. Attach report to Contractor's Quality Control Daily Report.

C. Initial Phase:

1. As soon as work begins, inspect and test a representative portion of a particular feature of work for quality of workmanship.
2. Review control-testing procedures to ensure compliance with contract requirements.
3. Prepare a report on all initial phase activities and discussions. Attach report to Contractor's Quality Control Daily Report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

D. Follow-Up Phase: Inspect and test as work progresses to ensure compliance with contract requirements until completion of work.

E. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be required on the same feature of work for the following reasons:

1. Quality of on-going work is unacceptable.
2. Changes occur in the applicable quality control staff, on-site production supervision, or work crew.
3. Work on a particular feature of work is resumed after a substantial period of inactivity.

3.4 DOCUMENTATION

A. Maintain Quality Control Daily Reports and Daily Test Report Information Sheets (samples attached) of quality control activities and tests.

B. Quality Control Daily Reports may not be substituted for other written reports required under clauses of the contract, such as Disputes, Differing Site Conditions, or Changes.

3.5 ENFORCEMENT

A. Stop work on any item or feature pending satisfactory correction of any deficiency noted by the quality control staff or the CO. The CO may designate locations of tests.

END OF SECTION 014000

CONTRACTOR'S QUALITY CONTROL DAILY REPORT

REPORT NO. SHEET 1 OF

PROJECT				CONTRACT NO.	DATE
FOREST				CONTRACTOR'S REPRESENTATIVE ON THE JOB	
WEATHER (Rain, Snow, Cloudy, Windy, etc.)	RAINFALL Inches	TEMPERATURE		GROUND CONDITIONS (Dry, Damp, Wet, Frozen, etc.)	
		MAX.	MIN.		

1. PRIME CONTRACTOR

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY PRIME CONTRACTOR:

MATERIALS DELIVERED	OFFICIAL VISITORS TO SITE

2A. SUBCONTRACTOR, _____: (If more than one subcontractor use copies of following page.)

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY SUBCONTRACTOR:

3. SPECIFIC INSPECTIONS: (Inspections performed, results, and corrective actions)

4. TESTING: ☐1 Check if any testing was performed today. (Complete and attach Test Report Information Sheets.)

Type and Location of Testing: _____

5. VERBAL INSTRUCTION RECEIVED FROM GOVERNMENT ON CONSTRUCTION DEFICIENCIES OR RE-TESTING REQUIRED:

6. REMARKS:

7. CERTIFICATION:

I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the prime contractor and each subcontractor and determined that all materials, equipment, and workmanship are in strict compliance with

the plans and specifications except as may be noted above. _____

Contractor's Quality Control Representative

SUBCONTRACTOR WORK CONTINUED:	CONTRACT NO.	REPORT NO. _____ SHEET ____ OF ____

2 SUBCONTRACTOR,

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY SUBCONTRACTOR:

2 SUBCONTRACTOR,

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY SUBCONTRACTOR:

2 SUBCONTRACTOR,

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY SUBCONTRACTOR:

2 SUBCONTRACTOR,

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	COMMENTS

WORK PERFORMED BY SUBCONTRACTOR:

DAILY TEST REPORT INFORMATION SHEET

CONTRACT NO. REPORT NO. _____
SHEET _____ OF _____

1. Individual Making Inspection or Test:
2. Testing Laboratory; Name: Phone #:
Address:
3. Description of Work and Test Method:
4. Location of Samples and Tests or Inspections:
5. Specification Section:
6. Inspection or Test Data:
7. Test Results and Interpretations of Test Results:
8. Comments or Professional Opinion About Compliance of Inspected Work or Tested Work with contract Document Requirements:
9. Recommendations:
10. Corrective Actions Taken:
CERTIFICATION: I certify that the above testing report is complete and correct and that all testing performed this day for this contract is in strict compliance with the plans and specifications except as noted above.
Signature of Inspector

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SECTION 024119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes demolition, cutting, patching, repairs and removal of selected portions of a building, structure, or building system or site components.

B. See Division 2 through 33 Sections for specific requirements and limitations applicable to individual parts of the work.

1.2 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction and deliver them to Government.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

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

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Government property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 SUBMITTALS

A. Provide Informational Submittals as specified in Division 01 Section “General Requirements” submittal procedures.

B. Proposed Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.

C. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services.

D. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

F. Cutting, Patching, and Repair Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting, patching, and repairs operations. Show how the operations will be performed.
2. Dates: Indicate when cutting, patching, and repairs will be performed.
3. Contracting Officer's (CO) Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

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

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Predemolition Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Government may occupy portions of the building immediately adjacent to selective demolition area. Conduct selective demolition so Government operations will not be disrupted. Provide not less than 72 hours' notice to Contracting Officer (CO) of activities that will affect Government operations.

B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

C. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

D. Government assumes no responsibility for condition of areas to be selectively demolished. Conditions existing at time of inspection for bidding purpose will be maintained by Government as far as practical.

E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work except where identified.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Contracting Officer (CO). Hazardous materials will be removed by Government under a separate contract.

F. Storage or sale of removed items or materials on-site will not be permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 – PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to CO.

D. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from CO and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required.
3. Protect existing site improvements, appurtenances, and landscaping to remain.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

3.3 POLLUTION CONTROLS

A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

1. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.4 SELECTIVE DEMOLITION

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

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Government.
4. Transport items to Government storage area designated by CO.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by CO, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 CUTTING, PATCHING, AND REPAIRS

A. General:

1. Promptly repair damage to adjacent construction caused by selective demolition operations.
2. Employ skilled workers to perform cutting, patching, and repairs.

B. Protection: Protect existing construction during cutting, patching, and repairs to prevent damage. Provide protection from adverse weather conditions for portions of project that might be exposed during cutting, patching, and repair operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

E. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, using methods least likely to damage elements retained or adjoining construction.

1. Provide temporary support of work to be cut.
2. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
3. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
4. Proceed with patching after construction operations requiring cutting or repairs are complete.

F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

G. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.

H. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

I. Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair wall surfaces in the space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

J. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Government property and legally disposes of them.

END OF SECTION 024119

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SECTION 221316
SANITARY WASTE PIPING

PART 1- GENERAL

1.1 SUMMARY

A. This Section includes piping and accessories for installing sanitary sewer piping within the building and extending five feet beyond the building.

B. See Division 33 section, “Sanitary Sewerage” for underground piping beyond five feet from the building.

1.2 PERFORMANCE REQUIREMENTS

A. Soil, Waste, and Vent Piping: Components and installation shall be capable of with-standing the 10 foot head of water.

1.3 SUBMITTALS

A. Product Submittals: As specified in Division 01 Section, “General Requirements” submittal procedures.

1. Submit manufacturer's product literature for piping and fittings.
2. Sample warranties.

B. Closeout Submittals: As specified in Division 01 Section, “General Requirements” closeout procedures.

1. Field quality test reports.
2. Operation and Maintenance Data: Include for regulator and valves.
3. Warranty: Provide copies of manufacturer’s warranties.

1.4 QUALITY ASSURANCE

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

B. Code Compliance: Install plumbing systems in accordance with the International Plumbing Code (IPC) latest edition and State and Local codes.

PART 2 - PRODUCTS

2.1 SANITARY SEWER MATERIALS

A. Solid-Wall or Cellular-Core PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
2. Solvent Cement and Adhesive Primer.

B. PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.

1. Gaskets: ASTM F 477, elastomeric seals.

C. Cast Iron to PVC Couplings: PVC No-Hub adapter fitting with neoprene inner gasket surrounded by an outer stainless steel shield or band with series 300 stainless steel worm clamps.

D. Underground Flexible Transition Couplings: ASTM C 1173 with elastomeric sleeve, ends of same sizes as piping to be joined. Include corrosion-resistant stainless steel metal band with stainless steel worm drive screws on each end.

2.2 CLEANOUTS

A. Exposed Cleanouts:

1. Adapter Material: PVC to match connected piping.
2. Closure: Raised-head, plastic plug.
3. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

PART 3 – EXECUTION

3.

3.1 SANITARY SEWER PIPING INSTALLATION

A. Underground, soil, waste, and vent piping: Solid-wall or cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.

1. Install buried utilities in trenches in conformance with Division 31 section “Trenching, Bedding, and Backfill for Utilities.”
2. Do not place pipe in the trench until the Contracting Officer has inspected the trench and bedding.

3. Sleeve-Type Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
4. Install gravity-flow piping and connect to building's main sanitary drain.

    a. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.

5. Pipe Joint Construction and Installation: Join and install pipe and fittings according to ASTM D 2321.

    a. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

B. Aboveground, soil, waste, and vent piping: Solid-wall or Cellular-core PVC pipe, PVC socket fittings, and solvent-cemented joints.

1. Install PVC soil, waste, and vent piping according to ASTM D 2665.
2. Make changes in direction for soil, waste, and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees.
3. Install soil, waste, and vent piping at the following minimum slopes, unless otherwise indicated:

    a. Building Sanitary Drain:

        1) NPS 4 and smaller: 2 percent downward in direction of flow for piping.
        2) NPS 5 and larger: 1 percent downward in direction of flow for piping.

3.2 CONNECTIONS

A. Connect soil and waste piping to exterior sanitary sewerage. Use transition fitting to join dissimilar piping materials.

B. Cleanouts: Install cleanouts in aboveground piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

3.3 FIELD QUALITY CONTROL

A. Notify Contracting Officer at least 48 hours before inspection or testing. Perform test in the presence of the Contracting Officer. Prepare report for each test, signed by Installer, General Contractor, and Contracting Officer.

B. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

C. Final Inspection and Testing:

1. Test for leaks and defects in piping. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced piping until it has been tested. Expose work that was covered or concealed before it was tested.
3. Test Procedure:

    a. Close openings in piping system and fill with water to point of overflow but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection.
    b. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained

D. Reinspection: If piping will not pass test or inspection, make required corrections and arrange for reinspection.

END OF SECTION 221316

SECTION 260500
ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes electrical materials for a complete electrical system including the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Ground-fault circuit interrupters.
5. Device wall plates.
6. Circuit breakers.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to Division 26 Sections.

1.3 QUALITY ASSURANCE

A. Worker's Qualifications: All electrical work shall be performed by licensed electricians or under the direct supervision of a licensed electrician licensed in the state of Colorado.

B. Codes and Regulations:

1. All work shall meet requirements of governing codes and regulations, NFPA 70-2014 (NEC), and NESC.
2. Comply with the State of Colorado requirements for electrical installations.
3. Advise the Contracting Officer of conflicting codes or conflicts between codes drawings, and specifications.
4. When the requirements of specifications or drawings are more stringent than the codes, regulations, or standards, the specifications or drawings shall prevail.
5. The electrical installation shall meet the requirements of NECA Standard of Installation, except where otherwise specified.

C. UL Listing:

1. All electrical materials and equipment shall meet requirements of the applicable standards of UL if UL standards exist for such materials and equipment.

2. The UL authorized listing mark is acceptable as evidence that the materials meet this requirement.
3. Install materials and equipment only for their intended operational purpose.

D. Standard Products: Provide only new electrical equipment of current standard design.

E. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in NFPA 70.

F. UL Compliance: Applicable requirements of UL Standards Nos. 467, "Electrical Grounding and Bonding Equipment," and 869, "Electrical Service Equipment," pertaining to grounding and bonding of systems, circuits, and equipment. In addition, compliance with UL Standard 486A, "Wire Connectors."

G. IEEE Compliance: Applicable requirements and recommended installation practices of IEEE Standards pertaining to grounding and bonding of systems, circuits, and equipment.

1.4 INTENT OF CONSTRUCTION DRAWINGS

A. Electrical drawings do not attempt to show complete details of building construction that affect installation. Diagrams are schematic only and do not necessarily show physical arrangement of equipment. Refer to drawings of other trades for additional details that affect work.

B. Conduit, conductor and ground connections are shown diagrammatically only. Layout does not necessarily show total number of conduits or conductors for circuits required and should not be used for obtaining quantities for linear runs of conduits or wires. Provide additional conduits and wire wherever needed to complete installation of specific equipment furnished.

C. Locations of outlets, switches, and junction boxes on drawings are approximate and may be distorted for clarity in representation.

D. Changes such as offsetting conduit runs, moving outlets, or other minor changes necessary to facilitate installation shall be made at no additional expense to the Government.

1.5 SUBMITTALS

A. Product Submittals: As specified in Division 01 Section, "General Requirements" submittal procedures. Submit manufacturer's product literature for the following items:

1. Conduit, raceways, and fittings.
2. Wire and cable.
3. Ground fault circuit interrupters.

4. Circuit Breakers.

B. Closeout Submittals: As specified in Division 01 Section, General Requirements" closeout procedures.

1. Operation and maintenance data.

PART 2 – PRODUCTS

2.1 RACEWAYS

A. Metal Conduit:

1. RMC: UL 6 rigid metal conduit; hot dipped galvanized rigid steel; ANSI C80.1 with threaded fittings.
2. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

B. PVC Coated Metal Conduit: NEMA RN 1, rigid steel conduit with external PVC coating, 20 mil thick.

1. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel fittings with external PVC coating to match conduit.

C. FMC: Flexible metal conduit; zinc-coated steel, interlocked steel construction.

1. Fittings: ANSI/NEMA FB 1, steel compression type.

D. LFMC: UL 360, liquid tight flexible metal conduit; zinc-coated steel with sunlight-resistant and mineral-oil-resistant PVC jacket.

1. Fittings: ANSI/NEMA FB 1.

E. EMT: UL 797 electrical metallic tubing; ANSI C80.3, zinc-coated steel.

1. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression or set screw type.

F. RNC: Rigid nonmetallic conduit; NEMA TC 2, Schedule 40 or Schedule 80 PVC as indicated.

1. Fittings and Conduit Bodies: NEMA TC 3.

G. Bushings: Insulated type bushings designed to prevent abrasion of wires without impairing the continuity of the conduit grounding system comprised of rigid steel conduit. Provide locking type grounding bushings with a feed-through compression lug.

H. Expansion Fittings: Rigid hot-dipped galvanized steel or malleable iron with factory-installed packing and grounding ring.

1. Rigid non-metallic conduit expansion fittings: Provide short type for runs 25 feet or less and long type in runs 26 to 80 feet.

a. Short Type: On-piece coupling with O ring providing 2 inches of total movement range in 1/2-inch to 2-inch conduit sizes.
b. Long Type: Two piece barrel and piston joint providing 6 inches of total movement range in 1/2-inch to 6-inch conduit sizes.

I. Sealing Fittings: Threaded, zinc or cadmium coated, cast or malleable iron type for steel conduits. Provide continuous drain type when fittings are used to prevent passage of water vapor.

2.2 BUILDING WIRE AND CABLE

A. Feeders and Branch Circuits: Copper, stranded conductor, 600 volt insulation, Type THHN/THWN depending on application.

B. Cable Types: Armored Cable (AC), Metal-Clad Cable, (MC), Non-metallic Sheathed Cable (NM), Mineral-insulated, Metal-sheathed Cable (MI) all with ground wire.

2.3 GROUNDING

A. Grounding Electrode Conductors: Stranded copper cable, without splice throughout its length; bare or green insulated wire is acceptable.

B. Equipment Grounding Conductors: Copper, insulated with green-colored insulation. Use same type as other wires in the circuit.

C. Ground Rods: One piece, copper or copper-clad steel rod, 3/4 inches by 120 inches.

D. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

E. Bonding Jumpers: Bare copper tape or tinned-copper tape, braided copper conductors, terminated with copper ferrules.

F. Ground Bus: Bare, annealed copper bars of rectangular cross section with insulated spacer.

G. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

1. Exothermic-Welded Type: Kit form selected per manufacturer's written instructions.

2.4 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

D. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

2.5 RECEPTACLES

A. Ground Fault Circuit Interrupter (GFCI) Receptacles: Weather resistant, complying with NEC 406.9 and UL 943, Class A, straight blade, thermosetting ivory plastic, commercial specification grade, duplex receptacle with NEMA 5-20R configurations. Ivory color. Hubbell catalog No. GFWRST20I or equal.

B. Tamper-Resistant Ground Fault Circuit Interrupter (GFCI) Receptacles: UL 943, Class A, straight blade, commercial specification grade, duplex receptacle with NEMA 5-20R configuration and self test technology. Indicator light glows red upon trip condition. Ivory color. Hubbell catalog No. GFTRST20 or equal.

C. Weatherproof Receptacle Cover: NEMA 3R rated, UL listed for wet locations and designed to meet requirements of NEC Article 410-57(b). UV stabilized high impact polycarbonate cover. Single gang, weatherproof cover/base assembly, gasket, inserts, and mounting hardware. Intermatic model WP1000 or equal.

2.6 OUTLET, PULL, AND JUNCTION BOXES

A. General: Provide one for each outlet, switch, receptacle, or combination, at each junction point.

1. Metal Raceway Systems in Interior Dry Locations: Plastic or galvanized sheet metal.
2. Outdoor and Wet Locations: Weatherproof, cast metal, threaded hub.
3. Buried or Subject to Constant Moisture: Watertight.

2.7 DEVICE PLATES AND COVERS

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished and Unfinished Spaces: Ivory, smooth, high impact thermoplastic.

3. Material for Wet Locations: Listed and labeled for use in "wet locations," gasketed and weatherproof, with spring loaded neoprene gasketed doors for receptacles, lever operators for switches and cast aluminum cover plates for junction boxes.

2.8 CIRCUIT BREAKERS

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents. Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Heavy-duty, bolt-on or snap-in, quick make, quick break type. Minimum interrupting rating of 10,000 amperes symmetrical at 240 volts, unless otherwise noted on drawings.

1. Multiple Pole Circuit Breakers: Thermal-magnetic type with common type handle. Minimum 100-ampere frame and through 100-ampere trip sizes shall take up same pole spacing.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Field verify circuiting arrangements and all existing conditions prior to beginning work. Beginning of removal means installer accepts existing conditions.

B. Verify that abandoned wiring and equipment serve only abandoned facilities. Maintain electrical continuity to remaining wiring and equipment.

C. Removal information is based on existing record documents. Report discrepancies to Contracting Officer before disturbing existing installation.

3.2 REMOVAL AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, abandon, and extend existing installations to accommodate new construction.

B. Connect new work to existing work in a manner that will assure proper operation and grounding throughout in conformance with the National Electrical Code.

C. Removed conduits, wire, devices, etc. shall become the property of the Contractor unless otherwise noted.

D. Coordinate installation of meter can and final connection with Utility Company.

3.3 UNDERGROUNG POWER INSTALLATION

A. Excavating, trenching, backfilling, and warning tape: Comply with Division 31 section, “Trenching, Bedding, and Backfill for Utilities.”

3.4 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.5 RACEWAY APPLICATION

1. Homeruns:

    a. Above Accessible Ceilings: 1/2-inch.
    b. Above Non-accessible Ceilings and in Slab: 3/4-inch.
    c. Below Grade or Slab: 3/4-inch minimum.

2. Branch Circuits After First Junction Point: 1/2-inch.

B. Outdoor Locations, Above Grade: RMC.

C. Underground Installations:

1. More than 5-feet from Foundation Wall: PVC Schedule 40 RNC
2. Within 5-feet from Foundation Wall: RMC, plastic coated.
3. In or under Slab on Grade: PVC Schedule 40 RNC.
4. Under roadways and within 5-feet of roadways: Schedule 80 RNC.

D. Wet and Damp Locations: RMC.

E. Dry Locations:

1. Exposed: EMT.
2. Concealed in Walls or Ceilings: EMT.

F. Connection to Vibrating Equipment: FMC; except in wet or damp locations use LFMC.

3.6 RACEWAY INSTALLATION

A. Install raceways in accordance with NECA "Standard of Installation" and manufacturer's recommendations.

B. Route exposed raceways parallel and perpendicular to walls.

C. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

D. Run raceway plumb, level, and in a direct line, with long sweeping bends and offsets. Make changes in direction of raceway with symmetrical bends or metal fittings.

E. Keep legs of raceway bends in the same plane and keep straight legs of offsets parallel.

F. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104^0F.

G. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes and cast boxes in damp and wet locations.

H. Install no more than equivalent of four 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction.

I. Seal wall and roof penetrations weathertight.

J. Grout around conduit tie-ins entering building walls. Where conduit enters buildings, seal openings with duct seal to prevent circulation of air or moisture.

K. Transition from underground RNC to above grade RMC or EMT below slab with a rigid PVC coated conduit elbow.

L. Underground Conduit:

1. Install minimum depth to top of underground conduit in accordance with NEC unless otherwise indicated.
2. Install underground conduit with watertight joints.

3.7 WIRE AND CABLE METHODS

A. Conductor Size:

1. Meet requirements of NFPA 70 or the sizes shown on the drawings if larger. Use no wire smaller than No. 12 AWG for power and lighting circuits, and no smaller than No. 16 AWG for control wiring.
2. Use No. 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet.

B. Wire and Cable Application: Use wiring and cabling methods specified below to the extent permitted by applicable codes.

1. Concealed Interior Feeders and Branch Circuits: AC, MC, or MI cable.
2. Exposed Interior Locations: Building wire in raceways.
3. Exposed, Above Accessible Ceilings, in Attic, or Crawlspaces: AC, MC, or MI cable.
4. Wet or Damp Interior Locations: Building wire in raceways.
5. Exterior Locations: Building wire in raceways.

3.8 WIRE AND CABLE INSTALLATION

A. Taps and Splices:

1. Permitted only in junction or outlet boxes.
2. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

B. Place an equal number of conductors for each phase of a circuit in same raceway or cable. Pull all conductors into a raceway at the same time.

C. Cable Installation:

1. Do not use cable as flexible connection to motors or other vibrating equipment.
2. Run concealed cable parallel and perpendicular to building elements at right angles. Run parallel cable runs together. Run high and tight to structure.
3. Support cable every four feet and within 12 inches of every outlet box, junction box, cabinet, of fitting.

3.9 GROUNDING

A. Size and install grounding system and grounding electrode conductors in accordance with NEC.

B. Ground the electrical service system neutral at service entrance equipment to metallic cold water service, concrete encased electrode, building steel and to supplementary grounding electrodes.

C. Make exothermic welded connections where grounding conductors connect to underground grounding conductors and to underground grounding electrodes, and for bonding to steel. Exothermic weld all underground connections.

D. Provide a corrosion-resistant finish to field connections, buried metallic bonding products, and where factory applied protective coatings have been destroyed, where subject to corrosive action.

E. If other grounding systems are present at or within 50 feet of the building or structure served, bond the systems together with bare copper ground wire, sized to the larger of the two grounding electrode conductor sizes.

F. Install code-sized ground cable bonding jumpers, with ground clamps, across conduit expansion couplings and fittings.

G. Route grounding connections, conductors to ground, and grounding conductors to protective devices in the shortest and straightest paths possible to minimize transient voltage rises.

H. Install equipment-grounding conductor in feeder and branch circuits. Route to switches, receptacles, equipment enclosures, equipment, and panels. Ground as required by NEC. Terminate each ground conductor to the bushing and ground lug.

I. Install an equipment-grounding conductor in non-metallic and flexible metallic conduits.

J. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

K. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Equipment Grounding Conductor Terminations:

    a. No. 8 AWG and larger: Use pressure-type, such as setscrew or hydraulic compression, grounding lugs.
    b. No. 10 AWG and smaller: Terminate with winged pressure-type connectors.

2. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings

with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exists with grounding bushings and bare grounding conductors, unless otherwise indicated.

3. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Use values specified in UL 486A if manufacturer's torque values are not indicated.
4. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.10 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Use hot-dip galvanized materials or nonmetallic, slotted channel system components.

B. Dry Locations: Use steel materials.

C. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb minimum design load for each support element.

D. Clean cuts and welds. Coat unpainted surfaces with cold application zinc galvanizing. Coat cuts and welds on painted surfaces with zinc chromate primer and finish to match existing paint.

3.11 SUPPORT INSTALLATION

A. Arrange supports to prevent misalignment during wiring installation.

B. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

C. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps except use spring-steel fasteners for 1-1/2-inch and smaller single raceways above suspended ceilings and for fastening raceways to slotted channel and angle supports.

D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves during erection of concrete and masonry walls.

E. Do not support conduit with wire or perforated pipe straps. Do not attach conduit or supports to ceiling support wires.

F. Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:

1. Wood: Wood screws or screw-type nails.

2. Gypsum Board: Toggle bolts. Seal around sleeves with joint compound, both sides of wall.
3. Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.
4. Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.

3.12 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Nameplates: Identify panels, motor starters, control points, and disconnect switches.

E. Wire Markers: Install at each end of each wire interconnecting between such items as control panels, sensors, and control devices. Wire markers shall correspond to control wire numbers on schematic diagrams.

3.13 WIRING DEVICES

A. Mounting heights to centerline of outlet box or receptacle:

1. Receptacles: 18 inches above floor or ground, except as specified below.

a. Above Counters: 4 inches above countertops or backsplashes.

B. Remove fiber washers on mounting screws before installing device.

3.14 CIRCUIT BREAKERS

A. Field verify panel prior to ordering circuit breakers.

B. Install filler plates in unused protective device spaces.

C. Label panel directory with circuit number and equipment served.

END OF SECTION 260500

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SECTION 311100
CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

A. This work consists of clearing, grubbing, trimming, removing, and disposing of, or treatment of, live and dead timber, construction slash, and debris. Included is the protection from injury or defacement of vegetation and other objects designated to remain and treatment or removal of damaged trees

B. Included are areas associated with installing wastewater and underground electrical systems, and other areas indicated to be graded.

1.2 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions. Information required may also be included in Division 1 Section "General Requirements."

1.3 QUALITY ASSURANCE

A. Preconstruction Conference: Conduct conference at Project site as directed by Owner's Representative prior to start of construction. Contractor to comply with requirements, which may also be included in Division 1 Section "General Requirements."

1.4 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from the Government and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Protect improvements on the Government's property.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

F. Restore damaged improvements to their original condition, as acceptable to the Government.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks, survey control points, monuments, property line pins and other reference points from disturbance during construction. If disturbed or destroyed, restore or replace at no cost to Owner.

B. Provide erosion control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust from leaving project site.

C. Locate and clearly flag trees and vegetation to remain or to be relocated.

D. Protect existing site improvements to remain from damage during construction.
   1. Restore or replace damaged improvements to their original condition, as acceptable to Owner.

3.2 CLEARING

A. Clearing Limits:

   1. Utility Trenches: Width of clearing shall not exceed 15 feet unless otherwise agreed to by the Contracting Officer or as designated on the drawings.
   2. Areas to be graded: 2 feet past the intersection of the existing ground with the cut slope and to the toe of fill as applicable.

B. Remove trees, down timber, snags, underbrush, rubbish, and other objectionable materials within the clearing limits.

C. Leave individual marked trees, within the clearing limits, standing and uninjured.

D. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking, or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.

E. Provide temporary guards to protect trees and vegetation to be left standing.

F. Coordinate cutting and removal of trees, limbs, or branches with the Contracting Officer.

G. Disposal solvents, oils, and other material, which may be harmful to plant life, in containers and remove from the site. At the completion of the work, remove contaminated soil and replace with topsoil.

H. Fell trees into areas being cleared when ground conditions, tree lean, and shape of clearing permit. Use controlled felling to ensure the direction of fall to prevent damage to property, structures, trees designated to remain, or traffic.

I. Deck sound logs that exceed 8 feet in length and 4 inches in diameter at the small end and are capable of being skidded by chokers or tongs, at location designated by the Contracting Officer.

J. Treat material smaller than described above as slash and dispose.

K. Felling, cutting, and trimming methods shall not cause bark damage to standing timber.

L. Fell and dispose trees with major roots exposed by construction that are rendered unstable.

3.3 GRUBBING

A. Grub, remove, and dispose all debris, stumps, roots and other protruding vegetative material within the clearing limits, not designated to remain, except the following:

1. System Mains, Service Laterals, and Absorption Fields: Inside the clearing limits, cut stumps and projecting roots flush with the natural ground.
2. When grubbing for areas to be landscape graded; grub and remove all stumps inside the clearing limits. Grub and remove all roots to a depth of at least 6 inches below the natural ground when fill is required for site grading. When excavation is required for site grading, grub and remove all roots to a depth of at least 6 inches below finished grade.
3. Stumps, roots, and material developed in grubbing operations shall be removed from National Forest lands.

3.4 UTILIZATION OF TIMBER

A. Felling and Bucking: Minimize damage to remaining trees outside of clearing limits. Utilize saws or shears unless otherwise coordinated with the Contracting Officer.

B. Utilization and Removal of Timber: Deck sound logs parallel one to the other in a manner that will not damage standing trees and so logs will not roll. Install decks free of brush and soil.

3.5 SLASH TREATMENT

A. Treatment Methods:

1. Chipping: Process construction slash, up to 4 inches in diameter, through a chipping machine. Deposit chips on site, in designated area, to a loose depth not exceeding 6 inches.
2. Removal: Haul construction slash to a certified landfill.

B. Do not deposit construction slash in lakes, meadows, streams, or streambeds. Immediately remove construction slash that interferes with drainage structures.

END OF SECTION 311100

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SECTION 312250
EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes excavation, dewatering, subgrade preparation, backfilling, and grading for surface and subsurface improvements.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Course placed between the subbase course and surface course or hot-mix asphalt paving.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

   1. Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by CO. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction of the CO. Unauthorized excavation, as well as remedial work directed by CO, shall be without additional compensation.
   4. Unclassified Excavation: Excavation to subgrade elevation and to lines and dimensions indicated regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
   5. Rock Excavation: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 2.5 cubic yards that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting when permitted:

1. Excavation of Footings, Trenches, and Pits: Track-mounted hydraulic excavator; equipped with a 30-inch wide, short-tip-radius rock bucket; rated at not less than 120-hp flywheel power with bucket-curling force of not less than 25,000 lbf and stick-crowd force of not less than 18,700 lbf; measured according to SAE J-1179.
2. Bulk Excavation: Track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 45,000-lbf breakout force; measured according to SAE J-732.

F. Fill: Soil materials used to raise existing grades.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, aggregate base, drainage fill, initial or subsequent backfill materials.

1.3 SUBMITTALS

A. As specified in Division 1 Section "General Requirements" submittal procedures.

1. Submit source of aggregate and backfill materials and certified sieve analysis.
2. If materials are obtained from a commercial source, submit certification from the supplier certifying that materials meet the requirements of this section.
3. Submit all Material and Compaction Test results directly to Contracting Officer (CO) from testing services, with copy to Contractor

B. Closeout Submittals: As specified in Division 1 Section "General Requirements" closeout procedures.

1. Field quality test reports.

1.4 PROJECT CONDITIONS

A. Existing Utilities: Locations, sizes and depths, or invert elevations of existing utilities, as shown on the drawings, are believed to be correct but may not be absolutely so. Such information is therefore presented only as approximations and should be verified prior to construction. Protect from damage any sewer, water, gas, electric, phone, or other pipe lines or conduits uncovered during the work until they have been examined by the Contracting Officer. If such lines are found to be abandoned and not in use, remove affected sections without extra cost. If such lines are found to be in use, carefully protect and carry on work around them. If the Contracting Officer deems it advisable to move such lines, the Government will pay cost of moving. Do not interrupt utilities serving facilities occupied by the Government or others unless permitted in writing by the Contracting Officer and then only after arranging to provide temporary utility services according to requirements indicated.

1. Contact utility-locator service for area where project is located before excavating.
2. Notify the Contracting Officer not less than two days in advance of proposed utility interruptions.
3. Do not proceed with utility interruptions without the Contracting Officer's written permission.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

C. Existing Contours and Elevations: Contours and spot elevations of existing ground elevations at the site, and approximate elevations of finish-grade cuts, fills, and excavations for the work are shown on the drawings. Contours and elevations for existing ground lines are believed to be correct, but may not be absolutely so. Existing contours and elevations should therefore be considered approximate and should be verified at the site prior to construction.

D. Verification of Existing Conditions: Visit the site prior to submission of bids. Verify existing conditions, elevations, and contours. In the event of discrepancies between existing conditions and those indicated on the contract documents or survey, contact the Contracting Officer for clarification.

E. Existing Benchmarks: Carefully preserve and maintain existing benchmarks, monuments, property line pins, and other reference points. if disturbed or destroyed, restore or replace by a professional land surveyor at no additional cost to the Government.

F. Frost Protection: When freezing temperatures may be expected, do not excavate to the full depth indicated unless the footing or slabs are to be poured immediately after the excavation has been completed. If placing of concrete is delayed, protect the bottoms of excavations from frost until concrete is placed.

1.5 QUALITY ASSURANCE

A. Conduct compaction tests as necessary to monitor the installation procedure and assure the quality of the work. Material Test and Compaction Test to be the responsibility of the Contractor.

B. Perform all trench excavation in accordance with minimum requirements of OSHA Regulations. Provide shoring, bracing and tight sheeting to prevent caving and to protect workers in accordance with OSHA requirements and to protect adjacent property and structures.

C. Direct dewatering operations to natural drainages or storm sewers as appropriate. Perform discharge from dewatering operations in accordance with rules and

regulations established by the Colorado Department of Public Health and Environment.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS, GENERAL

A. Excavated material may be processed and used for backfill if the Contractor can show compliance with the material specified herein. Import material if excavated material is not sufficient to meet requirements.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 6 inches in any dimension, debris, waste frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

2.2 INITIAL BACKFILL

A. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1 inch sieve and not more than 8 percent passing a No. 200 sieve. Excavated material may be used if approved by the Contracting Officer.

2.3 SUBSEQUENT BACKFILL

A. Excavated material or borrow material, free from rock larger than 6 inches in the greatest dimension, frozen material, clods, debris, or organic material. Borrow material used as subsequent backfill shall have a gradation and character suitable to achieve the compaction specified in this Section.

2.4 AGGREGATE

A. Clean, hard, durable angular fragments or particles of crushed stone, crushed slag, or crushed or natural gravel. Materials that break up due to freeze-thaw or wet-dry cycling shall not be used.

B. Material shall meet the requirements shown in the table below:

SIEVE DESIGNATION	PERCENT PASSING
¼ inch	100
No. 8	53-83
No. 16	33-53
No. 40	20-40

C. Installed aggregate at surface shall be ABA compliant.

2.5 PEA GRAVEL

A. Material shall meet the requirements shown in the table below:

SIEVE DESIGNATION	PERCENT PASSING
1/2 inch	100
3/8 inch	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5
No. 200	<1

2.6 SHEETING AND SHORING

A. Timber or metal members to provide adequate support of the soils.

PART 3 - EXECUTION

3.1 LOCATION, ALIGNMENT AND GRADE

A. Stake and establish grades for the location of septic tanks. Review locations with the CO before excavation is started.

3.2 PREPARATION

A. Protect existing structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Cold Weather Work: Prevent frost from entering bearing stratus upon which construction will take place or in areas where fill will be placed in that season.

3.3 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

C. Protection of Persons and Property:

1. Provide all necessary measures to protect workmen and passersby. Barricade open excavations occurring as part of the work, as required by municipal or other authorities having jurisdiction.
2. Protect adjacent streets, roadways, and properties throughout the entire operation. Protect newly graded areas from destruction by weather or runoff. Protect structures, utilities, sidewalks, pavements, and other improvements from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

3.4 EXPLOSIVES

A. Do not use explosives.

3.5 EXCAVATION, GENERAL

A. Unclassified Excavation: All excavation (other than rock excavation) is considered as unclassified and is defined as removal of all material encountered, regardless of soil type. Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include soil materials, and obstructions. Unclassified excavation is considered normal excavation and no extra costs will be allowed.

B. Exposed areas which will receive fill once properly cleaned, shall be scarified to a minimum depth of 8 inches, conditioned to near optimum moisture content, and compacted.

C. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

D. Maintain the excavations to guard against and prevent injury to employees and the public. Provide adequate shoring and bracing as required by OSHA and other local governing regulations.

E. Fence excavations left open at the end of the working day to protect the public.

F. Unanticipated Conditions: Notify the Contracting Officer immediately upon finding evidence of previous structures or filled materials which penetrate below designated excavation levels, groundwater or water-bearing strata, or other conditions which are not shown, or which cannot be reasonably assumed from existing surveys and geotechnical reports. Secure the Contracting Officer's instruction before proceeding with further work in such areas.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Refer to Division 31, Section "Trenching and Backfilling," for excavating and backfilling of utilities.

3.7 EXCAVATION FOR SEPTIC TANKS

A. Excavate to elevations and dimensions indicated within a tolerance of plus or minus one (1) inch. Do not disturb bottom of excavations intended for bearing surface.

B. Clearance: 12 inches each side of the tank.

3.8 APPROVAL OF SUBGRADE

A. Notify CO when excavations have reached required subgrade.

B. If CO determines that unsatisfactory soil is present, continue excavation and replace with initial backfill material as directed.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by CO.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation as directed by CO.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile, borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below-finish-grade, including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for record documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring and bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
   8. Acceptance of subgrade by the Geotechnical Engineer.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Refer to Division 31, Section “Trenching and Backfilling,” for excavating and backfilling of utilities.

3.13 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact subsequent backfill material in layers to required elevations.

D. Backfill and compact above chambers using tracked equipment only

3.14 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to optimum or to 3 percent over optimum moisture content for clay soils, or within 2 percent of optimum moisture content for granular soils.

   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact material with the following methods and techniques appropriate to type of soil. Compaction shall be witnessed by the Contracting Officer. Provide 72 hours notification prior to compaction.

D. Fill:
   1. Compact with mechanical impact tampers, plate tampers, vibrating pad foot rollers, rubber tire rollers, other suitable compaction equipment, or equipment travel:
      a. Uniformly distribute equipment passes.
      b. Perform a minimum of 3 passes after each layer.
      c. Compact in horizontal layers to compacted thickness of 6 inches or less.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

   1. Provide a smooth transition between adjacent existing grades and new grades.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

   1. Lawn or Unpaved Areas: Plus or minus 1 inch.

C. Finishing Slopes: Finished slopes shall conform reasonably to the lines staked on the ground or shown on the drawings. The finished slope shall be left in a roughened condition to facilitate the establishment of vegetative growth. The finish associated with template and stringline or hand-raking methods will not be allowed.

3.17 AGGREGATE

A. Place aggregate surface, subbase, and base course(s) on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, the maximum compacted thickness of any one layer will not exceed 6 inches.

C. Compact each layer according to Section 3.15, D.

3.18 FIELD QUALITY CONTROL

A. Notify Contracting Officer at least 48 hours before inspection or testing. Perform test in the presence of the Contracting Officer. Prepare reports for each test, signed by Testing Agency.

B. Inspections: Obtain Contracting Officer's approval after each inspection prior to proceeding with work.
   1. Perform inspection of subgrade prior to placing fill or backfill.
   2. Perform inspection after each compaction of fill and backfill layer.
   3. Perform inspection after each compaction of aggregate layer.

C. When inspection reports indicate that fills or backfills have not achieved compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and reinspect until specified compaction is obtained.

D. Excessive settlement or other evidence of improper backfill shall be corrected by reopening the excavation to the depth required for proper compaction and then shall be refilled and satisfactorily compacted.

E. The correction and retesting of unacceptable work shall be paid by the Contractor at no expense to the Government.

F. The CO may reduce the testing frequency contingent upon the uniformity of material at the project site, compactive effort put forward by the Contractor, and previous test results for similar materials and compactive effort.

3.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specify tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

   1. Scarify or remove and replace soil material to depth as directed by CO, reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.20 SURFACE FINISH

A. In unpaved areas, surface finish shall be subsequent backfill to elevations shown on drawings.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Dispose surplus satisfactory soil at location designated by the Contracting Officer. Dispose waste material, including unsatisfactory soil, trash, and debris, off Government property.

END OF SECTION 312250

SECTION 312317
TRENCHING, BEDDING, AND BACKFILL FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. The work in this Section includes excavation, dewatering, preparation of the trench bottom, supply and installation of bedding and backfill materials; and disposal of waste material for the installation of utilities and related appurtenances.

1.2 QUALITY ASSURANCE

A. Conduct compaction tests as necessary to monitor the installation procedure and assure the quality of the work. Material Test and Compaction Test to be the responsibility of the Contractor.

B. Perform all trench excavation in accordance with minimum requirements of OSHA Regulations. Provide shoring, bracing and tight sheeting to prevent caving and to protect workers in accordance with OSHA requirements and to protect adjacent property and structures.

C. Direct dewatering operations to natural drainages or storm sewers as appropriate. Perform discharge from dewatering operations in accordance with rules and regulations established by the Colorado Department of Public Health and Environment.

1.3 SUBMITTALS

A. As specified in Division 1 Section, “General Requirements” submittal procedures.

1. Submit the source of bedding and backfill materials and certified sieve analysis.
2. Product Data: Provide manufacturer’s literature for the following:

    a. Warning tape.
    b. Tracer wire system.

B. Closeout Submittals: As specified in Division 1 Section, “General Requirements” closeout procedures.

1. Field quality test reports.

1.4 PROJECT CONDITIONS

A. The type, size and location of known underground utilities have been shown on the drawings; however, no guarantee is made as to the true location of such utilities.

B. Verify the existence and location of all underground utilities at the project site. Notify 'One-Call' at 811 at least three business days prior to any excavation work so local utility companies can locate their lines.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Locations, sizes and depths, or invert elevations of existing utilities, as shown on the drawings, are believed to be correct but may not be absolutely so. Such information is therefore presented only as approximations and should be verified prior to construction. Protect from damage any sewer, water, gas, electric, phone, or other pipe lines or conduits uncovered during the work until they have been examined by the Contracting Officer. If such lines are found to be abandoned and not in use, remove affected sections without extra cost. If such lines are found to be in use, carefully protect and carry on work around them. If the Contracting Officer deems it advisable to move such lines, the Government will pay cost of moving. Do not interrupt utilities serving facilities occupied by the Government or others unless permitted in writing by the Contracting Officer and then only after arranging to provide temporary utility services according to requirements indicated.

1. Contact utility-locator service for area where project is located before excavating.
2. Notify the Contracting Officer not less than two days in advance of proposed utility interruptions.
3. Do not proceed with utility interruptions without the Contracting Officer's written permission.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

C. Existing Contours and Elevations: Contours and spot elevations of existing ground elevations at the site, and approximate elevations of finish-grade cuts, fills, and excavations for the work are shown on the drawings. Contours and elevations for existing ground lines are believed to be correct, but may not be absolutely so. Existing contours and elevations should therefore be considered approximate and should be verified at the site prior to construction.

D. Verification of Existing Conditions: Visit the site prior to submission of bids. Verify existing conditions, elevations, and contours. In the event of discrepancies between existing conditions and those indicated on the contract documents or survey, contact the Contracting Officer for clarification.

E. Existing Benchmarks: Carefully preserve and maintain existing benchmarks, monuments, property line pins, and other reference points. if disturbed or destroyed, restore or replace by a professional land surveyor at no additional cost to the Government.

F. Frost Protection: When freezing temperatures may be expected, do not excavate to the full depth indicated unless the footing or slabs are to be poured immediately after the excavation has been completed. If placing of concrete is delayed, protect the bottoms of excavations from frost until concrete is placed.

1.6 DEFINITIONS

A. Bedding: Layer placed over the excavated subgrade in a trench before laying pipe.

B. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Subsequent Backfill: Backfill placed over initial backfill to fill a trench.

C. Borrow: Satisfactory soil imported off-site for fill or backfill.

D. Unclassified excavation: Excavation and disposal of all material encountered in the work, including excavation obtained from borrow source.

E. Rock excavation: Removal and disposal of igneous, metamorphic, and sedimentary rock which cannot be excavated without blasting or using rippers, and all boulders or other detached stones each having a volume of one-half cubic yard or more.

F. Muck excavation: Removal and disposal of saturated organic mixtures of soils or organic matter which requires additional work or equipment which would not normally be required for unclassified excavation.

PART 2 - PRODUCTS

2.1 BEDDING

A. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, except with 100 percent passing a ½-inch sieve and not more than 8 percent passing a No. 200 sieve. On site materials may be used.

2.2 BACKFILL AND FILL

A. Excavated material may be processed and used for backfill if compliance with the material specified herein can be documented. Provide documentation to the Contracting Officer for review. Import material if excavated material is not sufficient to meet requirements.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols, free of rock or gravel larger than 3

inches in any dimension, debris, waste frozen materials, vegetation, and other deleterious matter.

C. Initial Backfill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, except with 100 percent passing a ½- inch sieve and not more than 8 percent passing a No. 200 sieve. On site materials may be used.

D. Subsequent Backfill: Excavated material or borrow material, free from rock larger than 6 inches in the greatest dimension, frozen material, clods, debris, or organic material. Borrow material used as subsequent backfill shall have a gradation and character suitable to achieve the compaction specified in this Section.

2.3 WARNING TAPE

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 3 inches wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep, colored as follows:

1. Red: Electric.
2. Blue: Water systems.
3. Yellow: Propane.
4. Green: Sanitary Sewerage.

2.4 TRACER WIRE SYSTEM

A. Tracer Wire: #12 AWG copper clad steel with minimum 450 lb. break load, 30 ml HDPE insulation intended for direct bury. Color coat insulation per APWA standard for the specific utility being marked.

B. Connectors: Direct bury, dielectric silicon filled or split bolt, lock type wire connectors manufactured for use in underground tracer wire installation.

C. Terminations and Test Stations: Grade level, in ground, access box with lockable, cast iron or encapsulated magnet type, anti-corrosion lid. Provide light duty, adjustable type boxes for non-roadway applications and roadway boxes for boxes in roads and shoulders.

D. Ground Rod: Magnesium anode, drive-in type, 1.0 lb. minimum, rod with factory installed insulated, copper clad steel tracer wire and connector.

PART 3 - EXECUTION

3.1 ALIGNMENT AND GRADE

A. Stake out and establish grades for the location of pipelines and utility structures. Obtain Contracting Officer approval before starting excavation.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 SHEETING AND SHORING

A. Provide adequate shoring and bracing as required by OSHA and other local governing regulations.

B. Support excavations and sides of trenches with adequate materials as necessary for the safety of personnel and protection of the utility before backfilling.

C. Install and remove all sheeting, shoring, piling, and bracing to maintain the required trench or excavated section, and to maintain the undisturbed state of the soils at and below the bottom of the excavation.

D. Withdraw sheet piling and timbers in trench excavations in such a manner as to prevent subsequent settlement of the pipe or additional backfill loadings which might overload the pipe.

E. Remove all sheeting and shoring when safe to do so.

3.4 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.5 EXPLOSIVES

A. Do not use explosives.

3.6 EXCAVATION, GENERAL

A. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Remove topsoil from the area to be excavated and from the area where excavated material will be piled prior to excavation. Store topsoil as specified below.

C. Maintain the excavations to guard against and prevent injury to employees and the public. Provide adequate shoring and bracing as required by OSHA and other local governing regulations.

D. Fence excavations left open at the end of the working day to protect the public.

E. Notify the Contracting Officer when excavation is completed. Do not place pipe, conduit, bedding or backfill until the excavation is inspected by the Contracting Officer.

F. Notify the Contracting officer when pipe or conduit placement is completed. Do not cover pipe or conduit until pipe or conduit placement has been inspected by the Contracting Officer.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance (General): 6 inches on each side of pipe or conduit.
2. Clearance from other utilities: 12 inches on each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Pipes and conduit less than 6 inches in nominal diameter: Hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. Pipes and conduit 6 inches or larger in nominal diameter: Shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped initial bedding course.
3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for initial bedding course.

3.8 FIELD QUALITY CONTROL

A. Notify Contracting Officer at least 48 hours before testing. Perform tests in the presence of the Contracting Officer. Prepare reports for each test, signed by Testing Agency.

B. Inspections: Obtain Contracting Officer's approval after each inspection prior to proceeding with work.
   1. Perform inspection of trench prior to installing bedding.
   2. Perform inspection after each compaction of bedding and backfill.

C. When inspection reports indicate that fills or backfills have not achieved compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and reinspect until specified compaction is obtained.

D. Correct excessive settlement or other evidence of improper backfill by reopening the trench or excavation to the depth required for proper compaction. Refill, compact, and retest.

E. Test tracer wire:

   1. Locate tracer wire installation using low frequency, 512 Hz, line testing equipment.

F. Pay for the correction and retesting of unacceptable work at no expense to the Government.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

B. Keep topsoil separate from trench-excavated material by stockpiling. Reuse topsoil after backfilling.

3.10 UTILITY TRENCH BACKFILL

A. Place bedding material on trench bottoms by hand and tamp to the density specified. Install bedding to the full width of the trench bottom to a minimum depth of 6 inches. Shape initial bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Carefully compact bedding under pipe haunches

B. After individual pipe is jointed, place initial backfill material by hand along each side of the pipe to offset conditions that might tend to move the pipe off line and grade. Place backfill to prevent pipe movement under pressure tests. Tamp backfill to the density specified. Compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Keep all joints, valves, etc., uncovered for inspection purposes during testing.

C. Do not complete backfill until pressure and leakage tests have been performed and the pipeline installation is approved by the Contracting Officer. Place and compact initial backfill to a height of 12 inches over the utility pipe or conduit. Place initial backfill and bedding in layers not to exceed 4 inches in loose depth.

D. Place and compact subsequent backfill to final subgrade in layers not to exceed twelve inches in loose depth. Compact each layer as specified in this section. Do not place large rock remaining in the backfill material and approved by the Contracting Officer within three feet of the pipe.

E. Fill voids with backfill materials while shoring and bracing, and as sheeting is removed.

F. Install warning tape 12 inches directly above utilities.

G. Place 6 inches of topsoil as final backfill in trench areas where this material had been previously stripped and stockpiled. Compact topsoil layer to remain in place but remain loose enough to allow plant growth.

3.11 TRACER WIRE INSTALLATION

A. Install tracer wire system in trenches where water, sewer, or gas lines are the only utility located in the trench.

B. Install tracer wire no further than 6 inches from the pipe and where possible directly above the pipe.

C. Install tracer wire system as a continuous wire with no looping or coiling. Use manufacturer recommended connectors where connections are required. Interconnect tracer wire at tees and crosses using 3-way or 4-way connectors. Wrap connectors and exposed wire with electrical tape.

D. Provide access boxes on service laterals and stubs and at 500 foot intervals on lines without service laterals or stubs.

1. Locate access box directly above the utility.
2. Terminate tracer wire in box and provide a minimum of 2 feet of excess wire after setting access box at final grade.

E. Grounding: Ground tracer wire at deadends, stubs, valves, or curb stops. Trim wire to appropriate length before connecting wire. Connect ground rod to the tracer wire using manufacturer recommended connectors. Where anode wire is connected to tracer wire access box, provide a minimum of 2 feet of slack after meeting final elevation.

F. Install warning tape 12-inches above the pipe.

3.12 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to optimum or to 3 percent over optimum moisture content for clay soils, or within 2 percent of optimum moisture content for granular soils.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF BACKFILLS AND FILLS

A. Compact material with the following methods and techniques appropriate to type of soil. Compaction shall be witnessed by the Contracting Officer. Provide 72 hours notification prior to compaction.

B. Perform minimum of 3 passes with vibratory equipment after installing each of the following at trenches and pullboxes:
1. Bedding
2. Initial backfill: Each 6-inch lift.
3. Subsequent bedding and backfill: Each 12-inch lift.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Dispose surplus satisfactory soil at location designated by the Contracting Officer. Dispose waste material, including unsatisfactory soil, trash, and debris, off Government property.

END OF SECTION 312317

SECTION 312500
TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. The work of this section consists of furnishing, installing, maintaining, and removal of temporary erosion and sedimentation controls.

B. Permits and Fees: Obtain and pay for all permits and fees required for the work of this section, including erosion and sediment control and water quality permits required by the Colorado Department of Public Health and Environment, Water Quality Control Division.

C. Erosion Control: Provide erosion control on all exposed surfaces created by construction activities.

1.2 SUBMITTALS

A. As specified in Division 01 Section "General Requirements" submittal procedures.

1. Storm Water Management Plan:

   a. Provide a Storm Water Management Plan (SWMP) and report addressing erosion and sediment control measures for all sites with over one acre of disturbed ground.
   b. Obtain all required permits including a General Permit application for Storm Water Discharges associated with construction activities at least ten (10) days prior to start of construction. Permits are to be filed with the Colorado Department of Public Health and Environment, Water Quality Control Division.
   c. Contractor shall have the Storm Water Management Plan (SWMP) and report available on-site at all times.

2. Produce Data Sheets: Provide product data sheets for all materials listed in Section 2.1.

1.3 QUALITY ASSURANCE:

A. Regulatory Requirements: Comply with applicable local, State and Federal ordinances, rules and regulations concerning sedimentation control and storm water runoff.

B. In case of conflict between the above codes, regulations, references, standards and these specifications, the more stringent requirements shall govern.

C. Preconstruction Conference: Conduct conference at Project site as directed by Contracting Officer prior to start of construction.

1.4 PROJECT/SITE CONDITIONS

A. Existing Conditions: Verify all existing conditions affecting the work of this section prior to submitting price proposals. Additional compensation will not be allowed for revisions or modification of work resulting from failure to verify existing conditions.

1.5 WARRANTY

A. Maintain Temporary Erosion and Sediment Control measures until permanent measures are in place. Correct all damaged, disturbed or devices filled with sediment, which occurs within the project warranty period at no cost to the Government. Restore any devices damaged by erosion or sediment to their original condition at no cost to the Government.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Erosion and Sedimentation Control Materials: Provide one or more of the following materials, as shown on the plans or as applicable for site conditions:

1. Sand bags.
2. Clean, seed-free, certified, cereal hay or grain straw bales.
3. Silt fences.
4. Rock riprap.
5. Temporary seeding.
6. Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh.
7. Biodegradable twisted jute or spun-coir mesh, 0.92 lb/sy minimum, with 50 to 65 percent open area.
8. Drainage geotextile.
9. Impervious fill.
10. Other materials proposed for use on-site.

PART 3 – EXECUTION

3.1 PREPARATION

A. General: Determine the existing ground elevations, drainage patterns, and changes to such patterns during excavation in order to satisfactorily plan and provide materials for adequate erosion and sediment control devices.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and rights-of-way according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

D. Secure grading permit from agency have jurisdiction prior to commencing grading operations.

3.3 EXAMINATION

A. Examine areas and conditions under which the work of this section will be performed. Do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

3.4 INSTALLATION

A. Erosion and Sedimentation Control Devices. Erosion and sedimentation control measures to be taken during construction include, but are not necessarily limited to the following:

1. Apply soil stabilization within 14 days to all disturbed areas that are to be dormant for a period longer than 30 calendar days after reaching grade. Stabilize soil with mulch anchored per criteria of authorities having jurisdiction. Temporarily revegetate areas that will remain in an interim condition for more than three months.
2. Roads and parking areas indicated to be paved may be covered with an appropriate aggregate base course in lieu of mulch. Temporary mulching or aggregate base course is not required if final pavement construction will take place within 30 days after grading to final contours.
3. Soils that will be stockpiled for more than 30 days must be mulched and seeded within 14 days after stockpile construction.
4. Prevent sediment from leaving the project site by installing a silt fence or other Best Management Practices (BMPs) as indicated on the plans. Protect existing storm inlets adjacent to the site by an approved gravel filter.
5. Hay bales may be used at specific locations to provide temporary filtration of sediment from runoff.
6. Provide temporary erosion controls consisting of berms at the top of slopes and interceptor ditches at ends of berms and at those locations which will eliminate or minimize erosion during construction, along with temporary seeding, temporary diversion, chutes, and down pipes and lining of water courses.

7. Temporary sedimentation controls shall consist of silt dams, traps, silt fence, barriers, and appurtenances at the top of spoil and borrow area slopes and where runoff water exits the site.
8. Maintain the available silt holding capacity of silt dams, fence traps and barriers until no longer needed. The sediment capacity of sediment retainage areas shall be at a minimum, the capacity shown on the plans in conformance with Urban Drainage Criteria Manual, Volume 3. Prior to removal, obtain concurrence of the Contracting Officer.
9. Remove accumulated sediment and debris from a Best Management Practice (BMP) when the sediment level reaches one-half the height of the BMP, or at any time the sediment or debris adversely impacts the functioning of the BMP.
10. Remove hay bales which have deteriorated and filter stone or cloth which has become dislodged. Place new hay bales and new filter and fence.
11. The erosion/sediment control plan shows the minimum required for the project. If it becomes apparent that additional controls are necessary, the Contractor shall install additional controls.

B. Chemicals and Pollutants:

1. Store construction materials and chemicals that could contribute pollutants to the runoff within an enclosure, container, or dike located around the perimeter of the storage area, to prevent discharge of these materials into runoff from the construction site.
2. Locate areas used for collection and temporary storage of solid and liquid waste away from the storm drainage system. Provide covering or fencing as required to prevent windblown materials; construct perimeter dike to contain liquid runoff. These measures may not be necessary if materials are immediately placed in covered waste containers.
3. Perform equipment maintenance in designated areas using measures such as drip pans to control petroleum products spillage.
4. Immediately clean up and properly dispose of spills of construction related materials such as paints, solvents, or other chemicals.

C. Final Stabilization and Long-Term Management:

1. Final stabilization shall be achieved through permanent vegetation and landscaping after construction of all buildings and paved surfaces.
2. With approval of Contracting Officer temporary erosion and sediment control measures may be removed within 30 days after final site stabilization is achieved or after temporary measures are no longer needed.

D. Inspection and Maintenance: Inspect erosion and sediment control measures weekly during construction. In addition, inspect all facilities immediately after any significant runoff or snowmelt which results in runoff. Repair or otherwise mitigate any damage to the erosion and sediment control facilities at no additional cost to the Government.

3.5 CLEANING

A. Removal of Controls: Remove controls upon completion of that portion of the work for which controls were furnished. Leave the site and work area in a clean condition.

END OF SECTION 312500

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SECTION 321313
CONCRETE FOR MINOR STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This specification is intended for minor structures such as concrete around valve boxes, curb stops, cleanouts, and other minor areas.

1.2 SUBMITTALS

A. As specified in Division 01 Section, “General Requirements” submittal procedures.

1. Product data for each manufactured material.
2. Design Mixes: For each proposed concrete mix.

PART 2 – PRODUCTS

2.1 PREPACKAGED CONCRETE MIX

A. Material conforming to ASTM C387, Normal Strength Concrete; Normal Weight Concrete.

B. Do not use prepackaged concrete mix where the hardened concrete will be exposed to freeze-thaw conditions unless surface deterioration can be tolerated, as determined by the Contracting Officer (CO).

C. Do not use prepackaged concrete mix where any single placement will be more than one cubic yard.

2.2 COMMERCIAL PLANT CONCRETE

A. 4000 psig minimum compressive strength, meeting as a minimum the requirements of Job-Batched Concrete.

2.3 JOB-BATCHED CONCRETE

A. Aggregates shall be clean, washed materials supplied by a firm regularly engaged in the production of concrete aggregates. Separate stockpiles shall be maintained of sand passing a 3/8-inch sieve and coarse aggregate of 3/4 inch to No. 4 nominal size.

B. Cement: ASTM C150, type II or I.

C. Proportion dry ingredients by volume in the following ratio:

1. Cement: 3 parts.

2. Sand: 5 parts.
3. Coarse aggregate: 7 parts.

D. Add water to obtain a slump of 3-6 inches. Based on the ratio of dry ingredients of 3-5-7, the water will be approximately two parts.

E. The relative proportions of sand and coarse aggregate may be adjusted, upon approval of the CO, if necessary to obtain better workability.

F. Follow ACI 306.1-90 for placement of concrete during cold weather

G. Follow ACI 211.1 for air-entrainment

2.4 FORMS

A. Steel, Wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

B. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 FORM CONSTRUCTION

A. Set forms to require grades and lines, rigidly braced and secured.

B. Install sufficient quantity of forms to allow continuous progress of work so that forms can remain in place at least 24 hours after concrete placement.

C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

A. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials, which reduce or destroy bond with concrete.

B. Place reinforcement to obtain at least minimum coverage's for concrete protection.

1. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations.
2. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

3.4 MIXING OF JOB-BATCHED CONCRETE

A. Thoroughly mix ingredients.

B. Use mechanical mixer if total quantity to be placed is over 8 cubic feet.

3.5 CONCRETE PLACEMENT

A. Thoroughly dampen compacted subgrade before placement.

B. Forms shall be free of debris, and surfaces shall be clean, free of frost, ice, mud, and water.

C. Place in layers to avoid segregation and begin placing at corners of structure.

D. Consolidate with mechanical vibrators or hand tampers.

E. Thoroughly work the external surface to bring mortar against the forms to produce a smooth finish, substantially free of air or water pockets or honeycomb.

3.6 COLD WEATHER

A. Heat or protect concrete, if necessary, to maintain a temperature of more than 35 degrees F for at least 24 hours after placing.

3.7 CURING

A. Keep surfaces moist a minimum of 2 days. Acceptable methods include ponding, wet burlap, wet straw or hay, curing paper, plastic sheets. The CO must approve any other methods.

3.8 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface with screeding and floating. Use hand methods only where mechanical floating is not possible.

B. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Broom finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to the CO.

C. Do not remove forms for 24 hours after concrete has been placed.

D. After form removal, clean ends of joints and point-up any minor honeycombed areas.

E. Remove and replace areas or sections with major defects.

3.9 REPAIRS AND PROTECTIONS

A. Repair or replace broken or defective concrete.

B. Protect concrete from damage until acceptance of work.

1. Exclude traffic from pavement for at least 14 calendar days after placement.
2. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
3. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION 321313

SECTION 329219
SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. This work shall consist of supplying and spreading commercial topsoil or stockpiled on site topsoil, seed and mulch at all disturbed areas. The placement of the topsoil, seed and straw mulch shall be on all disturbed areas including staging sites.

1.2 SUBMITTALS

A. As specified in Division 1 Section, “General Requirements” submittal procedures.

1. Submit signed vendor seed certification.
2. Submit mulch certification.

PART 2 - PRODUCTS

2.1 ON-SITE AND COMMERCIAL MATERIAL

A. Stockpile topsoil stripped from all on-site disturbed areas. Replace on areas to be restored.

B. Topsoil shall consist of loose, friable, free draining, vegetative matter free of clods, stumps, logs, brush, weeds, non-native plants or other material that would be detrimental to the development of native vegetative growth. No rocks greater than 4” shall be in the topsoil and rocks must compose less than 5% of the topsoil material.

2.2 SEED

A. The kinds of grass, legume, and cover crop seed furnished shall be those stipulated in the section 3.6. Seed shall be "certified" or "blue tag".

B. Seed shall be furnished separately or in mixture in standard containers with (1) seed name; (2) lot number; (3) net weight; (4) percentages of purity and of germination ; and (5) percentage of maximum weed seed content clearly marked for each kind of seed. The contractor shall furnish the Contracting Officer duplicate signed copies of a statement by the vendor, certifying that each lot of seed has been tested by a recognized laboratory for seed testing within 6 months of date of delivery. This statement shall include (1) name and address of laboratory, (2) date of test, (3) lot number for each kind of seed, and (4) results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnish, and, in case of a mixture, the proportions of each kind of seed.

C. All seed shall be certified noxious weed free and labels submitted to the Contracting Officer for a record of what products were supplied and placed on the project by the contractor.

2.3 STRAW MULCH

A. Wheat or barley straw to be hand crimped in areas where seed is broadcast.

B. Free of mold or other evidence of decomposition.

C. Certified free from weed seed by Colorado Department of Agriculture.

PART 3 – EXECUTION

3.1 TOPSOIL LOCATIONS

A. All disturbed areas shall receive topsoil and then be seeded.

3.2 STRIPPING

A. Complete clearing and grubbing as applicable.

B. Strip topsoil to 4-inch depth in a manner to prevent intermingling with underlying subsoil or other objectionable material.

C. Remove large roots, stones (over 4” in diameter) and other debris.

3.3 TOPSOIL STOCKPILING

A. The Contractor may stockpile provided the location and method of stockpiling are as shown on the drawings approved by the Contracting Officer. Stockpiling shall employ such protective measures as the Contracting Officer deems feasible to hold segregation, intermixing and waste to a practical minimum. Stockpiles shall be constructed to freely drain surface water. Upon completion of topsoil placement, the stockpile area shall be cleaned and restored to original condition. Excess topsoil shall be wasted upon site in locations approved by the Contracting Officer.

3.4 PLACEMENT OF TOPSOIL

A. Surfaces where topsoil is to be placed shall be at the elevation that will accommodate specified topsoil depth so that the finished surface is at the correct elevation.

B. Disturbed surfaces to receive topsoil shall be ripped and scarified to depth of 6”to 12”. Fill surfaces shall not be compacted on the top 6”.

C. Topsoil shall be deposited and spread to the top 6” of the existing surface and raked smooth. Topsoil depth shall be 6”.

D. Topsoil shall not be compacted and shall be graded to blend with the adjacent ground. Rocks larger than 4” in diameter or other organic material brought to the surface shall be buried.

E. Topsoil shall not be spread when the ground or topsoil is frozen, excessively wet or in a condition detrimental to the work.

F. All roads shall be kept clean during hauling operations. Topsoil or other soil deposited upon the road shall be removed before it becomes compacted by traffic.

3.5 SEEDING SEASONS

A. Seeding season shall consist of all the months of the year (fall preferred) except June, July and August, whenever the ground is free of snow, not frozen or muddy as determined by the Contracting Officer. Seeding materials shall not be applied if wind velocity exceeds 5 MPH or when the ground is excessively wet or frozen. Work shall be performed during each specified seeding season on all completed and previously untreated sections.

3.6 APPLICATION METHODS FOR SEED

A. Material may be placed by the following methods:

1. Drilled Method. Mechanical seed drills or other approved mechanical seeding equipment shall be used to apply the seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.

B. Seed shall be applied at the following rates per Pueblo Water recommended seed mix:

Use Pure Live Seed (PLS)

Species	Variety	Application Rate (PLS lbs/ac)
Western wheatgrass	Arriba, Barton	4.80
Sideoats grama	Niner	2.25
Alkali sacaton	Salado	0.30
Galleta grass (caryopsis)	N/A	0.60
Blue grama	Hachita	0.30

3.7 STRAW MULCH

A. Straw will be hand crimped.
1. Rate: 2 tons per acre uniformly spread

2. Anchor with threader (i.e., tracked vehicle).
3. Operate crosswise to slope.
4. Depth: 3 to 4 inches.
5. Interval: 6 to 12 inches across slope.

3.8 CARE DURING CONSTRUCTION

A. The Contractor shall be responsible for protecting and caring for seeded areas until final acceptance of the work. The Contractor shall repair all damage to seeded areas caused by his construction operations without additional compensation.

END OF SECTION 329219

SECTION 331116
WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes piping and appurtenances for potable-water service outside the buildings and non-potable water service inside the treatment building. This Section also includes flushing, testing, and disinfecting waterlines.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Working Pressures: The following are minimum pressure requirements for POTABLE piping and specialties, unless otherwise indicated:

1. Potable-Water Service: 150 psig.

1.3 SUBMITTALS

A. As specified in Division 1 Section “General Requirements” submittal procedures.
1. Product data which shows compliance with the reference standards for the following:
   a. Pipe and fittings.
   b. Compression couplings for similar and dissimilar pipes (transition couplings).
   c. Mechanical couplings.
   d. Curb Valve and Box.
   e. Operating Tools for Curb Valves.
   f. Method for disposing water used in testing and disinfection of waterlines.
   g. Pressure gauges.
   h. Fire department connection.
   i. Water Meter.
   j. Valves.

B. Closeout Submittals: As specified in Division 1 Section “General Requirements” closeout procedure.
1. Operation and Maintenance Data: Provide for data for curb valves, valves, and water meter.
2. Field quality test reports.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with standards of authorities having jurisdiction for potable water-service piping, including materials, installation, testing, and disinfections.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. NSF Compliance: Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Protect flanges, fittings, and specialties from moisture and dirt.

C. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.

B. Coordinate with other utility work.

PART 2 – PRODUCTS

2.1 GENERAL

A. All waterlines, pipes, and fittings shall be new and unused, of the type, pressure rating or class, and size specified and as shown on the drawings.

2.2 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. Pipe:

1. PE plastic pipe shall be PE-3408 as defined in ASTM D1248, with a minimum cell classification of 345444C in accordance with ASTM D3350. The pipe shall be SDR11, 160 psig minimum pressure rating and comply dimensionally with ASTM D3035.
2. Pipe shall be manufactured in accordance with AWWA C901 for sizes ½" through 3".
3. PE pipe larger that 2" diameter shall be provided in 40-foot lengths rather than rolls.
4. The joining method shall be butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. Butt fusion

equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including but not limited to, temperature requirements, alignment, and fusion pressures. Ribbed steel inserts with stainless steel clamps are not approved for PE pipe.

5. The HDPE pipe shall be Geo-Flo pipe as manufactured by PW Pipe, P.O. Box 10049, Eugene, OR, (541) 343-0200 or Cen Fuse pipe as manufactured by Centennial Plastics LLC, Hastings, NE (866) 851-2227 or equal.

B. Fittings:

1. PE fittings shall be made from material meeting the same requirements as the pipe.
2. Molded fittings shall be manufactured in accordance with either ASTM D2683 for socket fused or ASTM D3261 for butt fused and shall be so marked.
3. All PE fittings shall have the same or higher pressure rating and compositions,
4. HDPE elbows, tees and reducers shall be as manufactured by Central Plastics Co., Shawnee, OK, (800) 654-3872 or equal.

2.3 GALVANIZED STEEL PIPE (GSP)

A. Pipe:

1. ASTM A53 for pipe 4-inch diameter and smaller. Schedule 40.
2. Plain ends for joining with standard manufactured couplings.
3. Threaded ends shall meet requirements of ASME B1.20.1.

B. Fittings:

1. ASTM A53. Schedule 40.
2. For threaded ends use Teflon thread sealing tape.

2.4 COUPLINGS FOR SIMILAR OR DISSIMILAR PIPE (TRANSITION COUPLINGS)

A. Compression type transition fittings for making connections between like and dissimilar pipe materials shall be designed to enable a variety of connections between polyethylene pipe to various pipes, sizes 2” and smaller, using the same central body and different inserts and collets. Fittings shall be Cepex performance series compression fittings as manufactured by Cepex Holding, S.A. or equal.

2.5 MECHANICAL COUPLINGS

A. Plain-end products shall have a minimum 150 psi (1.0 MPa) working pressure.

B. Flange adapters shall be designed and tested in accordance with ANSI B16.5.

C. Pipe materials shall be HDPE or PVC as specified on Drawings. HDPE (high density polyethylene) pipe shall conform to ASTM D2447, D3035 or F714 or shall conform to ISO 161/1, AS 1159 and DIN 8074, with wall thickness from SDR 32.5 to 7.3. PVC pipe shall conform to ASTM D1785.

D. Couplings, mechanical-tees, valves and other system components shall be made of stainless steel casting. Stainless steel casting shall conform to A351, Grade CF8 (Type 304) or Grade CF8M (Type 316).

E. Bolts and nuts shall be stainless steel track bolts. Stainless steel track bolts shall conform to ASTM A193, Type 304 or Type 316, coated with molybdenum disulfide (MoS2) with stainless steel heavy duty nuts conforming to ASTM A194. As an option, silicon bronze nuts may be used with stainless steel bolts to avoid galling.

F. Gaskets shall be pressure responsive design, molded of Grade “E” EPDM as designated in ASTM D2000.

2.6 PIPE CORROSION PROTECTION FOR GSP

A. Cold applied mastic type 1200, as manufactured by Protecto Wrap Co., Denver, CO (303) 777-3001 or equal.

2.7 CURB STOP

A. One-piece, closed-bottom body with tee head and plug integrally cast, O-ring sealed design, and 175 psig maximum working pressure.

B. Minneapolis pattern.

C. Female iron pipe inlet by female iron pipe outlet.

D. Hole for attaching curb box rod or handle in provided in tee head.

E. Heavy cast bronze body construction conforming to AWWA C800.

F. Curb stops shall be Mueller 300 Ball Curb Valve, sized for pipe diameter and material, both ends female threaded with Minneapolis patter top, model number B20287, as manufactured by Mueller Co., Decatur, Illinois, (800) 423-1323, or equal.

2.8 VALVE BOXES

A. Bingham & Taylor P/N P-24-105-2 Lid label “Water” or equal.

B. Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over valve, and approximately 5-inch- (125-mm-) diameter barrel.

1. Operating Wrenches: Steel tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.9 UNDERGROUND DETECTION AND MARKING TAPE

A. As specified in Division 31 Section “Trenching. Bedding, and Backfill for Utilities.”

2.10 TRACER WIRE

A. As specified in Division 31 Section “Trenching. Bedding, and Backfill for Utilities.”

2.11 CURB VALVE

A. One-piece, closed-bottom body with tee head and plug integrally cast, TFE coated brass ball that is supported by two Buna-N-seats, and 300 psig maximum working pressure.

B. Minneapolis pattern.

C. Female iron pipe inlet by female iron pipe outlet.

D. Hole for attaching curb box rod or handle is provided in tee head.

E. Heavy cast bronze body construction conforming to AWWA C800.

F. Curb Valves shall be 300 psig Ball Curb Stops, sized for pipe diameter and material, both ends threaded with Minneapolis pattern top, model number 6105, as manufactured by A.Y. McDonald, Mfg. Co., P.O. Box 508, Dubuque, Iowa, (800) 292-2737, or equal.

2.12 CONCRETE

A. As specified in Division 32 Section “Concrete for Minor Structures.”

2.13 PVC SLEEVES

A. Schedule 40 PVC.

2.14 PIPE SEALS THROUGH CONCRETE SLAB OR EXTERIOR OF BUILDING

A. Foam for Annular Space: High density, low expansion insulate foam, Dap Tex as manufactured by Dap, Inc., Baltimore, MD, (888) 327-8477 or equal.

2.15 VALVES

A. General:

1. Provide factory-fabricated valve recommended by manufacturer for use in service indicated.

    a. Provide valves of types and pressure ratings indicated; provide proper selection as determined by installer to comply with installation requirements.
    b. Provide end connections that properly mate with pipe, tube, and equipment connections.

2. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.

B. Ball Valve:

1. PVC, single entry, thermoplatic ball valve, economical industrial grade, quarter-turn, polypropylene handle with union nuts. Pressure rated at 235 psi. Valves shall be PVC Single Entry Ball Valves as manufactured by Spears Manufacturing Company, Sylmar, CA (818) 364-1611 or equal.
2. 2.5 gpm flow controller shall be installed on each ball valve used as a hose bibb or sampling tap.

C. Check Valve:

1. Check valve with two resilient seated isolation valves and four top mounted, resilient seated test cocks meeting the requirements of ASSE Std. 1015 and AWWA Std. C510.
2. Check Valve series 007 model number 007M2QT as manufactured by Watts Water Technologies Company 978-688-1811 or equal.
3. Check Valve model number 62100701 manufactured by Apollo. Ball Cone Spring style check valve.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine roughing-in work of potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures.

B. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures.

C. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Contracting Officer (CO).

3.2 VALVES

A. General:

1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping.
2. Locate valves so as to be accessible and so that separate support can be provided when necessary.
3. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable.

3.3 INSTALLATION OF WATER METER

A. The water meter shall be installed with standard pipe unions at each end.

B. Where possible install the water meter with 10 pipe diameters of straight pipe upstream and 5 pipe diameters of straight pipe downstream to minimize turbulence and ensure accuracy of the meter readings.

3.4 SUPPORTS, HANGERS AND SHIELDS

A. Install hanger, supports and shields to support piping properly from building structure; comply with MSS SP-69.

B. Install hangers and support to allow controlled movement of piping system.

3.5 PIPE INSTALLATION, GENERAL

A. Install piping in trenches as specified in Division 31 section “Trenching, Bedding, and Backfill for Utilities” and install directionally drilled sections of water piping as specified in Division 33 section “Utility Horizontal Directional Drilling.”

B. Construct the water system to the lines and grades shown or established in the field.

C. Stake locations of waterlines as shown on the drawings. Review waterline location with Contracting Officer before installation of waterline.

D. Grade water line installations to drain.

E. Handled and lay pipe, fittings, and appurtenances in strict conformance to the manufacturer’s recommendations.

F. Keep the interior of all pipe, fittings, and other accessories free from dirt and foreign matter at all times. Clean each piece of line of debris as it is laid. When the pipeline has become dirty on the inside during shipment or storage, swab out by drawing a damp swab through the line before lying. Care shall be exercised to keep all joining surfaces clean. Discard any pipe with contaminated or damaged joining surfaces, which cannot be satisfactorily cleaned or repaired. Under no circumstances lay pipe in water, and do not lay pipe when trench conditions or the weather is unsuitable for such

work. Securely close all open ends of pipe and fittings, when work is not in progress, so that no trench water, rodents, earth, or other substance enters the pipe or fittings.

G. Remove and replace any section of pipe with new pipe where pipe is laid and found to be defective.

H. Where water line crosses a road culvert, adjust grade of water line to provide a minimum of 12 inches of separation between the water line and culvert, maintaining slope of water line to daylight drain.

I. Maintain a minimum of one foot separation between electric and water lines in the same trench. Unless the electric conductors are in conduit, install the water line a minimum of one foot below electric conductors.

3.6 CUTTING AND HANDLING OF PIPE

A. Cut pipe for closure pieces by methods that will not damage the pipe. Handle the pipe and fittings to insure delivery and final placement in undamaged condition. Exercise care not to damage pipe surfaces or coatings. Do not use damaged pipe in the work.

3.7 LAYING PIPE

A. Do not place pipe in the trench until the Contracting Officer has inspected the trench and bedding.

B. Rest each section of pipe upon the pipe bed for the full length of its barrel.

C. Backfill the pipe within 24 hours after installing the pipe in the trench, leaving the joints and one foot of pipe on each side of each joint exposed until testing is complete.

D. When work is not in progress, securely close open ends of pipe and fittings.

E. Weave high density polyethylene pipe in the trench to provide horizontal slack for expansion and contraction.

F. Allow high density polyethylene pipe to cool to within 20°F of the shaded trench bottom temperature before backfilling.

3.8 PIPE ALIGNMENT AND GRADE

A. Construct complete water system to drain by gravity for servicing. Construct waterlines to drain at a minimum grade of 0.5%. Remove and replace waterlines not meeting this requirement.

B. Slightly adjust pipelines to avoid existing obstacles; however, install all lines to slope towards daylight drains as shown on the drawings.

C. Do not manufacturer's recommended maximum joint deflection or curvature when making deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets. If the alignment requires curvature or deflections in excess of these limitations, install bends, standard fittings, or a sufficient number of shorter lengths of pipe to provide angular deflections at the joints within the limit set forth by the manufacturer. Bends resulting in tension on joints will not be allowed.

3.9 HDPE PIPE INSTALLATION

A. Install HDPE pipe according to ASTM D 2774 and ASTM F 645.

3.10 JOINT CONSTRUCTION

A. Make joints in accordance with the manufacturer's instructions. Use jointing materials applied with the proper accessories. Adjust joints to obtain the degree of water tightness required. Utilize nontoxic lubricant if lubricant is required for assembly of pipe and fittings. Make connections between new work and existing lines using special fittings to suit the actual conditions.

B. Threaded Joints:

1. Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape and apply wrench to fitting and valve ends into which pipes are being threaded.
2. Paint exposed threaded pipe joints on galvanized steel pipe with mastic following the manufacturer's application procedures.
3. Square off field cut ends by grinding or filing; ream ends to remove all chips and flakes removed.
4. Make field cut threads or machined joints with sharp tools to sharp finished ends.

C. PE Heat-Fusion Joints

1. Install according to ASTM D 2657 and piping manufacturer's written instructions.
2. Join pipes using butt fusion method. Butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including but not limited to, temperature requirements, alignment, and fusion pressures.
3. Personnel trained in butt fusion techniques by the manufacturer of the pipe, shall supervise or perform butt fusion operations.
4. Perform butt fusion between pipe ends or pipe ends and fitting outlets, of like outside diameter and wall thickness, SDR or DR. Butt fusion joining between same diameters but unlike wall thickness is not be permitted. Make transitions between unlike wall thickness with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means.

5. Make branch connections to the main with polyethylene fittings, and butt fuse.
6. On every day butt fusions are to be made, the first fusion of the day shall be a trial fusion. Allow the trial fusion to cool completely, and then cut-out fusion test straps. The test strap shall be 300 mm (12") (min) or 30 times the wall thickness in length with the fusion in the center, and 25 mm (1") (min) or 1.5 times the wall thickness in width. Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Do not commence butt fusion of pipe to be installed until a trial fusion has passed the bent strap test.

D. Dissimilar Materials Piping Joints

1. Join polyethylene pipe and fittings to other materials by means of couplings designed for joining polyethylene pipe to another material. Couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the coupling will cause the pipe to yield before the coupling disjoints.
2. Use adapters compatible with both piping materials, OD, and system working pressure.

3.11 BRANCH CONNECTIONS

A. Make branch connections to the main with tees.

B. Horizontal tees for waterline laterals are not be permitted. Install the branch side of tees up when drainage is toward the tee, and down when drainage is away from the tee.

C. Waterline tees shall be the same diameter as the largest pipe connected to the tee.

3.12 INSTALLATION OF COUPLINGS

A. Install all couplings in accordance with manufacturer's recommendations.

3.13 INSTALLATION OF CURB VALVE AND BOX

A. House each curb valve in a curb box.

B. Comply with manufacturers written instructions. Install underground curb valves with head pointed up.

C. Install concrete pad around top of box as shown on the drawings.

3.14 FINAL PIPE CLEANING AND FLUSHING

A. Before testing, clean new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired by high pressure water jet or mechanical means.

B. If the new waterlines are extensions or modifications of an existing water system, the new system(s) and all of the existing system immediately downstream of the control valve shall be flushed to remove sediment. The control valve referred to here is the valve in the existing system that must be closed to allow construction of new facilities.

C. During the flushing operation, operate all valves, hydrants, hose bibs and other outlets.

D. Flush system with clean potable water until dirty water does not appear at points of outlet.

3.15 PRESSURE TESTING WATERLINES

A. Notify Contracting Officer at least 48 hours before inspection or testing. Perform test and inspections in the presence of the Contracting Officer. Prepare report for each test, signed by Installer, General Contractor, and Contracting Officer.

B. Conduct pressure and leakage tests on all newly installed or laid pipeline, or any valved section thereof. Pneumatic testing will not be allowed.

C. Conduct piping tests before joints are covered and after thrust blocks, if required, have hardened sufficiently. Joints shall remain uncovered until testing is completed satisfactorily.

D. Furnish the pump, pipe, gauge, measuring device, connections, and all other necessary apparatus, and the necessary personnel to conduct the tests. All equipment**,** gauges, and attachments shall be subject to approval by the Contracting Officer.

E. Test all newly constructed portions of the water system, including water mains, service lines, fittings, valves, and hydrants. Test new waterlines that are extensions or modifications of an existing water system tested at the test pressure specified here.

F. Conduct piping tests before joints are covered. Joints shall remain uncovered until testing is completed satisfactorily.

G. Use only potable water.

H. Test waterlines in sections not to exceed 2,000 ft in length or a maximum pressure differential of 30 psi in the test section.

I. Test Procedure

1. Slowly fill each valved or plugged test section of pipe with water. The line shall be filled by means of a pump connected to the pipe. Operate all hydrants and

taps to bleed entrapped air from the test section. Operate the pump continuously during bleeding operations. The pump shall take suction from a small auxiliary tank for measuring the water the water pumped into the test section.

2. Raise the internal pressure of the system by pumping in water. Increase pressure in 50-psig increments and inspect each joint between increments. The test pressure for the system shall be 100 psi.
3. The system should be allowed to stabilize for 3 hours at the test pressure before conducting the hydrostatic test. Make up liquid may be added during this time to return to test pressure.
4. After obtaining the test pressure, record the water level in the auxiliary tank.
5. The test phase follows immediately and shall last 2 hours.
6. Immediately following the initial expansion phase, reduce the test pressure by 10 psi, and stop adding test liquid. If the test pressure remains steady (within 5% of the target value) for one (1) hour, no leakage is indicated.

J. Leakage shall be verified by the Contractor and the Contracting Officer.

K. If there is leakage in excess of the above requirements, locate and replace any defective pipe, fittings, valves, joints, and hydrants as required, until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage. Flush the system, and repeat the pressure test until leak is repaired.

L. Do not use paints, asphalts, tars, enamels, or other types of pipe compounds to eliminate leaks.

M. Complete trench backfill after acceptance from the Contracting Officer.

N. Furnish a written report describing the results of each test. The report must identify the specific portions of the pipeline tested, the pressure, the duration of the tests, and the amount of leakage.

3.16 DISINFECTION OF WATERLINES

A. Notify Contracting Officer at least 48 hours before disinfection. Perform disinfection in the presence of the Contracting Officer. Prepare report for each test, signed by Installer, General Contractor, and Contracting Officer.

B. Perform disinfection by chlorination after flushing and pressure testing are completed and accepted by the Contracting Officer.

C. Dosage: Provide chlorine solution with approximately 25 mg/l of chlorine for disinfecting the water system.

D. Procedure: Fill the entire system, including the storage tank, with the disinfecting solution. Coordinate location for placement of chlorine solution with the Contracting

Officer. Open all taps, hydrants, and other outlets and leave open until chlorine is noticeable by odor or testing in the water coming from each. Immediately close taps, hydrants, and other outlets. An effort shall be made to limit the amount of chlorinated water discharged from the taps, hydrants and other outlets. Do not drain chlorinated water into streams, rivers, or lakes; rather, open first those drains and hydrants which permit the longest travel time for the solution to reach surface waters.

E. Test Period:

1. Chlorinated water shall remain in the system a minimum of 24 hours, after which the system shall be examined by the Contracting Officer for residual chlorine. Chlorine residual at the end of the 24-hour period shall be a minimum of 10 mg/1.
2. If the minimum residual is not found present, the system shall be drained and the disinfection testing shall be repeated. When disinfection is complete and accepted by the Contracting Officer, the system shall be flushed with potable water and the water leaving the lines shall have a residual chlorine concentration no higher than 1 mg/l.
3. When emptying the lines or tank after the 24-hour period, whether the system has passed or failed, the chlorine solution shall be neutralized before being discharged. Neutralize system by adding sodium thiosulfate to the storage tank in accordance with the table below. Let the sodium thiosulfate sit in the storage tank for 24-hours and then release the water from the tank and flush the system. There shall be a trace of residual chlorine at the outlets.

Amounts of Chemical Required to
Neutralize Various Residual Chlorine
Concentrations in 1,000 gallons of Water

Residual Chlorine Concentration mg/L	Pounds of Sodium Thiosulfate ($Na_2 S_2 O_3 –5H_2O$)
1	0.012
2	0.024
10	0.12
50	0.60

F. Bacteriological Examination: After the system has been disinfected as specified, the Contracting Officer shall test the water for bacteriological contamination from representative points in the system. The coliform organisms shall be tested for presence/absence in accordance with State drinking water regulations. If coliform bacteria are present, testing shall be repeated in accordance with State drinking water regulations. If the report of this examination is unsatisfactory, the system shall be flushed and the disinfection procedure repeated until the results of bacteriological examinations are satisfactory.

G. The satisfactory quality of water delivered by the waterline should continue for a period of at least two full days, as demonstrated by laboratory examination of samples taken from taps along the system.

H. Bacterial testing of the water system will be the responsibility of the Forest Service. Notify Contracting Officer 48 hours in advance of the need for bacterial testing.

I. Repeat disinfection of the water system shall be the responsibility of the Contractor with no additional expense to the Government.

3.17 FIELD QUALITY CONTROL

A. Upon completion of installation of appurtenances and equipment and after system is pressurized, test appurtenances and equipment to demonstrate capability and compliance with requirements.

B. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

END OF SECTION 331116

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SECTION 331219
WATER HYDRANTS

PART 1 – GENERAL

1.1 SUMMARY

A. Provides for furnishing and installing water hydrants.

1.2 LOCATION

A. General location and orientation of all hydrants are shown on the drawings.

B. Exact location and orientation shall be approved by the Contracting Officer.

1.3 SUBMITTALS

A. As specified in Division 1 Section “General Requirements” submittal procedures. Include product data for hydrants and components.

B. Closeout Submittals: As specified in Division 1 Section, “General Requirements” closeout procedures.”
   1. Operations and Maintenance Data for hydrants.

PART 2 - PRODUCTS

2.1 HYDRANT

A. Post Hydrant: Non-freezing, self-draining type with depth of bury 6 feet. Furnish with 1-1/2” FIP inlet and 1-1/2” NST outlet. Provide hydrant with non-turning operating rod. Bronze working parts and serviceable from above grade. MainGuard #80WD as manufactured by Kupferle Foundry Company 2511 North 9th Street, St. Louis, MO 63102, (800) 231-3990, or equal.

B. Yard Hydrant: Non-freezing, self-draining type with depth of bury 6 fee. Furnish with 1” NPT inlet and ¾” hose adapter. Any Flow Frost Proof Yard Hydrant manufactured by Merril Manufacturing, 315 Flindt Drive, Storm Lake, Iowa 50588, (800) 831-6962, or equal.

2.2 CURB VALVE

A. As specified in Section 33, “Water Distribution.”

2.3 SUPPLY PIPE

A. High Density Polyethylene (HDPE) pipe as specified in Section 33, “Water Distribution.”

2.4 DRAINAGE COURSE

A) Drainage Course: Narrowly graded mixture of crushed stone or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a no. 8 (2.36-mm) sieve.

PART 3 - EXECUTION

3.1 WATER HYDRANTS

A. Install hydrants as shown on the drawings and in accordance with manufacturer’s recommendations.

END OF SECTION 331219

SECTION 333110
SANITARY SEWERAGE

PART 1- GENERAL

1.1 SUMMARY

A. This Section includes sanitary sewerage outside the buildings.

1.2 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.3 SUBMITTALS

A. As specified in Division 1 Section, “General Requirements” submittal procedures.

1. Product Data: For the following:

a. Piping.
b. Cleanouts.
c. Manhole frame and cover.
d. Manhole risers.
e. Septic Tank.
f. Gravel-less Infiltration Chambers.
g. Meter box.
h. RV Hookup.
i. Pump

2. Shop Drawings: Include plans, elevations, details, and attachments for the following:

a. Clean Outs.
b. Sewer Service Connection, Tap Saddle and Wye.

3. Coordination Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utilities crossing system piping.

B. Closeout Submittals: As specified in Division 1 Section “General Requirements” closeout procedures.

1. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle precast septic tank and other structures according to manufacturer's written rigging instructions.

1.5 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Location and elevation of invert of pipe inverts shall be approved by the Contracting Officer (CO) prior to installation.

PART 2 - PRODUCTS

2.1 GRAVITY PVC SEWER PIPES AND FITTINGS

A. Pipe:

1. Piping shall conform to the requirements of ASTM D-3034, Type PSM, SDR-35 (PS 46) minimum. PVC pipe shall be manufactured in a continuous extrusion process employing a prime grade of un-plasticized PVC plastic material that meets the requirements for this product as specified in ASTM D-1784.

    a. PVC Sewer Pipe shall have a flexible elastomeric seal (O-ring or rubber sealing elastomeric gasket joint), and conform to the latest revisions of ASTM D3212. Solvent cement joints will not be allowed for sewer pipe and fittings.
    b. Nominal laying lengths shall not be less than 12.5 feet, except shorter lengths may be used adjacent to manholes. Each length of pipe shall be marked, as a minimum, with size, SDR, "Sewer Pipe" and ASTM number.

B. Nonpressure-type Pipe Couplings:

1. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.2 PRESSURE PVC SEWER PIPE AND FITTINGS

A. Pipe:

1. Pipe: Dual rated ASTM D1785/D2665, Schedule 40 PVC, with plain or bell ends for solvent-cemented joints.

B. Fittings:

1. Fittings: ASTM D2466, Schedule 40 PVC, solvent weld, socket type.

2.3 CLEANOUTS

A. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.4 METER BOX

A. Meter Boxes:

1. Plastic meter box shall be injection molded in accordance with ASTM-D2853, Class 1212. Meter box shall be a rigid combination of polyolefin with inorganic component reinforcing, and U.V. stabilizer additive to assure resistance to material degradation from ultra-violet light.
2. The cover shall be molded of the same material, and designed with no molded protrusions for latching. Cover shall be secured with one acetal snap catch and a polycarbonate pentagon bolt and receiver. Pentagon bolt head shall recess into the cover, so as not to protrude above the plane of the cover.
3. Meter box (16”x10 ¾”x12”) shall be Model 170114, 12” high standard meter box with green sewer cover, as manufactured by Ametek, Plymouth Products Division, Sheboygan, Wisconsin, (800) 348-7550 or equal.

2.5 PRECAST CONCRETE SEPTIC TANK

A. Monolithic tank shall meet ASTM C 1227.
1. Three- compartment septic tank shall have a combined capacity of 2000 gallons; with a total volume of 2500 gallons, measured below the outlet invert of the third compartment. The inlet invert of the first compartment shall be 3-inches minimum above the outlet invert of the third compartment. The septic tank shall be rated for H-20 loading and be rated to be buried to a depth of at least 4 feet.
2. Two- compartment septic tank shall have a combined capacity of 1500 gallons, measured below the outlet invert of the third compartment. The inlet invert of the first compartment shall be 3-inches minimum above the outlet invert of the second compartment. The septic tank shall be rated for H-20 loading and be rated to be buried to a depth of at least 4 feet

B. Watertight push seal gaskets suitable for 4-inch diameter pipe.

C. Butyl rubber sealant complying with Federal Specification SS-S-210A.

D. Nonshrink, metallic grout, Masterflow 713, by Master Builders, Cleveland, Ohio, or equal.

2.6 LEACHFIELD

A. Infiltration Chambers:

1. Molded high-density polyethylene domed chambers with open bottom. H-10 load rating with 12-inch compacted cover. Louvered sidewall that allows effluent to pass laterally into the soil. Incorporates splash plates on inlets.
2. Standard Infiltrator Chamber as manufactured by Infiltrator Systems, Inc., Old Saybrook, CT, (800) 221-4436, or equal.

B. Pipe: 1.5” Schedule 40 PVC pipe with 1/8” perforations premanufactured or drilled onsite.

C. Inspection Port:

1. PVC Sewer pipe and Fittings as described in this Section, solvent weld instead of gasketed joints.
2. Meter box as described in this Section.

2.7 MANHOLE RISERS

A. Manhole Risers shall meet ASTM C478. The rises shall extend a minimum of 3 inches above grade.

2.8 RV HOOKUP

A. Concrete: As specified in Division 32 section “Concrete for Minor Structures.”

B. Mastic Joint Sealant: Permanent, flexible, watertight polymer blend sealant resistant to shrinkage, hardening, or oxidization. RAM-NEK by Henry Sealant Division of Henry Companies, Houston, TX, (800) 231-4549 or equal.

C. Chain: Short link end-welded utility chain, brass plated 5/64” sash chain with 0.50” link size. Part no. 8951T18 by McMaster-Carr Supply Company, Chicago, IL, (630) 833-0300 or equal.

D. Eye Bolt: Stainless steel eyebolt with shoulder to fit in PVC sewer plug and secure chain to concrete base. Stainless steel nuts to secure eyebolt in sewer plug. Type 304 stainless steel eyebolt by McMaster-Carr Supply Company, Chicago, IL, (630) 833-0300 or equal.

2.9 SAND FILTER TREAMENT MEDIA

A. The depth of the sand media below the distribution system must be at least 24 inches unless otherwise noted

B. "Imported Treatment Sand" Media Requirements:
   1. Effective size: 0.15-0.60 mm
   2. Uniformity coefficient: ≤7.0
   3. Percent fines passing #200 sieve must be ≤ 3.0
   4. A gradation of the sand media must be provided. The gradation must be dated no more than on month prior to the installation date.

2.10 PUMP

A. Sewage Ejector Pump
   1. Pump must be capable of 39 GPM at 18 Ft of head. 100836, Model SE411VF, SE Series, Sewage Pump, 4/10 HP, or equal.
      a. 2" or 1.5" NPT outlet
      b. 3/4" Solids Handling
      c. 2 year or longer warranty

2.11 CONTROL BOX

A. Simplex control box and box mounted to a stand near the pump tank
   1. Must have auditory and visual highwater alarm
   2. Includes the installation of Float tree with Start, Stop and Alarm Floats
   3. Barnes 106482, Weathertight Simplex Control Panel, 120/208/240, 1 Phase, 15-20 Amp Range, NEMA 4X Thermoplastic Enclosure
   4. Install per manufacturer instructions by a licensed electrican

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavating, trenching, and backfilling are specified in Division 31 Sections “Earthwork” and “Trenching, Bedding, and Backfill for Utilities.”

B. Identification: Materials and their installation are specified in Division 31, “Trenching, Bedding, and Backfill for Utilities.” Install warning tapes directly over piping and at outside edges of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

C. Piping Applications:

1. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
   a. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.
   b. Unshielded flexible couplings for same or minor difference OD pipes.
   c. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
2. Use pressure-type pipe couplings for force-main joints.

D. Sleeve-Type Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

E. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

F. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

G. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

H. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

I. Install gravity-flow, nonpressure, piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
2. Install piping with 36-inch minimum cover.
3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

J. Install force-main, pressure piping according to the following:

1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
2. Install piping with 36-inch minimum cover unless otherwise indicated.
3. Install PVC pressure piping according to ASTM D 2774 and ASTM F 1668.

K. Pipe Joint Construction and Installation: Join and install pipe and fittings according to installations indicated.

1. Join gravity-flow, nonpressure, drainage piping according to the following:
   a. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
   b. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

2. Join force-main, pressure piping according to the following:
   a. Join PVC pressure piping according to ASTM D2855.
   b. Join dissimilar pipe materials with pressure-type couplings.

L. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Install piping so cleanouts open in direction of flow in sewer pipe. Set cleanout frames and covers in earth in cast-in-place concrete block, 24 by 24 by 4 inches deep. Set with tops 1 inch above surrounding grade.

M. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

N. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

O. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

P. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. Place plug in end of incomplete piping at end of day and when work stops.
2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

3.2 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318, ACI 350R, and Division 32 "Concrete for Minor Structures.".

3.3 METER BOX INSTALLATION

A. Set meter box on level, compacted soil so that cover is 1-inch above surrounding grade.

B. Install in accordance with manufacturer's recommendations.

3.4 CONCRETE SEPTIC TANK

A. Handle tank in accordance with manufacturer's instruction and in accordance with ASTM C-891. Comply with manufacturer's instruction and ASTM C-891 for standard practice for the installation of underground precast concrete utility structures.

B. Excavation: As specified in Division 31 section "Earthwork."

1. Provide a minimum of 24 inches of working space around the tank. Comply with OSHA and state excavation safety requirements. Keep excavation bottom free of water, frost and loose material.
2. Excavate 6 inches below the required elevation of the septic tank. Over excavation below the required subgrade elevation should be filled with initial backfill and compacted to 95 percent relative density, as determined by ASTM D698, Method C. Place and compact 6 inches of crushed aggregate on prepared subgrade. The compacted surface shall be smooth and level.
3. Continue backfilling. Utility lines entering the structure shall be bedded and covered with initial backfill as required for the adjacent utility line.

C. Pipe Connection to Septic Tank: Provide a gasketed bell connection to the sewer pipe within 5 feet of septic tank or install a flexible coupling.

D. Riser Section: Install riser section in accordance with tank manufacturer's instructions using butyl rubber sealant or equal.

3.5 SOIL TREATMENT AREA

A. Excavation: As specified in Division 31 section "Earthwork."

1. Plan the site excavation by staking out the location STA. Set the elevation of the septic tank, piping, and trench bottom to ensure drainage into field.

2. Construct trenches 3 ft wide to place chamber in.
   Check to be sure that the sand filter is smooth and level using a 4-foot level, transit or laser.
3. Place chambers and pressure pipe on undisturbed native surface and cover with appropriate backfill material.
4. Compact over chambers using tracked equipment only

B. End Plates: Attach the end plates on only the first and last chambers of each trench. Follow manufacturer's instructions.

C. Inspection Ports:

1. Create an opening for 4" PVC pipe in the premarked area located in the center top of the infiltration chamber.
2. Solvent weld a 6-inch long PVC pipe into a coupling. Notch PVC pipe on opposite sides approximately 4-inches so that it will straddle the pressure distribution pipe. Inspection port should not be located over ¼-inch hole in distribution pipe.
3. Insert the pipe into the opening at the top of the chamber so that coupling rests on top of chamber.
4. Solvent weld another piece of pipe into the coupling and attach a threaded cleanout assembly onto the protruding pipe as shown on the drawings.

D. Set meter box on level, compacted soil so that cover is 1-inch above surrounding grade.

3.6 SEPTIC TANK ABANDONMENT

A. Locate septic tanks.

B. Septic tanks shall be pumped by a licensed contractor in Teller county.

C. Crush pumped septic tanks and fill all voids with sand, gravel or compacted soil.

D. Grade filled area to match surrounding grade allowing for settling.

E. Abandon septic tanks in accordance with Regulation NO. 43- On-Site Wastewater Treatment System Regulation section 43.9 C

3.7 FIELD QUALITY CONTROL

A. Notify Contracting Officer at least 48 hours before inspection or testing. Perform test and inspections in the presence of the Contracting Officer. Prepare report for each test, signed by Installer, General Contractor, and Contracting Officer.

B. Septic Tanks and Grease Trap Inspection: Inspect new septic tanks and existing septic tanks and grease traps to remain in accordance with Regulation NO. 43- On-Site Wastewater Treatment System Regulation

C. Locate septic tanks.
   1. Septic tanks shall be inspected by a licensed contractor in Teller county.
   2. Pump existing septic tanks and grease traps prior to inspection.
   3. Document tank inspection.
   4. Provide recommendations and cost to correct existing septic tank deficiencies.

D. Piping Inspection: Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

   1. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.

   2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   3. Reinspect and repeat procedure until results are satisfactory.

E. Pipe Testing: Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems.
   3. Submit separate reports for each test.
   4. Perform tests as follows:
      a. Sanitary Sewerage: Perform hydrostatic test.

         1) Allowable leakage is maximum of 4 gal. per 100 feet of pipe, during 24-hour period.
         2) Close openings in system and fill with water, fill to rim of host sewer connection.
         3) Purge air and refill with water.
         4) Disconnect water supply.
         5) All water to sit for 24 hours period.
         6) Inspect joints for leaks.

7) After 24 hours, refill pipe to rim of host sewer connection. Measure make up water volume. Volume shall not exceed specified allowable line loss.

b. Sanitary Sewerage: Perform air test according to Uni-Bell Specification Uni-B-6-90 or latest, Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

c. Preform flow test to ensure squirt height at end of distribution lateral is 5 ft min.

5. Leaks and loss in test pressure constitute defects that must be repaired.

6. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

F. Septic/Pump Tank Testing: After installation, but before backfilling, fill tank with water to outlet invert and let stand a minimum of 12 hours to check for leakage. If leaks occur, mark the areas, drain the tank, and allow to dry thoroughly. Grind these areas down and repair with bonding agent and grout. Recoat repaired area with appropriate surface coatings, and repeat water test. Tank shall be watertight before backfilling. If tank fails to be leak proof after second repair, replace with new tank.

G. Pump testing: Before backfilling over field run squirt test on field to ensure 5ft squirt height at furthest perforation of field is achieved. If required squirt height is not achieved adjust or replace pump to ensure required pressure it met.

END OF SECTION 333110