

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Description:

1. The work consists of furnishing all labor, supervision, equipment and materials for the construction of various improvements within an area referred to as the **CHALAN GALAIDE WATERLINE REPLACEMENT – PHASE 1**, Saipan, CNMI. This work includes, but is not limited to:
 - a. Installation of a new main waterline;
 - b. Connection of new main waterline to existing waterline;
 - c. Installation of gate valve assembly, fire hydrants assembly, flush hydrants, water sample tap, and other appurtenances;
 - d. Existing service lateral tap relocation;
 - e. New service lateral connection and stub-outs;
 - f. Relocation of water meters from private property to right-of-way;
 - g. Restoration of existing asphalt concrete road.
 - h. Restoration of existing concrete slab/pavement on grade.
2. Construct all work in strict accordance with the Plans and Specifications and subject to the terms and conditions of the Contract.

B. Location of the work:

1. Saipan, Commonwealth of Northern Mariana Islands.

C. Contractor's duties:

1. Except as specifically noted, provide and pay for:
 - a. Labor, materials and equipment.
 - b. Tools, construction equipment and machinery.
 - c. All utilities required for construction.

- d. All other facilities and services necessary for proper execution and completion of work.
2. Pay legally required sales, consumer and use taxes.
3. Conform to the requirements of all permits.
4. Provide BECQ Earthmoving and Erosion Control Permit, HPO Clearance, DPW Building Permit and DPW Road Cutting Permit. Secure and pay for any other permits as necessary for proper execution and completion of the work, applicable permits and licenses.
5. In performance of the Contract, the Contractor shall comply with the applicable provisions of the U.S. Occupational Safety and Health Act (OSHA), and shall take all precautions necessary to protect persons and property, including, but not limited to, providing, erecting, and maintaining all necessary barricades, suitable and sufficient red lights, danger signals, and signs. Roads subject to interference by the work shall be kept open or suitable detours shall be provided and maintained by the Contractor.
6. Give required notices.
7. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities, which bear on performance of the work.
8. Promptly submit written notice to Owner's Representative of observed variance of contract documents from legal requirements.
9. If any subcontractor or person employed by the Contractor shall appear to the Owner's Representative to be incompetent or to act in a disorderly or improper manner, he shall be discharged immediately on the requisition of the Owner's Representative, and such person shall not again be employed on the work.
10. The Contractor is responsible for keeping an updated set of plans with all changes from the original plans at the job site. The final set of as-builts shall be clearly marked and turned over at least 10 working days prior to final inspection and acceptance of the project

1.2 CONTRACTS

- A. All work is contained in this contract. The limits of work are shown in the Plans. It will be the Contractor's responsibility to coordinate their activities to resolve conflicts.

1.3 WORK SEQUENCE

- A. The first order of business is submission of submittals and a schedule for completing the work. See General Conditions, Paragraph 14.1 for construction progress chart requirement. Complete submittals for all items to be incorporated into the work shall be made within thirty (30) calendar days after the receipt of Notice to Proceed to provide all required time for reviews, securing approvals, for possible revision, and resubmittal, and for placing orders, securing delivery and installations.
- B. The Contractor will be required to coordinate scheduling with the Owner to ensure a minimum of interruption to existing pedestrian and vehicular traffic adjacent to project site.
- C. The completion of the work must be completed within 365 calendar days from the Notice to Proceed.
- D. The work contained herein must be carried out such that the existing system is always operational while construction is in progress.

1.4 UTILITIES

- A. Contractor shall pay for and have provided all temporary power, water, and telephone as required for construction of this work.

1.5 CONTRACTOR USE OF PREMISES

- A. Construction corporation yards and/or storage areas are the responsibility of the Contractor.
- B. Confine operations at site to areas permitted by:
 - 1. Permits
 - 2. Contract Documents
- C. Do not encumber site with materials or equipment.
- D. Do not load structure or roadway with weight that will endanger or render unusable any structures or roadways.
- E. Assume full responsibility for protection and safekeeping of products stored on premises.

F. Move any stored products that interfere with operations of Owner or other Contractors.

G. Obtain and pay for use of additional storage of work area for operations.

PART 2 - PRODUCTS – Not Used.

PART 3 - EXECUTION – Not Used.

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SECTION 01 22 00

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 GENERAL

A. Units of measurement shall be in accordance with U.S. Standard Measures.

1.2 BID SCHEDULE

A. The Bid Schedule shall be used for determining progress pay estimates.

1.3 MEASUREMENT AND PAYMENT ITEMS

A. The measurement and payment shall be based on the following. Payments shall be inclusive of all costs associated with permitting and compliance with relevant CNMI and federal laws and regulations pertaining to the work described:

1. Mobilization/Demobilization: Measurement and payment for this item shall be on a lump sum basis. Payment shall include full compensation for all materials, labor, tools and equipment, transportation and all other items required to mobilize to the site and demobilize from the site, including obtaining all required permits and paying related fees, bonding costs and final clean-up.
2. Pressure Testing and Chlorination: Measurement and payment for this item shall be on a lump sum basis. Payment shall include full compensation for testing liquid tightness of the new waterlines, and disinfection of pipelines prior to putting facilities in service including all materials, labor, tools, apparatus, and equipment, and all other items needed for a complete and operational testing and treatment
3. Clearing and Grubbing: Measurement and payment for this item shall be on lump sum basis. Payment shall include full compensation for clearing vegetation and tree removal including removal of tree stump. The contractor shall make their own determination as to what additional measures may be required for their operations to comply with DEQ and earthmoving permit.
4. Cut and Cap Existing 1-1/4-inch waterline. Measurement and payment for this item shall be on the number of 1-1/4-inch waterlines cut and capped. Payment shall include full compensation for cutting and capping existing 1-1/4-inch

waterlines including all materials, labor, tools and equipment, and all other items needed for a complete abandonment.

5. Remove and Install 6-inch Gate Valve: Measurement and payment for this item shall be made based on the number of removal and installation made. Payment shall include full compensation for removing existing and installing 6-inch gate valve, backfill, and compaction including all materials, labor, tools and equipment, and all other items needed for a complete and operational removal.
6. New Waterline Crossing Over/Under HDPE Pipe: Measurement and payment for this item shall be made based on the number of adjustments made. Payment shall include full compensation for adjusting existing sewer line below or above new waterlines and adjusting new waterlines below or above drainage line including all materials, labor, tools and equipment, and all other items needed for a complete and operational adjustment.
7. 6-inch PVC Waterline Installation: Measurement and payment for this item shall be made based on the number of linear feet (LF) of pipe installed. Payment shall include full compensation for excavation, pipe bedding and backfill (exclusive of flowable fill), compaction, and installation of 6-inch PVC waterline including all materials, labor, tools and equipment, and all other items needed for a complete and operational installation and connection.
8. Install 2-inch PVC Service Lateral Stub-out: Measurement and payment for this item shall be made based on the number stub-out installed. Payment shall include full compensation for excavation, pipe bedding and backfill (exclusive of flowable fill), compaction, and installation of 2-inch PVC waterline including all materials, labor, tools and equipment, and all other items needed for a complete and operational installation and connection.
9. Install PRV Assembly with valve box: Measurement and payment for this item shall be made based on the number of PRV with valve box installed. Payment shall include full compensation for installing and connecting to the new waterline including installation of PRV with concrete valve box with a traffic rated access hatch, including all materials, labor, tools and equipment, and all other items needed for a complete and operational installation.
10. New Water Sample Tap Installation: Measurement and payment for this item shall be made based on the number of water sample tap installed. Payment shall include full compensation for installing new sample tap assembly with concrete collar, PVC stand pipe, lock and hasp, lockable hose bibb, pipes, fittings, and valve including all materials, labor, tools and equipment, and all other items needed for a complete and operational adjustment. Payment for removal shall include

full compensation for removing water sample tap, backfill, and compaction including all materials, labor, tools and equipment, and all other items needed for a complete and operational removal.

11. Flowable Fill: Measurement and payment for this item shall be made based on the volume (in cubic yards) of material installed, up to the limits delineated in the construction drawings. Payment shall include full compensation for flowable fill installed including all materials, labor, tools and equipment, and all other items needed for a complete installation. Payment shall not be made for volume which exceeds the limits delineated in the construction drawings, eg. the maximum excavation width shown. Only where authorized by Project Engineer.

12. Temporary Safety and Traffic Control: Measurement and payment for this item shall be on lump sum basis. Payment shall include full compensation for installing temporary traffic signs, devices, temporary detour and other related measures including all materials, labor, tools and equipment, and all other items needed for a complete and operational installation. The Contractor shall make their own determination as to what additional measures may be required for their operations to comply with DPW traffic regulations.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

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SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 SECTION INCLUDES:

- A. This Section specifies administrative and procedural requirements relative to a certified Application for Payment.
 - 1. Coordinate the certified Schedule of Values and certified Application for Payment with, but not limited to, the Construction Schedule, submittal log, and list of Subcontractors.

1.2 RELATED SECTIONS:

- A. Section 01 22 00: Measurement and Payment
- B. Section 01 70 00: Execution and Closeout Requirements

PART 2 - PRODUCTS – Not used

PART 3 - EXECUTION

3.1 APPLICATION FOR PAYMENT

- A. Each certified Application for Payment should be consistent with previous applications and payments as reviewed by Owner’s Representative, paid by the Owner.
- B. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
- C. Payment Application Times: The period of Work covered by each Application for Payment is the payment date for each progress payment as specified in the General Conditions. The period covered by each Application for Payment shall be no less than one month.
- D. Payment Application Forms: Use Owner provided forms for the Application for Payment.

- E. Application Preparation: Complete every entry on the form. Include execution by a person authorized to sign legal documents on behalf of Contractor. Incomplete applications may be returned without action,
- F. Transmittal: Submit a minimum of two (2) notarized and signed, original copies of each certified Application for Payment to the Owner's Representative. All copies shall be complete, including releases, certified payroll and similar attachments.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to Owner's Representative.
- G. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal for the first certified Application for Payment include, but are not limited to, the following:
 - 1. Submit Schedule of Values within 20-days after receipt of Notice to Proceed. The schedule of values shall include cost breakdown for all lump sum item and serve as the basis for progress payment.
 - 2. Performance and payment bonds. List of principal suppliers and fabricators.
 - 3. Worker Compensation certificates, if applicable.
 - 4. Auto Insurance, if applicable.
 - 5. Hazardous Material Insurance Certificates, if applicable.
 - 6. Construction Schedule
 - 7. Submittal Schedule
 - 8. Emergency Contact List
 - 9. Copies of authorizations, licenses and permits from governing authorities for performance of the Work
- H. Progress Application for Payment: Application for payment include, but are not limited to, the following:
 - 1. Daily Construction Reports
 - 2. Photos

3. If applicable, test results for compaction, compression testing, etc.
- I. Application for Payment at Substantial Completion: Following Owner's Representative issuance of the certificate of Substantial Completion, submit an Application for Payment:
1. Administrative actions, submittals and/or Work that shall precede or coincide with this application include:
 - a. Removal of temporary facilities, signs and services.
 - b. Testing, adjusting and balance records.
 - c. Removal of surplus materials, rubbish, and similar elements.
 - d. Start-up performance reports.
 - e. Owner training and orientations.
 - f. Change over information related to Owner occupancy, use, operation, and maintenance.
 - g. Final cleaning.
 - h. Ensure that incomplete Work will be completed without undue delay.
 - i. Notice on shifting insurance coverage.
 - j. List of defective Work, recognized as exceptions to certificate of Substantial Completion.
- J. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include, but are not limited to, the following:
1. Completion of Contract Closeout requirements.
 2. Project record documents.
 3. Completion of final punch list items.
 4. Delivery of extra materials, products and or stock.
 5. Identification of unsettled claims.
 6. Proof that taxes, fees, and similar obligations are paid.
 7. Operating and maintenance instruction manuals.
 8. Consent of surety to final payment.
 9. Waivers and releases.

10. Warranties, guarantees and maintenance agreements.

11. Acceptance of all road restoration work by the Department of Public Works.

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SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 – GENERAL

1.1 SECTION INCLUDES:

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Pre-installation meetings.
- G. Reports

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Coordinate completion and clean-up of Work of separate sections in preparation of Delivery Order completion.
- C. Coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to ensure Owner's involvement with correction of defective work.

1.3 PRECONSTRUCTION MEETING

- A. Owner will schedule meeting after Notice of Award.
- B. Attendance Required: Owner, and Contractor.

- C. Agenda:
1. Execution of Owner-Contractor Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.
 4. Submission of list of Subcontractors, list of products, and progress schedule.
 5. Designation of personnel representing parties in Contract, and Architect/Engineer.
 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 7. Scheduling.
- D. Record minutes and distribute copies within two 2 days after meeting to participants, with two 2 copies to Owner, and those affected by decisions made.

1.4 SITE MOBILIZATION MEETING

- A. If decided during the preconstruction meeting a site mobilization meeting will be held.
- B. Owner will schedule meeting at Project site prior to Contractor occupancy.
- C. Attendance Required: Owner, Special Consultants, and Contractor, Contractor's Superintendent, and major Subcontractors.
- D. Agenda:
1. Use of premises by Owner and Contractor.
 2. Owner's requirements
 3. Construction facilities and controls provided by Owner.
 4. Temporary utilities provided by Owner.
 5. Survey and layout.
 6. Security and housekeeping procedures.
 7. Procedures for testing.
 8. Procedures for maintaining record documents.
 9. Requirements for start-up of equipment.
 10. Inspection and acceptance of equipment put into service during construction period.
- E. Record minutes and distribute copies within two 2 days after meeting to participants, with two 2 copies to Owner, and those affected by decisions made.

1.5 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems impeding planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.
 - 13. Other business relating to Work.
- E. Record minutes and distribute copies within two 2 days after meeting to participants, with two 2 copies to Owner, and those affected by decisions made.

1.6 PRE-INSTALLATION MEETINGS

- A. When required in individual specification sections, convene pre-installation meetings at Project site prior to commencing work of specific section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific section.
- C. Notify Engineer four 4 days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of installation, preparation and installation procedures.

- 2. Review coordination with related work.
- E. Record minutes and distribute copies within two 2 days after meeting to participants, with two 2 copies to Owner, and those affected by decisions.

1.7 REPORTS

- A. Submit daily construction reports by email by the following business day.
- B. Weekly construction reports to be submitted by the first working day of the following week.

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SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for submittals required for the Work, including but not limited to; Shop Drawings, Product Data, Samples, material lists, and quality control items as required by the Contract Documents.
- B. Wherever possible, throughout the Contract Documents, the minimum acceptable quality of workmanship and products has been defined by the name and catalog number of a manufacturer and by reference of recognized industry standards.
- C. To ensure that specified products are furnished and installed in accordance with the design intent, procedures have been established for submittal of design data and for its review by Owner’s Representative and others.

1.2 RELATED SECTIONS

- A. Section 01 29 00: Payment Procedures
- B. Section 01 50 00: Temporary Facilities and Controls
- C. Section 01 60 00: Product Requirements
- D. Section 01 70 00: Execution and Closeout Requirements

PART 2 - PRODUCTS - Not used

PART 3 – EXECUTION

3.1 PROCEDURES

- A. Contractor shall package each submittal appropriately for transmittal and handling. Contractor shall transmit each submittal to the Owner’s Representative. Owner’s Representative will not accept submittals received from sources other than the Contractor.

- B. After review, Owner's Representative will transmit submittals to Contractor and others as required. Installation of materials requiring submittal approval shall not commence until reviewed and approved submittals are transmitted to Contractor.
- C. Contractor shall clearly identify any deviations from the Contract Documents on each submittal. Any deviation not noted, even though stamped reviewed, is not acceptable.
- D. Contractor shall coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities requiring sequential activity.
- E. Timing of Submittals:
 - 1. Contractor shall submit to the Owner's Representative, those Shop Drawings, Product Data, diagrams, materials lists, Samples and other submittals required by the Contract Documents.
 - 2. The schedule of submittals shall provide adequate time between submittals in order to allow for proper review without negative impact to the Construction Schedule.
 - 3. Schedule of submittals shall be related to Work progress, and shall be so organized as to allow sufficient time for transmitting, reviewing, corrections, resubmission, and re-reviewing.
 - 4. Contractor shall coordinate submittal of related items. Owner's Representative reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received by Owner's Representative.
 - 5. Contractor shall revise, update and submit submittal schedule to Owner's Representative on the first of each month, or as required by Owner's Representative.
 - 6. Contractor shall allow in the Construction Schedule, at least twenty (20) calendar days for Owner's Representative review following Owner's Representative receipt of material submittals. For design submittals mechanical, plumbing, electrical, and other submittals requiring joint review with Owner's Representative, Contractor shall allow a minimum of twenty-five (25) calendar days following Owner's Representative receipt of submittal.

7. No adjustments to the Contract Time and/or Milestones will be authorized because of a failure to transmit submittals to Owner's Representative sufficiently in advance of the Work to permit review and processing.
 8. In case of product substitution, Shop Drawing preparation shall not commence until such time Owner's Representative reviews said submittal relative to the General Conditions.
- F. If required, resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such. Review times for re-submitted items shall be as per the time frames for initial submittal review.
- G. Shop drawing preparation shall not commence until such time as Contractor receives Product Data approval.
- H. Owner's Representative, or authorized agent, will stamp each submittal with a uniform, action stamp. Owner's Representative, or authorized agent, will mark the stamp appropriately to indicate the action taken, as follows:
1. Approved: When Owner's Representative, or authorized agent, marks a submittal "Approved", the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on compliance.
 2. Approved With Conditions: When Owner's Representative, or authorized agent, marks a submittal "Approved With Conditions", the Work covered by the submittal may proceed provided it complies with restrictions, notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on compliance.
 3. Rejected: When Owner's Representative, or authorized agent, marks a submittal "Rejected", do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat as necessary to obtain different action mark. In case of multiple submittals covering same items of Work, Contractor is responsible for any time delays, schedule disruptions, out of sequence Work, or additional costs due to multiple submissions of the same submittal item. Do not use, or allow others to use, submittals marked "Rejected" at the Project site or elsewhere where Work is in progress.

3.2 SHOP DRAWINGS

- A. Shop Drawings are original drawings prepared by Contractor, Subcontractor, supplier, or distributor illustrating some portion of Work by showing fabrication, layout, setting, or erection details. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings.
- B. Produce Shop Drawings to an accurate scale that is large enough to indicate all pertinent features and methods. Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 x 11 inches but no larger than 24 x 36 inches.
- C. Shop Drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
 - 1. Dimensions
 - 2. Identification of products and materials included by sheet and detail number.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
- D. Provide a space of approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record Contractor and Owner's Representative review, and the action taken. Include the following information on the label for processing and recording action taken:
 - 1. Project name.
 - 2. Date.
 - 3. Name and address of Owner's Representative.
 - 4. Name and address of Contractor.
 - 5. Name and address of Subcontractor.
 - 6. Name and address of supplier.
 - 7. Name and address of manufacturer.
 - 8. Name and title of appropriate Specification Section.
 - 9. Drawing number and detail references, as appropriate.

- E. Unless otherwise agreed to or indicated in individual Specification Sections, submit a sufficient number to allow for adequate Contractor, Subcontractor, supplier, manufacturer and fabricators distribution plus two sets to be retained by Owner's Representative.
- F. Electronic files will not be provided by the Owner.
- G. Reproduction of the Contract Documents as a submittal is not allowed.

3.3 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of Work or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, wiring diagrams, schedules, illustrations, or performance curves.
 - 1. Mark each copy to show or delineate pertinent materials, products, models, applicable choices, or options. Where Product Data includes information on several products that are not required, clearly mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 - g. Notation of dimensions and required clearances.
 - h. Indicate performance characteristics and capacities.
 - i. Indicate wiring diagrams and controls.
 - 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- B. Required Copies and Distribution: Same as denoted in sub-section 3.2, E.

3.4 SAMPLES

A. Procedure :

1. Submit Samples of sufficient size, quantity, cured and finished and physically identical to the proposed product or material. Samples include partial or full sections or range of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches denoting color, texture, and/or pattern.
 - a. Mount or display Samples in the manner to facilitate review of qualities indicated. Include the following:
 - 1) Specification Section number and reference.
 - 2) Generic description of the Sample.
 - 3) Sampling source.
 - 4) Product name or name of manufacturer.
 - 5) Compliance with recognized standards.
 - 6) Availability and delivery time.
2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variations in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show the approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, assembly details, connections, operation, and similar construction characteristics.
 - c. Refer to other sections for Samples to be returned to Contractor for incorporation into the Work. Such Samples must be undamaged at time of installation. On the transmittal, indicate special requests regarding disposition of Sample submittals.
 - d. Samples not incorporated into the Work, or otherwise not designated as Owner property, remain the property of Contractor and shall be removed from the Project site prior to Substantial Completion.

3. Color and Pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to Owner's Representative for review and selection.
 4. Number Required: Submit three (3) samples of each item. Two will be returned to Contractor with one to Owner's Representative.
- B. When specified, erect field Samples and mock-ups at the Project site to illustrate products, materials, or workmanship and to establish standards by which completed Work shall be judged.
 - C. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of the Work. Sample sets may be used to obtain final acceptance of the Work associated with each set.

3.4 QUALITY CONTROL SUBMITTALS

- A. Prior to start of Work, Contractor shall submit lists of material submittals, design submittals and sample requirements.
- B. Submit quality control submittals, including design data, certifications, manufacturer's field reports, and other quality control submittals as required under other sections of the Contract Documents.
- C. When other sections of the Contract Documents require manufacturer's certification of a product, material, and/or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
- D. Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the represented company.
- E. Requirements for submittal of inspection and test reports are specified in other sections of the Contract Documents.

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SECTION 01 40 00

QUALITY REQUIREMENTS

PART I - GENERAL

1.1 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances
- C. References.
- D. Manufacturers' field services.
- E. Examination.
- F. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Owner's Representative before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Owner's Representative before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. E329: Standard Specification for Agencies Engaged in Construction Inspection and/or Testing
- B. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- C. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.
- D. Obtain copies of standards where required by product Specification Sections.
- E. When specified reference standards conflict with Contract Documents, request clarification from Owner's Representative before proceeding.
- F. Neither contractual relationships, duties nor responsibilities of parties in Contract nor those of Owner's Representative shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.5 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

- B. Submit qualifications of observer to Owner's Representative 30 days in advance of required observations. Observer subject to approval of Owner's Representative.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

--END OF SECTION 01 40 00--

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SECTION 01 45 23

TESTING AND INSPECTING SERVICE

PART 1 – GENERAL

1.1 TESTS

- A. Prior to start of Work, Contractor shall submit list of test requirements.
- B. Contractor shall notify the Owner and Testing Laboratory a sufficient time in advance of the manufacture of material to be supplied to him under the Contract Documents, which must by terms of the Contract be tested, in order that the Testing Laboratory may arrange for the testing of same at the source of supply.
- C. Material shipped from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from the Owner that such testing and inspection will not be required, shall not be incorporated in the work.
- D. The Owner may select additional tests other than those outlined in these Specifications. The Contractor will be reimbursed for any additional testing costs not defined in the Specifications.

1.2 TEST REPORTS

- A. Two copies of each test report will be forwarded to the Owner by the Testing Laboratory. Such reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Test reports will show the specified design strength. They will also state definitely whether or not the material or materials tested comply with requirements.

1.3 OWNER'S INSPECTOR

- A. The work of construction in all stages of progress will be subject to the personal continuous observation of the inspector. He shall have free access to any or all parts of the work at any time. Furnish the inspector reasonable facilities for obtaining such information as necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.

1.4 SPECIFIC TESTS AND INSPECTIONS

A. Any and all applicable tests and inspections noted below but not limited to, will be required to the extent that the work represented thereby is required by the Contract.

1. Concrete strength tests
2. Compaction tests
3. Pressure tests
4. Pump tests
5. Disinfections

PART 2 – PRODUCTS - Not Used

PART 3 – EXECUTION – Not Used

--END OF SECTION 01 45 23--

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SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section covers the work necessary to move in personnel and equipment, set up offices, and related facilities necessary to prepare the work area for construction. Temporary facilities and controls required for this work include, but are not necessarily limited to:
1. Temporary utilities such as water, electricity, and telephone;
 2. Sanitary facilities.

1.2 PRODUCT HANDLING

- A. Protection:
1. Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the work.

PART 2 - PRODUCTS

2.1 UTILITIES

- A. General:
1. Make available for use by all workers and subcontractors employed on the project.
 2. Maintain utilities in a proper, safe operating and sanitary condition.
 3. Upon completion of contract, remove such temporary utilities from premises.
 4. "Provide," as used below, means at Contractor's expense.
- B. Temporary water:
1. Make all arrangements and pay all operating costs for temporary water used during construction.
- C. Temporary electricity:

1. Make all arrangements and pay all operating costs for electrical power, both temporary and permanent, used during construction, testing, and up to the time of final acceptance by the Owner.
 2. Pay for all services associated with the temporary power.
- D. Temporary lighting:
1. Provide lighting for general security.
 2. Provide work lighting such that work can be properly and safely performed.
 3. Provide warning and barricade lighting.
 4. Provide temporary lighting as may be required by governing agencies.

2.2 SANITARY FACILITIES

- A. Toilet facilities shall be provided at each construction jobsite. Provisions shall be made for routinely servicing and disposing of the sewage in accordance with Federal, Commonwealth, and local health regulations. Toilets shall be maintained in a clean and sanitary condition with an adequate supply of toilet paper and holders for all stools. Provisions shall be made for scheduled routine inspection and maintenance of all toilet facilities.
- B. An adequate supply of potable water shall be provided in all places of employment. Drinking water shall be obtained from sources approved by Federal, Commonwealth, or local health authorities, and dispensed in a manner acceptable to the Owner. Containers used to dispense or distribute drinking water shall not be used for any other purpose. Use of common cups or glasses is prohibited.

PART 3 - EXECUTION

3.1 REMOVAL

- A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the Work; remove all such temporary facilities and controls as rapidly as progress of the Work will permit or as directed by the Owner's Representative.

--END OF SECTION 01 50 00--

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SECTION 01 56 00

TEMPORARY BARRIERS AND ENCLOSURES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing, installing, and maintaining barriers to protect existing facilities and the public from construction operations.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Material may be new or used, but shall be suitable for intended purpose. Fences and barriers shall be structurally adequate and neat in appearance.

2.2 FENCING

- A. Safety Barrier Fence: Orange plastic fence, minimum height, 4 feet.

2.3 BARRICADES AND SIGNS

2.4 LUMBER

- A. Free of nails, large knot holes and splinters.

2.5 BARRIER TAPE

- A. Banner Guard, imprinted with "CAUTION: CONSTRUCTION AREA", manufactured by Reef Industries, Inc., Houston, Texas, or approved equal.

PART 3 - EXECUTION

3.1 PROTECTION OF PUBLIC

- A. Fence, barricade, or otherwise block off the immediate work area to prevent unauthorized entry.
- B. Erect and maintain barricades, lights, danger signals, and warning signs in accordance with MUTCD-2003.

- C. Illuminate barricades and obstructions at night; keep safety lights burning from sunset to sunrise.
- D. Adequately barricade and post open cuts in or adjacent to thoroughfares.
- E. Protect pedestrian traffic by guardrails or fences.
- F. When pedestrian traffic is detoured onto a roadway, provide temporary walkways with protection as required at ends and overhead. For walkways, use lumber running parallel to direction of traffic movement and provide ramps at changes of elevation.
- G. Cover pipes, hoses, and power lines crossing sidewalks and walkways with troughs using beveled edge boards.
- H. Erect and maintain sufficient detour signs at road closures and along detour routes.

3.2 BARRIER TAPE

- A. Install where directed by Owner's Representative. Keep a minimum of two rolls on site at all times.

3.3 REMOVAL

- A. Completely remove barriers no longer needed when approved by Owner's Representative.

--END OF SECTION 01 56 00--

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SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.
- F. Equipment electrical characteristics and components.

1.2 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting Specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. Owner's Representative will consider requests for Substitutions only within 30 days after date of Owner-Contractor Agreement.

- A. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- C. A request constitutes a representation that Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide same warranty for Substitution as for specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
 - 6. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
 - 7. Substitution Submittal Procedure.
 - 8. Submit two copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - 9. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 - 10. Owner's Representative will notify Contractor in writing of decision to accept or reject request.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION – Not Used

--END OF SECTION 01 60 00--

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SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Starting of systems.
- C. Demonstration and instructions.
- D. Testing, adjusting, and balancing.
- E. Project record documents.
- F. Operation and maintenance data.
- G. Manual for equipment and systems.
- H. Spare parts and maintenance products.
- I. Product warranties and product bonds.
- J. Maintenance service.
- K. Examination.
- L. Preparation.
- M. Execution.
- N. Cutting and patching.
- O. Protecting installed construction.
- P. Final cleaning.

1.2 CLOSEOUT PROCEDURES

- A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
1. Submit maintenance manuals, Project record documents, and other similar final record data in compliance with this Section.
 2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
 3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
 4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
 5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
 6. Make final change-over of locks eliminating construction master-key system and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
 7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
 8. Perform final cleaning according to this Section.
- B. Substantial Completion Inspection:
1. When Contractor considers Work to be substantially complete, submit to Owner and/or their Representative:
 - a. Written certificate that Work, or designated portion, is substantially complete.
 - b. List of items to be completed or corrected (initial punch list).

2. Within seven days after receipt of request for Substantial Completion, Owner and/or their Representative will make inspection to determine whether Work or designated portion is substantially complete.
3. Should Owner and/or their Representative determine that Work is not substantially complete:
 - a. Owner and/or their Representative will promptly notify Contractor in writing, stating reasons for its opinion.
 - b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Owner and/or their Representative.
 - c. Owner and/or their Representative will reinspect Work.
 - d. Redo and Inspection of Deficient Work: Repeated until Work passes Owner and/or their Representative's inspection.
4. When Owner and/or their Representative finds that Work is substantially complete, Owner's Representative will:
 - a. Prepare Certificate of Substantial Completion on Owner's prescribed form, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Owner and/or their Representative (final punch list).
 - b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
5. After Work is substantially complete, Contractor shall:
 - a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
 - b. Complete Work listed for completion or correction within time period stipulated.
 - c. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
6. When Contractor considers Work to be complete, submit written certification that:

- a. Contract Documents have been reviewed.
 - b. Work has been examined for compliance with Contract Documents.
 - c. Work has been completed according to Contract Documents.
 - d. Work is completed and ready for final inspection.
7. Submittals: Submit following:
- a. Final punch list indicating all items have been completed or corrected.
 - b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
 - d. Accounting statement for final changes to Contract Sum.
 - e. Contractor's affidavit of payment of debts and claims.
 - f. Contractor affidavit of release of liens.
 - g. Consent of surety to final payment.
8. Perform final cleaning for Contractor-soiled areas according to this Section.
- C. Final Completion Inspection:
- 1. Within seven days after receipt of request for final inspection, Owner and/or their Representative will make inspection to determine whether Work or designated portion is complete.
 - 2. Should Owner and/or their Representative consider Work to be incomplete or defective:
 - a. Owner and/or their Representative will promptly notify Contractor in writing, listing incomplete or defective Work.
 - b. Contractor shall remedy stated deficiencies and send second written request to Owner and/or their Representative that Work is complete.

- c. Owner and/or their Representative will reinspect Work.
- d. Redo and Inspection of Deficient Work: Repeated until Work passes Owner and/or their Representative's inspection.

1.3 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of various equipment and systems.
- B. Notify Owner and/or their Representative seven days prior to startup of each item.
- C. Eight (8) hours of start-up and owner's training to be provided by a factory authorized and certified technician.
- D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- E. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.
- F. Verify that wiring and support components for equipment are complete and tested.
- G. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.
- H. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.
- I. Submit a written report according to Section 01 33 00 - Submittal Procedures Part 3.5 that equipment or system has been properly installed and is functioning correctly.

1.4 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instructed by authorized manufacturer's representative who is knowledgeable about the Project.

- C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- D. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

1.5 TESTING, ADJUSTING, AND BALANCING

- A. The Contractor shall be responsible for testing, adjusting and balancing by an Owner approved independent firm having five (5) years minimum experience.
- B. Reports will be submitted by independent firm to Owner and/or their Representative indicating observations and results of tests and indicating compliance or noncompliance with requirements of Contract Documents.
- C. The Contractor shall make any and all necessary repairs, adjustments, and replacements until performance has been demonstrated to the satisfaction of the Owner. The Contractor shall bear the cost of any repair, adjustment, or replacement.

1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, product data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.

- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates used.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
 - 1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
 - 2. Include locations of concealed elements of the Work.
 - 3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
 - 4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
 - 5. Identify and locate existing buried or concealed items encountered during Project.
 - 6. Measured depths of foundations in relation to finish main floor datum.
 - 7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 9. Field changes of dimension and detail.
 - 10. Details not on original Drawings.

- G. Submit PDF electronic files of marked-up documents to Owner's Representative with claim for final Application for Payment.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable plastic covers, and a CD with electronic PDF files of complete package.
- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project.
- C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- E. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - g. Safety precautions to be taken when operating and maintaining or working near equipment.
 - 3. Part 3: Project documents and certificates, including the following:

- a. Shop Drawings and product data.
- b. Air and water balance reports.
- c. Certificates.
- d. Photocopies of warranties and bonds.

1.8 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before Substantial Completion. Owner's Representative will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten (10) days after acceptance.
- C. Submit one copy of completed volumes fifteen (15) days prior to final inspection. Draft copy will be reviewed and returned after final inspection, with Owner's Representative's comments. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes within ten days after final inspection.
- E. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- F. Include color-coded wiring diagrams as installed with wire numbers noted.
- G. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer and special operating instructions.
- H. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- I. Include servicing and lubrication schedule and list of lubricants required.
- J. Include manufacturer's printed operation and maintenance instructions.

- K. Include sequence of operation by controls manufacturer.
- L. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- M. Include control diagrams by controls manufacturer as installed.
- N. Include Contractor's coordination drawings with color-coded piping diagrams as installed.
- O. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- P. Additional Requirements: As specified in individual product Specification Sections.

1.9 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.
- B. Deliver to Project Site and place in location as directed by Owner; obtain receipt prior to final payment.

1.10 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.
- B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include table of contents and assemble in three D side ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time of Submittals:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.11 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in Specification Sections during warranty period.
- B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.
- D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.

- D. Verify that utility services are available with correct characteristics and in correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Owner's Representative's before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
 - 1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
 - 2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
 - 3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Owner's Representative's for final decision.
- E. Allow for expansion of materials and building movement.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.

1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.
1. Refer questionable mounting heights choices to Owner's Representative's for final decision.
 2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.
- H. Adjust operating products and equipment to ensure smooth and unhindered operation.
- I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.4 CUTTING AND PATCHING

- A. Employ skilled and experienced installers to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting:
1. Structural integrity of element.
 2. Efficiency, maintenance, or safety of element.
 3. Visual qualities of sight-exposed elements.
 4. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:
1. Fit the several parts together, to integrate with other Work.
 2. Uncover Work to install or correct ill-timed Work.
 3. Remove and replace defective and nonconforming Work.
 4. Remove samples of installed Work for testing.

- D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products according to requirements of Contract Documents.
- G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- H. Identify hazardous substances or conditions exposed during the Work to Owner's Representative's for decision or remedy.

3.5 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

3.6 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment.
- B. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.
- C. Clean filters of operating equipment.

- D. Clean Site; sweep paved areas, rake clean landscaped surfaces.
- E. Remove waste and surplus materials, rubbish, and construction facilities from Site.

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SECTION 01 71 13

MOBILIZATION AND DEMOBILIZATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Mobilization shall consist of preparatory work and operation, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all offices, buildings, and other temporary facilities necessary for work on the project; for securing all permits, preparation and providing submittals and schedules; for signs; and for all other work and operations which must be performed, or cost incurred, prior to beginning work on the various items on the project site.
- B. Demobilization shall consist of movement of personnel and the removing and disposing of all equipment, materials, and supplies remaining upon completion of the work. And for final close-up, submittal of all test results, O&M manual.
- C. Costs of Mobilization and Demobilization are listed as one item in the Contractor's Bid for the Project.

PART 2 - PRODUCTS - Not used

PART 3 - EXECUTION - Not used

--END OF SECTION 01 71 13--

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SECTION 01 74 00

CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Maintain work areas free from accumulations of waste, debris, dust and mud caused by Contractor's operations.
- B. At completion of Work, remove all waste materials, tools, equipment, machinery, surplus materials and clean all exposed surfaces; leave property clean and ready for occupancy, leave all rights of ways in a condition equal to that at the beginning of Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Contractor to arrange with the Owner of water for cleanup, metered and pay all costs.
- B. Water for construction may not available within the site. The Contractor shall furnish water from a source outside the site.

PART 3 - EXECUTION

3.1 DURING CONSTRUCTION

- A. Execute cleaning to ensure that any buildings affected, grounds and especially streets and public properties are maintained free from accumulation of waste materials, dust, mud and debris.
- B. Where required, wet down surfaces to lay dust and prevent the blowing of dust to nearby residences or public properties.
- C. The Contractor shall keep all streets clean and free of dust, mud and debris resulting from his own operations. Daily cleanup throughout the job will be necessary as the Contractor progresses with his work, but extra precautions in cleanup shall be made prior to weekends and holidays.

- D. All waste materials, debris and rubbish shall be disposed of at sites to be chosen by Contractor. Prior to dumping on any private property, a letter allowing such dumping shall be obtained from the property owner and presented to the Owner's Representative. At the completion of work, a letter from affected property owners will be required releasing the Contractor, and the Owner from future liability.
- E. If the Contractor does not properly clean up (in the opinion of the Owner's Representative or the Owner), then either the Owner's Representative or the Owner shall have the option of using outside equipment to perform the work and such cost will be withheld from the Contract.
- F. See also the General Conditions for any withholds that may be retained when cleanup by the Contractor is found to be unsatisfactory.

3.2 FINAL CLEANING

- A. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from site-exposed interior and exterior finished surfaces.
- B. Repair, patch and touch up marred surfaces to match adjacent finishes.
- C. All dust, mud, spoils, and construction debris shall be removed from all roadways, ditches, shoulders, and private property (fills or spoils placed on private property at Owner's written request accepted).

--END OF SECTION 01 74 00--

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SECTION 02 00 00

EXISTING CONDITIONS

PART 1 - GENERAL

1.1 RELATED INFORMATION

- A. Related information and requirements are included in the General and Supplementary Conditions with regard to existing underground utilities.
- B. Existing Underground Structures - Section 02 00 50.

1.2 INFORMATION ON SITE CONDITIONS

- A. All information obtained by the Engineer regarding site conditions, subsurface information, groundwater elevations, existing construction of site facilities, and existing underground utilities and similar data are shown on the Plans.
- B. No investigations were conducted by the Engineer of subsurface conditions for the purpose of study and design, and neither the Owner nor the Engineer assumes any responsibility whatever in respect to the sufficiency or accuracy, or of the other investigations that have been made, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated are representative of those existing throughout such area, or that unlooked for developments may not occur.
- C. Test borings were not done by the Engineer to investigate subsurface conditions. The Contractor may perform its own independent soil borings to ascertain subsurface conditions. No representation of existing soil conditions is made herein.
- D. Information derived from inspection of logs of test borings, of topographic maps, or from Plans showing locations of utilities and structures will not in any way relieve the Contractor from any risk, or from properly examining the site and making such additional investigations as he may elect, or from properly fulfilling all the terms of the Contract Documents.

1.3 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall satisfy himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor,

water, electric power, roads, and uncertainties of weather, river stages, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment facilities needed preliminary to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this contract.

- B. The Contractor further shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials to be encountered from inspecting the site, any exploratory work done by the Owner, as well as from information presented by the Plans and Specifications made a part of this contract. Any failure by the Contractor to acquaint himself with all the available information will not relieve him from responsibility for properly estimating the difficulty or cost of successfully performing the work.
- C. The Contractor shall anticipate underground obstructions such as utility lines, concrete, water table, soil conditions and debris. No extra payment will be allowed for the removal, replacement, repair or possible increased cost caused by underground obstructions. Any such lines or obstructions indicated on the map show only the approximate location and must be verified in the field by the Contractor. The Owner and their Representative will endeavor to familiarize the Contractor with all known underground obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating all underground obstructions.
- D. The Contractor shall note that many of the existing roads and streets are residential in character and that heavy truck and equipment operations may cause roadway damage in excess of normal usage. Damage caused to the streets by Contractor's operations shall be repaired to the satisfaction of the Owner and their Representative.

1.4 ADDITIONAL INFORMATION

- A. Prior to bidding, bidders may make their own subsurface investigations subject to time schedules and arrangements approved in advance by the Owner's Representative. Before any subsurface test holes are excavated, obtain permits from the Owner to perform such work.

PART 2 - PRODUCTS - Not used

PART 3 - EXECUTION - Not used

--END OF SECTION 02 00 00--

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SECTION 02 00 50

EXISTING UNDERGROUND STRUCTURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Related requirements specified elsewhere:

1. See Division 1 regarding general conditions specific to the Contract. See also Section 02 00 00 regarding site conditions.
2. See also Plans for location of utilities and underground structures as they are believed to exist.

B. Construction Requirements:

1. The locations of utility lines and appurtenances as represented on the Plans were derived from field surveys, record drawings, construction drawings, and schematic drawings. Consequently, the location of all underground utilities is, at best, approximate only. The Contractor shall notify all utility agencies and concerns (as identified below) of planned clearing, excavation or other construction operations which may damage or somehow adversely affect underground utilities within the project limits and shall request said agencies for and obtain necessary permits or clearances from them prior to undertaking construction activities.
2. The exact locations of communication cables are unknown although approximate locations are implied by cable markers and service boxes. The Contractor shall, as part of his basic responsibility, arrange for each respective communication agency to field verify the location of said cables and appurtenances by field staking prior to undertaking any excavation work.
3. In the event that utility lines are to be relocated or when utility lines which are presently in service, but the exact or approximate location of which are not indicated on the Plans are uncovered during clearing, grubbing or excavation operations, the Contractor shall notify the Owner's Representative immediately to permit ample time for necessary measures to be taken to prevent interruption of the service during the relocation or removal of the existing lines.

PART 2 - PRODUCTS

2.1 UTILITIES AFFECTED

A. Electrical/Water/Sewer

1. Commonwealth Utilities Corporation (CUC) is responsible for underground electrical, water and sewer mains. They are located at P.O. Box 501220, Saipan, MP 96950. For underground utility location, they can be contacted at the above address or called at (670) 235 7025.

B. Drainage, Roads and Streets

1. Department of Public Works (DPW) is responsible for storm drains, roads and streets. They are located at Gualo Rai, Saipan, MP 96950, and may be called at (670) 235-5827.

C. Fire Protection, Road Detours or Closure

1. For items regarding fire protection, road detours or closure, contact the Department of Public Safety, Fire Department at (670) 234 6222. Offices are normally manned.

D. Telephone/Communications Systems

1. The exact locations of communications cables are unknown although approximate locations are implied by cable markers and service boxes.
2. IT&E is responsible for underground telecommunication cables. They may be contacted at their offices in Chalan Laulau on Middle Road, and may be called at (670) 234-6100.
3. DOCOMO is responsible for underground telecommunication cables. They may be contacted at their offices in Gualo Rai on Middle Road, and may be called at (670) 488-2273.

E. Cable TV

1. Marianas Cable Vision is responsible for their overhead cable TV lines. They may be contacted at their offices in the Nauru Building, and may be called at (670) 235-4628.

2.2 TEMPORARY FACILITIES

- A. See Section 01 50 00 for description of temporary utilities and payment therefore,

and some information regarding permanent service.

PART 3 – EXECUTION

3.1 LOCATION OF UTILITIES

- A. Utility companies have been very cooperative in the past about pre-marking their facilities and making available personnel to assist in location of water, sewer, and electric facilities. If no overhead electrical power is evident, it shall be assumed to be underground.

3.2 CONTRACTOR RESPONSIBILITY

- A. The Contractor shall anticipate water, sewer and power services to each building as well as water and sewer mains in the streets to serve the various residences. It may be expected that there will be variation in location from that as shown on the Plans to the actual location. Actual location can best be determined in the field after pre-marking by the various utilities affected.
- B. No extra payment will be allowed for the removal, replacement, repair, or possible increased cost caused by inadvertent or planned interception and breaking of underground obstructions which may exist.
- C. It should be understood that the various utilities are indicated on the Plans to show only the approximate location and must be verified in the field by the Contractor. The various utilities will cooperate with the Contractor to endeavor to familiarize him with all known underground utilities obstructions, but this will not relieve the Contractor from full responsibility in anticipating and locating their actual location.

3.3 PRIOR INVESTIGATION

- A. Prior to bidding, the bidders shall make their own subsurface investigations, talk to the various utilities affected to secure, for his own information, the knowledge of each utility with the precise location of their facilities so that he may take into account in his bid the difference in location from that believed to exist to that which may actually prove to be the precise location.

--END OF SECTION 02 00 50--

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SECTION 02 41 00
DEMOLITION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work included:

Demolition required for this Work includes removal of asphalt paving, concrete slabs/pavements, valve vaults, appurtenances and miscellaneous items as shown in the Plans.

B. See Plans for items to be removed, salvaged and delivered to Owner's Yard.

C. Related work described elsewhere:

1. Existing Conditions: Section 02 00 00
2. Existing Underground Structures: Section 02 00 50

1.2 QUALITY ASSURANCE

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

1.3 JOB CONDITIONS

A. Dust control:

1. Use all means necessary to prevent the spread of dust during performance of the work of this Section.

B. Burning:

1. On-site burning will not be permitted.

C. Protection:

1. Use all means necessary to protect existing structures designated to remain and, in the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative at no additional cost to the Owner.

PART 2 - PRODUCTS - Not used

PART 3 – EXECUTION

3.1 SITE INSPECTION

- A. Prior to any demolition work, carefully inspect the site and determine the extent of work involved.
- B. Report any discrepancy to the Owner’s Representative immediately.

3.2 COORDINATION AND SCHEDULING

- A. Schedule and coordinate demolition with Owner, any public utilities or other contractors which may be involved.

3.3 SHORING AND BRACING

- A. Provide any temporary shoring or bracing which may be required during demolition.

3.4 SAFETY

- A. All work shall conform to pertinent OSHA regulations and to other local codes and ordinances as applicable.

3.5 REMOVAL OF DEBRIS

- A. Remove all debris from the site and leave the site in a neat and orderly condition.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Remove demolished materials from Project site and legally dispose of them in an approved disposal site.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.

- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

--END OF SECTION 02 41 00--

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SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1. SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Form accessories.
- C. Form stripping.

1.2. RELATED SECTIONS

- A. Section 03 20 00 - Concrete Reinforcing.
- B. Section 03 30 00 - Cast-in-Place Concrete.

1.3. REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.
- C. ACI 347 - Recommended Practice For Concrete Formwork.

1.4. DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.5. QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 347.

1.6. REGULATORY REQUIREMENTS

- A. Conform to applicable code for design, fabrication, erection and removal of formwork.

PART 2 - PRODUCTS

2.1. FORM MATERIALS

- A. Form Materials: At the discretion of the Contractor.

2.2. FORMWORK ACCESSORIES

- A. Form Ties: Removable or Snap-off type, galvanized metal or plastic, fixed or adjustable length, cone type, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.
- C. Corners: Chamfered, rigid plastic or wood strip type; $\frac{3}{4}$ x $\frac{3}{4}$ inch size; maximum possible lengths.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1. EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2. EARTH FORMS

- A. Not permitted.

3.3. ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members which are not indicated on Drawings.
- F. Provide chamfer strips on external corners of beams, columns and walls.
- G. Coordinate this section with other sections of work which require attachment of components to formwork.
- H. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Owner's Representative.

3.4 APPLICATION - FORM RELEASE AGENT

- I. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- J. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- K. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Locate and set in place items which will be cast directly into concrete.
- B. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- C. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- D. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

- E. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.7 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.
- B. Camber slabs and beams in accordance with ACI 301.

3.8 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspection and testing.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

3.9 FORM REMOVAL

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

--END OF SECTION 03 10 00--

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SECTION 03 20 00
CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Reinforcing bars.
- B. Reinforcement accessories.

1.2 RELATED SECTIONS

- A. Section 03 10 00 - Concrete Forming and Accessories.
- B. Section 03 30 00 - Cast-in-Place Concrete.

1.3 REFERENCES

- A. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 318 - Building Code Requirements for Structural Concrete.
 - 3. ACI SP-66 - ACI Detailing Manual.
- B. American Society for Testing and Materials:
 - 1. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- C. American Welding Society:
 - 1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.
- D. Concrete Reinforcing Steel Institute:
 - 1. CRSI - Manual of Standard Practice.

2. CRSI - Placing Reinforcing Bars.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Reinforcing steel shop drawings: submit shop drawings for review prior to fabrication.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301, ACI SP-66 and ACI 318.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade; deformed billet steel bars.

2.2 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.
- C. Reinforcing Splicing Devices: Mechanical threaded type; full tension; sized to fit joined reinforcing.

2.3 FABRICATION

- A. Fabricate concrete reinforcement in accordance with ACI 318.
- B. Do not weld reinforcement.
- C. Bar splicing is not applicable.

PART 3 - EXECUTION

3.1 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Maintain concrete cover around reinforcement as indicated on Drawings.

--END OF SECTION 03 20 00--

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:

1. All cast-in-place concrete.

1.2 REFERENCES

A. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 305 - Hot Weather Concreting.
3. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society for Testing and Materials:

1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
5. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
6. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
7. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
8. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

9. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
10. ASTM D1190 - Standard Specification for Concrete Joint Sealer, Hot-Applied Elastic Type.
11. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
12. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Design Data:
 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - b. Air entrained concrete work.
 2. Identify mix ingredients and proportions, including admixtures.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I Portland type.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

- A. Furnish materials in accordance with local standards.
- B. Air Entrainment: ASTM C260.
- C. Chemical: ASTM C494 Type A - Water Reducing, Type B – Retarding
- D. Fly Ash: ASTM C618 Class F.

2.3 ACCESSORIES

- A. Non-Shrink Grout: ASTM C1107, Grade A

2.4 JOINT DEVICES AND FILLER MATERIALS

- A. Joint Filler: ASTM D1751.
- B. Expansion and Contraction Joint Devices: ASTM B221

2.5 CONCRETE MIX

- A. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C94.
- B. Select proportions for normal weight concrete in accordance with ACI 301 trial mixtures.
- C. Provide concrete to the following criteria:
 - 1. Concrete Fill and Pipe Encasements: Unless noted otherwise in the plans, design for 2,000 psi at 28 days using 1-inch maximum size of aggregate, and 4-inch maximum slump.
 - 2. Footings, Pipe Supports and Other Miscellaneous Items: Unless noted otherwise in the plans, design for 3,000 psi at 28 days using 3/4-inch maximum size of aggregate, and 3-inch maximum slump.
- D. Admixtures: Include admixture types and quantities indicated in concrete mix designs approved through submittal process.
 - 1. Air entraining admixture is required. Add air entraining agent to normal weight concrete mix.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify requirements for concrete cover over reinforcement.
- B. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PLACING CONCRETE

- A. Adding water to the previously batched mix in the truck is not permissible and will only be allowed with permission by the Owner's Representative on a case by case basis.
- B. Place concrete in accordance with ACI 301, ACI 318.
- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
- D. Repair vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 12 inches and seal watertight.
- E. Separate slabs on grade from vertical surfaces with 1/2 inch thick joint filler.
- F. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- G. Place concrete continuously between predetermined expansion, control, and construction joints.
- H. Screed slabs on grade level, maintaining surface flatness of maximum ¼ inch in 10 feet.

3.3 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.4 FIELD QUALITY CONTROL

- A. Contractor shall have tests made by independent laboratory to ensure compliance with Specifications. Concrete testing will be paid for by the Contractor.
- B. Submit proposed mix design to testing firm for review prior to commencement of Work.
- C. Tests of cement and aggregates shall be performed to ensure conformance with specified requirements.
- D. Three concrete test cylinders will be taken for every footing placed.
- E. One slump test will be taken for each set of test cylinders taken.
- F. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.5 PATCHING

- A. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Owner's Representative upon discovery.
- B. Patch imperfections in accordance with ACI 301.

3.6 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by Owner's Representative.

--END OF SECTION 03 30 00--

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SECTION 31 05 13

SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Subsoil materials.
 - 2. Topsoil materials.

- B. Related Sections:
 - 1. Section 31 05 16 - Aggregates for Earthwork.
 - 2. Section 31 23 23 - Fill.
 - 3. Section 31 23 33 – Trenching and Backfilling.
 - 4. Section 31 25 13 - Erosion Controls.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT - Not Used.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

- B. ASTM International:
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - 3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.
- C. Materials Source: Submit name of imported materials source.
- D. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Furnish each subsoil topsoil material from single source throughout the Work.
- B. Perform Work in accordance with CNMI's Department of Public Work's standard.
- C. Maintain one copy on site.

PART 2 - PRODUCTS

2.1 SUBSOIL MATERIALS

- A. Subsoil Type S1: Conforming to CNMI's Department of Public Work's standard.
- B. Subsoil Type S2:
 - 1. Select or local borrow.
 - 2. Graded.
 - 3. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - 4. Conforming to ASTM D2487 Group Symbol CL.

2.2 TOPSOIL MATERIALS

- A. Topsoil Type S3: Conforming to CNMI's Department of Public Work's standard.
- B. Topsoil Type S4:
 - 1. Excavated and reused material.
 - 2. Graded.

3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
 - a. Screening: Single screened.
 4. Conforming to ASTM D2487 Group Symbol OH.
- C. Topsoil Type S5:
1. Imported borrow.
 2. Friable loam.
 3. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.
 - a. Screening: Single screened.
 4. Acidity range (pH) of 5.5 to 7.5.
 5. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.
 6. Conforming to ASTM D2487 Group Symbol OH.

1.6 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing and analysis of soil material.
- B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698, ASTM D1557 or AASHTO T180.
- C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698, ASTM D1557 or AASHTO T180.
- D. When tests indicate materials do not meet specified requirements, change material and retest.
- E. Furnish materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.
- B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.
- C. Remove excess excavated materials, subsoil, and topsoil not intended for reuse, from site.
Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.
- D. Trench Excavation: Trenches shall be of necessary width for proper laying of pipe, shall be as nearly vertical as practicable. Bottoms of trenches shall be accurately graded to provide proper bedding for each section of pipe on undisturbed soil at every point along its entire length. When hard materials are encountered, trenches shall be cut to the required depth necessary for proper bedding of the pipe or appurtenance. Trenching or excavation shall be considered “unclassified” and that there shall be no extra compensation for hard rock excavation. The width of the trench shall be as shown on the plan.
 - 1. Water Lines: Trenches for waterlines shall be at the depths indicated. Interference of waterlines with other utilities shall be avoided. Water lines shall be graded so as to avoid air pockets.

3.2 STOCKPILING

- A. Stockpile materials on site at locations designated by Owner’s Representative.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Stockpile topsoil 8 feet high maximum.
- E. Prevent intermixing of soil types or contamination.
- F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

- G. Stockpile unsuitable or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

1.7 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.
- B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

--END OF SECTION 31 05 13--

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SECTION 31 05 16

AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Coarse aggregate materials.
2. Fine aggregate materials.

B. Related Sections:

1. Section 31 05 13 - Soils for Earthwork: Fill and grading materials.
2. Section 31 23 23 - Fill.
3. Section 31 23 33 – Trenching and Backfilling.
4. Section 31 25 13 - Erosion Controls.
5. Section 32 11 23 - Aggregate Base Courses.
6. Section 33 10 01 - Water Distribution System.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT - Not Used.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft³.
3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 6,000 ft-lbf/ft³.
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory
- C. Materials Source: Submit name of imported materials suppliers.
- D. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.
- B. Perform Work in accordance with CNMI Department of Public Work's standard.
- C. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate Type A1: Conforming to CNMI's Department of Public Work's standard.

- B. Coarse Aggregate Type A2 (Gravel):
 - 1. Coarse aggregate may be used as substitution for base course under sidewalk.
 - 2. Sieve Size, 1inch (100% passing), ½ inch (5% passing) with liquid limit of not more than 25; plasticity index of not more than five in accordance with ASTM D4318.
- C. Coarse Aggregate Type A3, Base Course; free of shale, clay, friable material and debris; graded in accordance with ASTM C136, ASTM D2487 within the following limits:

Sieve Size	Percent Passing
2 inches	100
1 inch	95
¾ inch	95 to 100
5/8 inches	75 to 100
3/8 inches	55 to 85
No. 4	35 to 60
No. 16	15 to 35
No. 40	10 to 25
No. 200	5 to 10

- D. Aggregate Type A4 (Pea Gravel): Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C136, ASTM D2487 Group Symbol GM or GC; to the following limits:
 - 1. Minimum Size: 1/4 inch.
 - 2. Maximum Size: 5/8 inch.

2.2 FINE AGGREGATE MATERIALS

- A. Fine Aggregate Type A5: Conforming to CNMI’s Department of Public Work’s standard.
- B. Fine Aggregate Type A6 (Sand): Natural river or bank sand; washed;] free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with

ASTM C136 or ASTM D2487 Group Symbol SW, SP, SM or SC; within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

- C. Blended Aggregate Type A7.

2.3 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing and inspection services.
- B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, AASHTO T180, ASTM D4318 or ASTM C136.
- C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698, ASTM D1557, AASHTO T180, ASTM D4318 or ASTM C136.
- D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavate aggregate materials from on-site locations designated by Owner's Representative as specified in Section 31 22 13.
- B. Stockpile excavated material meeting requirements for coarse aggregate materials and fine aggregate materials.
- C. Remove excess excavated materials, coarse aggregate materials and fine aggregate materials not intended for reuse, from site.

- D. Remove excavated materials not meeting requirements for coarse aggregate materials and fine aggregate materials from site.

3.2 STOCKPILING

- A. Stockpile materials on site at locations indicated designated by Owner's Representative.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- E. Stockpile hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

--END OF SECTION 31 05 16--

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SECTION 31 10 00

SITE CLEARING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removing surface debris.
2. Removing designated paving, curbs, and utilities.
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned utilities.
5. Excavating topsoil.

B. Related Sections:

1. Section 02 00 00: Existing Conditions
2. Section 02 00 50: Existing Underground Structures
3. Section 02 41 00: Demolition

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT – Not used.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

1.4 QUALITY ASSURANCE

- A. Conform to applicable code for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.

- B. Perform Work in accordance with CNMI Department of Public Works' standard.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 02 00 00 – Existing Conditions: Verification of existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.
- C. Identify salvage area for placing removed materials.

3.2 PREPARATION

- A. Call Local Utility Line Information service at CUC 235-7025, IT&E 234-6100 and MCV 235-4628 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

- A. Locate, identify, and protect utilities indicated to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping as specified in Section 01 50 00 - Temporary Facilities and Controls.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.4 CLEARING

- A. Clear areas required for access to site and execution of Work to minimum depth of 12 inches.
- B. Remove trees and shrubs within marked areas. Remove stumps, main root ball, root system to depth of 48 inches and surface rock.

- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Remove paving, curbs, and utilities as indicated on Drawings. Neatly saw cut edges at right angle to surface.
- C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- E. Do not burn or bury materials on site. Leave site in clean condition.

--END OF SECTION 31 10 00--

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SECTION 31 22 13

ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring, compacting, and site for site structures and building pads.

B. Related Sections:

1. Section 02 41 00 – Demolition.
2. Section 31 05 13 - Soils for Earthwork: Soils for fill.
3. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
4. Section 31 10 00 - Site Clearing: Excavating topsoil.
5. Section 31 23 16 - Excavation.
6. Section 31 23 23 - Fill.
7. Section 31 23 33 – Trenching and Backfilling: Trenching and backfilling for utilities.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT – Not Used.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
3. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft³ (2,700 kN-m/m³)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.
- C. Materials Source: Submit name of imported materials suppliers.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

- B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.
- B. Perform Work in accordance with CNMI Department of Public Work's standard.
- C. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Type as specified in Section 31 05 13.
- B. Subsoil Fill: Type as specified in Section 31 05 13.
- C. Structural Fill: Type as specified in Section 31 05 13 and 31 05 16.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 02 00 00 - Existing Conditions: Verification of existing conditions before starting work.
- B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

- A. Call Local Utility Line Information service at CUC 235-7025, IT&E 234-6100 and MCV 235-4628 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum.
- C. Protect utilities indicated to remain from damage.

- D. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.
- E. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, marked areas, entire site, without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Stockpile material on impervious material or 36 mil Hypalon material and cover over with same material, until disposal.
- D. Remove excess topsoil not intended for reuse, from site.

3.4 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.
- B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.
- C. When excavating through roots, perform Work by hand and cut roots with sharp axe.
- D. Remove excess subsoil not intended for reuse, from site.
- E. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.
- F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

- A. Fill areas to contours and elevations with unfrozen materials.
- B. Place fill material in continuous layers and compact in accordance with schedule at end of this section.

- C. Maintain optimum moisture content of fill materials to attain required compaction density.
- D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 feet, unless noted otherwise.
- E. Make grade changes gradual. Blend slope into level areas.
- F. Repair or replace items indicated to remain damaged by excavation or filling.

3.6 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.7 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Perform laboratory material tests in accordance with ASTM D1557.
- C. Perform in place compaction tests in accordance with the following:
 - 1. Density Tests: ASTM D1556, ASTM D2167 or ASTM D2922.
 - 2. Moisture Tests: ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Frequency of Tests:

3.8 SCHEDULES

- A. Structural Fill:
 - 1. Fill Type: To subgrade elevation indicated in the Drawing.
 - 2. Compact uniformly to minimum 95 percent of maximum density.

B. Previous Structural Fill:

1. Fill Type: To subgrade elevation indicated in the Drawing.
2. Compact uniformly to minimum 95 percent of maximum density.

C. Subsoil Fill:

1. Fill Type: To subgrade elevation indicated in the Drawing.
2. Compact uniformly to minimum 95 percent of maximum density.

D. Topsoil Fill:

1. Fill Type: To subgrade elevation indicated in the Drawing.
2. Compact uniformly to minimum 90 percent of maximum density.

--END OF SECTION 31 22 13--

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SECTION 31 23 16

EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil densification.
2. Excavating for building foundations.
3. Excavating for paving, roads, and parking areas.
4. Excavating for slabs-on-grade.
5. Excavating for site structures.
6. Excavating for landscaping.

B. Related Sections:

1. Section 31 05 13 - Soils for Earthwork: Stockpiling excavated materials.
2. Section 31 05 16 - Aggregates for Earthwork: Stockpiling excavated materials.
3. Section 31 23 23 - Fill.
4. Section 31 23 33 – Trenching and Backfilling: Excavating for utility trenches.
5. Section 31 25 13 - Erosion controls.
6. Section 33 10 01 - Water Distribution System.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT - Not Used.

1.3 REFERENCES

A. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - B. Local utility standards when working within 24 inches of utility lines.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.
- C. Shop Drawings: Indicate soil densification grid for each size and configuration footing requiring soils densification.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with CNMI Department of Public Work's standard.
- B. Maintain one copy of document on site.

1.6 QUALIFICATIONS

- A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in the CNMI.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 PREPARATION

- A. Call Local Utility Line Information service at CUC 235-7025, IT&E 234-6100 and MCV 235-4628 not less than three working days before performing Work.
 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum.

- C. Protect utilities indicated to remain from damage.
- D. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 EXCAVATION

- A. Underpin adjacent structures which may be damaged by excavation work.
- B. Excavate subsoil to accommodate building foundations, slabs-on-grade, paving and site structures, and construction operations.
- C. Excavate to working elevation for piling work.
- D. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 31 23 23 and Section 31 23 33.
- E. Slope banks with machine to angle of repose or less until shored.
- F. Do not interfere with 45 degree bearing splay of foundations.
- G. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- H. Trim excavation. Remove loose matter.
- I. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. Remove larger material as specified in Section 31 23 23.
- J. Notify Owner's Representative of unexpected subsurface conditions.
- K. Correct areas over excavated with structural fill specified in Section 31 23 23 or as directed by Owner's Representative.
- L. Remove excess and unsuitable material from site.
- M. Repair or replace items indicated to remain damaged by excavation.

3.3 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Request visual inspection of bearing surfaces by Owner's Representative before installing subsequent work.

3.4 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

--END OF SECTION 31 23 16--

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SECTION 31 23 23

FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backfilling building perimeter to subgrade elevations.
2. Backfilling site structures to subgrade elevations.
3. Fill under slabs-on-grade.
4. Fill under paving.
5. Fill for over-excavation.

B. Related Sections:

1. Section 03 30 00 - Cast-In-Place Concrete: Concrete materials.
2. Section 31 05 13 - Soils for Earthwork: Soils for fill.
3. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
4. Section 31 23 16 - Excavation.
5. Section 31 23 33 – Trenching and Backfilling: Backfilling of utility trenches.
6. Section 33 10 01 - Water Distribution System.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT - Not Used.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft³.
2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 6,000 ft-lbf/ft³.
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods Shallow Depth.
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods Shallow Depth.
7. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for geotextile fabric indicating fabric and construction.
- C. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.
- D. Materials Source: Submit name of imported fill materials suppliers.
- E. Manufacturer's Certificate: Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with CNMI Department of Public Works' standard.
- B. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Subsoil Fill: Type S1, S2 as specified in Section 31 05 13.
- B. Structural Fill: Type S1, S2, A1, A2, A3, A7 as specified in Section 31 05 13.
- C. Granular Fill: Type A1, A2, A3, A7 as specified in Section 31 05 16.
- D. Concrete: Lean concrete and Structural concrete as specified in Section 03 30 00 with compressive strength of 2000 psi.

2.2 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, woven or non-woven.
 - 1. Substitutions: Section 01 60 00 - Product Requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- B. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.
- C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

- A. Compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural or granular fill and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify subgrade surface to depth of 6 inch.
- D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Place geotextile fabric over fill prior to placing next lift of fill.
- D. Place material in continuous layers as follows:
 - 1. Subsoil Fill: Maximum 12 inches compacted depth.
 - 2. Structural Fill: Maximum 8 inches compacted depth.
 - 3. Granular Fill: Maximum 8 inches compacted depth.
- E. Employ placement method that does not disturb or damage other work.
- F. Maintain optimum moisture content of backfill materials to attain required compaction density.
- G. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.
- H. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- I. Slope grade away from building minimum 2 percent slope for minimum distance of 10 feet, unless noted otherwise.
- J. Make gradual grade changes. Blend slope into level areas.
- K. Remove surplus backfill materials from site.
- L. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Top Surface of Backfilling Within Building Areas: Plus or minus 1 inch from required elevations.

- C. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.
- D. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Perform laboratory material tests in accordance with ASTM D1557, ASTM D698 or AASHTO T180.
- C. Perform in place compaction tests in accordance with the following:
 - 1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
 - 2. Moisture Tests: ASTM D3017.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Proof roll compacted fill surfaces under slabs-on-grade, pavers, and paving.

3.6 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.
- B. Reshape and re-compact fills subjected to vehicular traffic.

3.7 SCHEDULE

- A. Interior Slab-On-Grade:
 - 1. Fill Type, 6 inches thick, compacted to 95 percent.
 - 2. Cover with Fill Type, 2 inches thick, compact uniformly to 95 percent of maximum density.
- B. Fill Under Grass Areas:
 - 1. Fill Type, to 6 inches below finish grade, compact uniformly to 85 percent of maximum density.

C. Fill Under Asphalt and Concrete Paving:

1. Compact subsoil to 95 percent of its maximum dry density.

--END OF SECTION 31 23 23--

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SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes excavation, trenching and backfill necessary for the construction of the facilities as indicated on the plans including, but not limited to: water mains, sewer mains, service lines, valves and hydrants. This section also includes general instructions for the abandonment and disposal of asbestos cement pipe materials, and restoration of roadways.

1.2 RELATED WORK

- A. Section 31 25 13 - Erosion Controls
- B. Section 32 01 01 - Pavement Removal and Replacement

1.3 REFERENCES

- A. ASTM D698 - Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12-in. Drop [Standard Proctor Test].
- B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ASTM D2216 - Test Method for Laboratory Determination of Water Content of Soil, Rock and Soil-Aggregate Mixtures.
- D. ASTM D2487 - Classification of Soils for Engineering Purposes [Unified Soil Classification System].
- E. ASTM D2774 - Standard Recommended Practice for Underground Installation of Thermoplastic Pressure Piping.
- F. ASTM D2922 - Test Method for Density of Soil and Soil Aggregate and Rock in Place by Nuclear Methods (Shallow Depth).
- G. ASTM D3017 - Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

- A. Bedding, Haunching and Initial Backfill zones as defined herein and on the standard general thermoplastic pipe trench drawing below (See construction drawings for specific dimensions).
- B. Native, and Import and Select/Engineered Material Definitions:
1. Native Material: Soils excavated from the trench in the immediate vicinity of current pipe installation activities.
 2. Import Material: Soils transported from a soil pit stockpile at a location other than the location where trench excavation is taking place.
 3. Select/Engineered Fill: Soil specified in the plans or specifications or by the Project Engineer to meet permit conditions or selected applications.
- C. Soil Materials as summarized in the table below and further defined in ASTM 02487:

ASTM D2321		ASTM D2487	
Class	Type	USCS <i>Group Symbol</i>	Description
IA	Manufactured aggregates: ¼ to 1 ½ inch open graded, clean.	* <i>None</i>	Closest to "Poorly graded gravel (GP)"
IB	Manufactured aggregates: ¼ to 1 ½ inch dense graded, clean.	* <i>None</i>	Closest to "Poorly graded gravel with sand (GP)"
II	Coarse sands and gravels with maximum particle size of 1 ½ inch, clean.	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.
		GP	Poorly graded gravels and gravel sand mixtures; little or no fines.
		SW	Well-graded sands and gravelly sands; little or no fines.
		SP	Poorly graded sands and gravelly sands; little or no fines.

	Coarse sands and gravels with maximum particle size of 1 ½ inch, borderline clean.	GW-GC SP-SM Etc.	Sands and gravels which are borderline between clean and with fines.
III	Fine sand and clayey gravels.	GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
IV	Fine grained soils (inorganic)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays.
		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
v	Organic soils	OL	Organic silts and organic silty clays of low plasticity.
		OH	Organic clays of medium to high plasticity, organic silts.
		PT	Peat and other high organic soils.

1.5 SUBMITTALS

- A. Submit the result of ASTM 698 standard proctors, including proctor curve, for each soil type encountered and used on the job.
- B. Submit all compaction test results in writing within 5 days of being performed.

- C. Submit gradation curves for imported fill for project engineer review and approval prior to placement.

1.6 QUALITY ASSURANCE

- A. Compaction Testing Qualifications: Tests must be performed by a firm or professional regularly engaged in soil testing for engineering purposes. The individual on site shall be certified to operate nuclear density equipment.
- B. Locations: Provide compaction test results at locations as designated by the Project Engineer and/or inspectors.
 - 1. Frequency:
 - a. Excavation, Trenching and Backfilling in an Established, Traveled Roadway: once per 100-feet along the pipeline (minimum).
 - b. Excavation, Trenching and Backfilling outside of an Established, Traveled Roadway: once per 300-feet along the pipeline (minimum).
 - 2. At each location, provide enough tests to demonstrate compliance with the compaction requirements for both the pipe embedment zone and the final backfill zone.
 - 3. If testing reveals inadequate compaction, retest at that location after remedying the non-compliance with the specifications.

PART 2 – PRODUCTS

2.1 BEDDING, HAUNCHING AND INITIAL BACKFILL MATERIAL

- A. Imported Bedding, Haunching and Initial Backfill Materials: Use one of the following materials.
 - 1. Class I, Class II or Class III, utilized in accordance with restrictions described in Part 3 with maximum particle sizes limited to 3/4-inch, utilized as stipulated in Part 3 - Execution.
- B. Native bedding, native haunching and native initial backfill material:
 - 1. Use in accordance with the restriction of Part 3 – Execution.
 - 2. Free from particles greater than 1-inch in dimension.

2.2 FINAL BACKFILL MATERIAL

A. General:

1. Free from stones or rocks larger than 4-inches in dimension.
2. Free from organic materials.

B. Imported Final Backfill for Wet Conditions:

1. Types GW, GP, SW, SP (coarse grained soils with less than 5% fines) or GW-GC/GM, GP-GC/GM, SW-SC/SM, SP-SC/SM (coarse grained soils with 5-12% fines).
2. Otherwise meeting the general requirements of Article 2.02 Paragraph A.

2.3 FLOWABLE FILL

A. General:

1. Conform to DPW, Standard Specification for Construction of Local Streets and Roads, and/or requirements of local road and highway authority as applicable.
2. For utility road crossings provide 200-300 psi flowable fill as specified in DPW Specifications for Road Restoration included in Section 32 01 01 - Pavement Removal and Replacement.

PART 3 – EXECUTION

3.1 GENERAL

- A. Conform to applicable safety laws, including, but not limited to, OSHA 29 CFR Part 1926.
- B. Obtain CNMI Bureau of Environmental and Coastal Quality One Start permit, inclusive of approvals and (as necessary) additional permits from CNMI Division of Fish and Wildlife, CNMI Coastal Resources Management Office, and Historic Preservation Office.
- C. Obtain all permits from the road agencies for construction within road right of way.

- D. Repair damage resulting from settlement, slides, cave-ins, water pressure, and other causes.
- E. Provide traffic control and other temporary provisions in accordance with DPW Permit Conditions.
- F. Install and maintain erosion and sediment control practices in accordance with BECQ Permit conditions.

3.2 EXCAVATION

- A. Remove brush, trees and stumps from excavation and site.
- B. Strip and stockpile existing topsoil.
- C. Maintain surface drainage away from trenching or excavation.
- D. If existing soil cannot provide uniform and stable bearing support along the length of the pipe, or if the existing soil contains stones greater than 1-inch in dimension, then over-excavate 6- inches below bottom of pipe.
- E. If trench is more than 5' in depth, the contractor must conform to OSHA guidelines on Trench Safety and Shoring. In addition the contractor must conform to all other State requirements for Trench Safety and Shoring.
- F. Contractor will be responsible for disposal of excavated materials during excavation. Contractor must identify construction disposal site within two miles of construction activities at a site to be identified by Owner prior to construction. If Contractor disposes excavated materials on land elsewhere, the Owner will not be liable for the disposal.

3.3 TRENCHING

- A. Total Bottom Width: As indicated on plans.
- B. Depth: Provide minimum cover as specified, or depths shown on plans.
- C. Top Width: As needed to meet safety requirements, but minimize the width where possible.
- D. Trench Walls: Keep trench walls vertical in the pipe embedment zone.

E. Length of Open Trench:

1. Unless authorized by the Project Engineer in writing, the length of trench excavation in advance of pipe being laid shall not exceed 200-feet during active construction.
2. All trenches must be backfilled during non-work hours, or alternately, up to 20-feet of trench can be left open during non-work hours if the trench is completely barricaded and fenced.
3. If open trenches in excess of this specification result in the wetting of moisture-sensitive stockpiled materials, such that the moisture content makes it impossible to meet compaction requirements, the contractor shall provide imported material that complies with these specifications and haul away the wet materials at no expense to the project or the Owner.

3.4 BEDDING

A. General:

1. Where over excavation is necessary, install a minimum of 6-inches of Imported Bedding.
2. Level and form the bottom of the trench to provide uniform bearing support along the length of the pipe.

B. Compaction of Imported Bedding: Meet the following density requirements based on standard proctor (ASTM D698):

Use of Soils and Aggregate for Bedding

	Class IA	Class IB	Class II	Class III
General	Excellent pipe support. Excellent drainage.	Excellent pipe support. Good drainage. Minimizes migration of adjacent material.	Good pipe support. Fair drainage.	Reasonable pipe support. Poor drainage
Compaction	Not required	Not required	Required 85% of Standard Proctor.	Required 90% of Standard Proctor.
Wet Conditions (below current or future water table). Rock Cuts	Acceptable. Must use same material for Haunching.	Acceptable. Must use same material for Haunching.	Acceptable. Clean groups only suitable for drainage blanket.	Not- Acceptable
Dry Conditions	Acceptable	Acceptable	Acceptable	Acceptable

3.5 HAUNCHING AND INITIAL BACKFILL

A. General

1. Provide complete and uniform bearing and support for the pipe, including allowance for bell holes.
2. Work material under the pipe haunches and around the pipe to ensure full pipe support.
3. Place material in lifts no greater than 6-inches thickness in loose measure.
4. Install initial backfill to a depth of 6-inches over the crown of the pipe.

B. Material Usage:

1. Rigid Pipe (Ductile Iron):
2. Dry Trench and Site Conditions: Use native material free from particles greater than 3/4-inch in dimension.
3. Wet Trench Conditions: Imported Material.
4. Plastic Pipe: Imported Material
5. If deemed necessary by the Project Engineer, and as required by road owner use imported material for PVC and Polyethylene pipe in accordance with ASTM D 2774 and/or road owner requirements.

Use of Soils and Aggregate or Haunching and Initial Backfill

	Class IA	Class IB	Class II	Class III
General	Excellent pipe support. Excellent drainage. Install to a minimum of 6" above the pipe crown.	Excellent pipe support. Good drainage. Minimizes migration of adjacent material. Install to a minimum of 6" above the pipe crown.	Good pipe support. Fair drainage. Install and compact to a minimum of 6" above the pipe crown.	Reasonable pipe support. Poor drainage. Install and compact to a minimum of 6" above the pipe crown.
Compaction	Not required	Not required	Required 85% of Standard Proctor. 6 inch maximum lifts.	Required 90% of Standard Proctor. 6 inch maximum lifts.

Wet Conditions (below current or future water table). Rock Cuts	Acceptable. Must use same material for Bedding. Extend Haunching to the top crown of the pipe.	Acceptable. Must use same material for Bedding. Extend Haunching to the top crown of the pipe.	Acceptable. Clean groups only suitable for drainage.	Not- Acceptable
Drv Conditions	Acceptable	Acceptable	Acceptable	Acceptable

C. Compaction of Haunching and Initial Backfill:

1. Compact haunching material and initial backfill using walk-behind vibratory plate compactor or manual hand-tamping tools
2. Ensure no contact between compacting equipment and the pipe.
3. Prohibited Compaction Equipment for Haunching and Initial Backfill:
 - a. hoe-pack
 - b. hydrohammer
 - c. rammer-tamper
 - d. vibratory rollers
4. Prevent movement of the pipe during placement or compaction of material.
5. Meet the following density requirements based on standard proctor (ASTM 0698):

Location	Percent of Max. Dry Density Required
Areas of Recent Fill or Embankment	95%
Areas Traveled By Vehicular Traffic, Rights-of-Way	90%
Unimproved Surfaces or Fields	85%

3.6 FINAL BACKFILL

A. General:

1. If moisture content of the native soil results in the inability to meet compaction requirements (due to fines), use imported material that meets Part 2.2 B.
2. Waste or haul away material not meeting the requirements at contractor's expense.
3. Conform to Section 32 01 01 - Pavement Removal and Replacement: for backfill requirements under roadways.
4. Repair any trenches improperly backfilled or where settlement occurs, then refill and compact.

B. Compaction:

1. Install 2-feet of total fill over the pipe crown before subjecting the trench to hydrohammers, hoe-packs, or vehicular traffic.
2. Backfill in lifts to meet compaction requirements throughout the full depth of backfilled trench.
3. Compact to the following requirements (Densities as a percent of Standard Proctor):

Location	Maximum Lift	Percent of Max. Dry Density Required
Under Roadways or Surfaces Traveled by Vehicular Traffic	8-inches	95%
Areas of Recent Fill or Embankment	12-inches	90%
Rights-of-Way	12-inches	90%
Unimproved Surfaces or Fields	12-inches	85%

4. Use smaller lifts if necessary to meet the in-place density requirements.

3.7 REMOVAL OF NUISANCE WATER

- A. Control site drainage, springs and runoff, and prevent water from adversely affecting trenching locations.
- B. Remove nuisance water entering the trenches. Water that can be removed through the use of sump or trash pumps will not be considered dewatering.
- C. Keep trenches free from standing water until the facilities are in place, the end plugged against the entrance of water, and backfill has been placed and compacted.

3.8 LOCATE EXISTING UTILITIES

- A. Field locate all existing underground utilities.
- B. Contact water and sewer officials 48-hours in advance of work in areas needing utility location service.

3.9 UTILITY CONFLICTS

- A. Protect existing utilities from damage during excavation and backfilling operations.
- B. Provide temporary support for existing water, telephone, power, or other utility services that cross the trench until backfilling of trench is complete.
 - 1. Compact backfill to 95% of maximum density under disturbed utilities
 - 2. Contractor is responsible for repairs to all damaged utilities.
- C. Water and sewer parallel and perpendicular crossings:
 - 1. Maintain a 10-foot horizontal separation (O.D. to O.D.) for parallel mains.
 - 2. Upon approval by the Owner's Representative, water and sewer mains may be installed in parallel as close as 5-feet, provided all of the following conditions:
 - a. Vertical separation is 18 inches (O.D. to O.D.)
 - b. Water main is above the sewer main.
 - c. Sewer pipe is constructed to withstand 150 psi static pressure without leaking.

3. Maintain a minimum 18-inch vertical separation (O.D. to O.D.) for perpendicularly crossing mains.
 - a. Place water pipe over sewer pipe.
 - b. Lay pipe with joints equidistant from the point of crossing.

3.10 ASBESTOS CEMENT PIPE (ACP) HANDLING

- A. Where ever possible, existing asbestos cement pipe {ACP} shall be abandoned, undisturbed, below ground.
- B. Contractor is responsible for disposal of ACP which must be removed from the excavation, in accordance with all applicable CNMI and federal laws and regulations. Contractor shall contact CNMI Bureau of Environmental and Coastal Quality (BECQ) prior to submitting its bid to obtain procedures for disposal of ACP sewer pipe.
- C. ACP materials which can be removed from the excavation intact are in most cases considered "non-friable" asbestos containing materials (ACM) and generally have fewer requirements for disposal. Intact, non-friable ACP can usually be disposed of directly by Contractor to the Marpi Landfill. Contractor shall be responsible for all costs and coordination necessary to remove, transport, and dispose of non-friable ACP in accordance with all applicable federal and CNMI laws and regulations.
- D. ACP materials which cannot be removed from the excavation intact may be considered friable ACM. Disposal or abandonment in the excavation may both be options. Contractor is responsible for determining method of abandonment/disposal in consultation with CNMI BECQ.
- E. Contractor shall show final disposition of ACP on As-Built Drawings, to indicate sections of pipe which are abandoned in place in an intact condition (to include nominal diameter, depths, and lengths). and sections which have been abandoned in a less than intact condition (As-Builts shall describe general condition of ACP left in place).

3.11 ROAD SURFACE RESTORATION

- A. Contractor shall restore all damaged road pavement in accordance with applicable DPW Specifications. Refer to Specification Section 32 01 01 - Pavement Removal and Replacement.

--END OF SECTION 31 23 33--

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SECTION 31 25 13

EROSION CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

This work consists of furnishing, constructing, and maintaining permanent and temporary erosion and sediment control measures for use during the life of the contract to control soil erosion and water pollution using below materials and methods.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Measurement and Payment: Section 01 22 00.

PART 2 – PRODUCTS

A. Material shall conform to the following Sections:

- | | |
|------------------------------|---|
| 1. Fill | Section 31 23 23 |
| 2. Trenching and Backfilling | Section 31 23 33 |
| 3. Geotextiles | BECQ Approved/per Plan |
| 4. Sandbags | BECQ Approved |
| 5. Silt fence | BECQ Approved/per Plan and this Section |

PART 3 – EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Erosion Control Plan. The erosion control plan in the contract documents reflect special concerns, measures to protect resources, and permit requirements. An alternate erosion control plan, with all necessary permits, may be submitted for

approval according to BECQ requirements. Submit alternate erosion control plans 30 calendar days before intended use.

Provide permanent and temporary erosion control measures to minimize erosion and sedimentation during and after construction. Do not modify the type, size, or location of any control or practice without authorization of Owner.

- B. Controls and Limitations on Work. Before grubbing and grading, construct all erosion controls around the perimeter of the project including filter barriers, diversion, and settling structures. Limit the combined grubbing and grading operations area to 35,000 square feet of exposed soil at one time. Additional areas may be grubbed and graded after all erosion control and sediment control measures are in place.

Construct erosion control and sediment control measures as follows:

1. Construct temporary erosion controls in incremental stages as construction proceeds.
 2. Construct temporary slope drains, diversion channels, and earth berms to protect disturbed areas and slopes.
 3. Provide silt fence around existing drainage inlets for protection from sedimentation.
 4. Apply temporary turf establishment on uncompleted disturbed areas that will remain exposed for over 30 calendar days.
 5. Construct and maintain erosion controls on and around soil stockpiles to prevent soil loss. Silt fence should surround soil stockpiles, and stockpiles should be seeded with appropriate grass species for erosion control if the stockpile is to remain for a period greater than 30 days.
 6. Following each day's grading operations, shape earthwork to minimize and control erosion from storm runoff.
- C. Filter Barriers. Construct silt fence, straw bales, or brush barriers for filtering sediment from runoff and reducing the velocity of sheet flow. Conserve brush from clearing operations to construct brush barriers. Silt fence fabric shall meet the Table below, unless otherwise approved by BECQ.

1. Filter Fabric

Fabric Properties	Value	Minimum Acceptable Test Method
Grab Tensile Strength (lbs)	100	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682
Mullen Burst Strength (psi)	250	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (modified)
Equivalent Opening Size	40-80	US Std Sieve CW-02215
Ultraviolet Radiation Stability (%)	90	ASTM-G-26

2. Fence post shall be a minimum of 36 inches long. Wood post shall be of sound quality hardwood with a minimum cross sectional area of 3.0 square inches. Steel post will be standard “T” and “U” section weighing not less than 1 lb/ft.
3. Wire fence shall be a minimum 14.25 gage with a maximum 6 inches mesh opening or as approved by BECQ.
4. Envirofence or approved equal maybe used in lieu of the above method providing the unit is installed per manufacturer’s instructions.

D. Sediment Retention Structures. Construct temporary sediment retention structures as follows:

1. Temporary sediment traps. Construct temporary sediment traps to detain runoff from disturbed areas and settle out sediment. Provide outlet protection.

E. Outlet Protection. Construct riprap aprons or basins to reduce water velocity and prevent scour at the outlet of permanent and temporary erosion control measures.

F. Diversions. Construct temporary channels, temporary culverts, earth berms, or sandbags to divert water around disturbed areas and slopes. Use temporary channels, temporary culverts, pumps, sandbags, or other methods to divert the flow of live streams for permanent culvert installations and other work. Stabilize channels and provide outlet protection.

3.2 MAINTENANCE AND CLEANUP

- A. Maintain temporary erosion control measures in working condition until the project is complete or the measures are no longer needed. Clean erosion control measures when half full of sediment. Use the sediment in the work, if acceptable, or dispose.
- B. Replace erosion control measures that cannot be maintained and those that are damaged by construction operations.
- C. Remove and dispose of temporary erosion control measures when the turf is satisfactorily established and drainage ditches and channels are lined and stabilized. Remove and dispose of erosion control measures.
- D. Restore the ground to its natural or intended condition and provide permanent erosion control measures.

--END OF SECTION 31 25 13--

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SECTION 31 50 00

EXCAVATION SUPPORT AND PROTECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Shoring required for general safety, worker protection and protection of adjacent property from the hazards of caving ground. Includes:
 - a. Trench excavations
 - b. Structural excavations, including manholes

B. Related requirements and work described elsewhere includes:

1. General and Supplemental General Conditions
2. Temporary Facilities and Controls Section 01 50 00
3. Existing Conditions Section 02 00 00
4. Existing Underground Structures Section 02 00 50
5. Trenching and Backfilling Section 31 23 33

1.2 CONTRACTOR'S RESPONSIBILITIES FOR SAFETY

- A. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons (including employees) and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours.
- B. Safety provisions shall conform to U.S. Department of Labor (OSHA), and all other applicable Federal and local laws, ordinances, codes, the requirements set forth below, and any regulations that may be detailed in other parts of these Specifications.

- C. The Contractor shall comply with the latest provision of OSHA regulations and specifically Part 1926 of 29 CFR, subpart P. This regulation governs excavations, trenching and protective systems, sloping, benching, wood and aluminum shoring for various types of soils, and depths of excavations. The Contractor shall follow these regulations for this project.
- D. A certificate indicating that the Contractor's Competent Person(s) has completed training in an excavation safety program based on OSHA regulations within the past 5 years must be submitted to the Owner.
- E. Where any of these are in conflict, the more stringent requirement shall be followed.

1.3 SAFETY ORDERS

- A. The Contractor shall have at the worksite, copies or suitable extracts of the Construction Safety Orders of OSHA, and Part 1926 of 29 CFR, subpart P.
- B. All work shall comply with the provisions of these and all other applicable laws, ordinances and regulations.

1.4 TRENCH SAFETY PLAN

- A. For trenches and excavations 5 feet or more in depth, the Contractor shall submit to the Owner's Representative a detailed plan design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazards of caving ground. Such plan shall be submitted at least 10 working days before the Contractor intends to begin trenching or excavation work.
- B. If such plans vary from the shoring system standards established by the Construction Safety Orders, or Part 1926 of 29 CFR, subpart P, the Contractor shall notify the Owner in writing and the plan shall be prepared, sealed and signed by a civil or structural engineer registered in the CNMI. Signed and sealed copies of calculations necessary to qualify the system shall be submitted also.
- C. Nothing herein shall be deemed to allow the use of shoring, sloping, or protective system less effective than that required by the Construction Safety Orders of the Division of Industrial Safety, or Part 1926 of 29 CFR, subpart P.
- D. If Contractor proposes to use trench jacks or speed shores, submittals shall show length and type of shoring, vertical and horizontal spacing, vertical or horizontal wales and plans. Shields, when proposed or used, shall show depth allowed in the soils expected to be encountered.

1.5 OWNER'S REPRESENTATIVE REVIEW

- A. The duty of the Owner's Representative to conduct construction review of the Contractor's performance is not intended to include a review or approval of the adequacy of the Contractor's safety supervisor, the safety program, or any safety measures taken in, on, or near the construction site.
- B. The Owner's Representative will review the submittal of the Contractor's proposed shoring system to verify the general scope of the work and to determine that qualified professional engineering services are used. This review shall not in any way be construed to relieve the Contractor from sole responsibility for the design and safety of such shoring.

1.6 CONTRACTOR'S SUPERVISOR

- A. The Contractor shall appoint a qualified and competent supervisory employee who shall be responsible to determine the sloping or shoring system which shall be used depending on local soil type, water table, stratification, depth, etc.
- B. This supervisor shall have a minimum of five years experience in the directing of such trenching, excavation and shoring work.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION – Not Used

--END OF SECTION 31 50 00--

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SECTION 32 01 01

PAVEMENT REMOVAL AND REPLACEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Where trenches, pits or other excavations are made in existing roadways and where asphalt or concrete pavement exists, restoration of such pavements shall require Department of Public Works Pavement Patching and Repair Permit, field inspection and approval.
- B. Refer to Typical Road Restoration in project drawings for removal and replacement requirements.

1.2 RELATED SECTIONS

- A. Policy on Asphalt Road Pavement Patching and Repair by DPW (provided at the end of this section).
- B. Specifications for Road Restoration by DPW (provided at the end of this section).

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Measurement and Payment: Section 01 22 00.

1.4 SUBMITTALS

- A. Certificates of Conformance or Compliance: Submit the following for approval:
 - 1. Base materials
 - 2. Asphalts and asphalt cement
 - 3. Bituminous Concrete Mix
 - 4. Concrete
- B. Materials Tests and Test Reports: The testing requirements for materials incorporated in referenced documents will be waived provided the manufacturer submits certificates stating: previously manufactured materials have been tested by

recognized laboratories; such materials meet testing requirements specified; and the materials furnished for this project are of the same type, quality, manufacture and make as that tested. Do not submit copies of the test reports unless specifically requested by the Contracting Officer.

- C. DPW Pavement Patching and Repair Permit – refer to DPW Policy on Asphalt Road Pavement Patching and Repair for guidelines.

PART 2 – PRODUCTS

- A. See attached DPW Specifications for Road Restoration.

PART 3 - EXECUTION

- A. See attached DPW Specifications for Road Restoration.

--END OF SECTION 32 01 01--

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SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aggregate subbase.
2. Aggregate base course.

B. Related Sections:

1. Section 31 22 13 - Rough Grading: Preparation of site for base course.
2. Section 31 23 17 - Trenching: Compacted fill under base course.
3. Section 31 23 23 - Fill: Compacted fill under base course.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT - Not Used.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb) Rammer and an 18-in. Drop.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft³.
2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 6,000 ft-lbf/ft³.
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods Shallow Depth.
6. ASTM D2940 - Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.
7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods Shallow Depth.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
 1. Submit data for geotextile fabric and herbicide.
- C. Samples: Submit, in air-tight containers, 10 lb sample of each type of aggregate fill to testing laboratory.
- D. Materials Source: Submit name of aggregate materials suppliers.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.
- B. Perform Work in accordance with CNMI's Department of Public Works' standard.
- C. Maintain one copy of each document on site.

PART 2 – PRODUCTS

2.1 REGATE MATERIALS

A. Subbase Aggregate: ASTM D2940; graded type.

Sieve Size	Percent Passing
2 inches	100
No. 4	30 to 60
No. 200	0 to 12

B. Base Aggregate: ASTM D2940; graded type.

Sieve Size	Percent Passing
2 inches	100
1-1/2 inches	95 to 100
3/4 inches	70 to 92
3/8 inches	50 to 70
No. 4	35 to 55
No. 30	12 to 25
No. 200	0 to 8

2.2 ACCESSORIES

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

PART 2 - EXECUTION

3.1 EXAMINATION

A. Section 02 00 00 - Existing Conditions: Verification of existing conditions before starting work.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.

1. Proof roll substrate in minimum two perpendicular passes to identify soft spots.
 2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.
- C. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

- A. Install geotextile fabric over subgrade in accordance with manufacturer's instructions.
1. Lap ends and edges minimum 6 inches.
 2. Anchor fabric to subgrade when required to prevent displacement until aggregate is installed.
- B. Spread aggregate over prepared substrate to total compacted thickness of 6 inches.
- C. Place aggregate equal thickness layers to total compacted thickness of 6 inches.
1. Maximum Layer Compacted Thickness: 8 inches.
 2. Minimum Layer Compacted Thickness: 4 inches.
- D. Roller compact aggregate to 95 percent maximum density or as indicated on Drawings.
- E. Level and contour surfaces to elevations, profiles, and gradients indicated.
- F. Add small quantities of fine aggregate to coarse aggregate when required to assist compaction.
- G. Maintain optimum moisture content of fill materials to attain specified compaction density.
- H. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Flat Surface: 1/2 inch measured with 10 foot straight edge.
- C. Maximum Variation From Thickness: 1/4 inch.
- D. Maximum Variation From Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Compaction testing will be performed in accordance with ASTM D1556, ASTM D1557, ASTM D698, AASHTO T180, ASTM D2167, ASTM D2922 or ASTM D3017.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- D. Frequency of Tests: One test for every 1000 square yards of each layer compacted aggregate.

3.6 SCHEDULES

- A. Pavement Restoration: thickness as indicated in the Drawings placed in equal layers.
 - 1. Compact placed aggregate materials uniformly to achieve minimum percentage of maximum dry density indicated in the Drawings.

--END OF SECTION 32 11 23--

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SECTION 32 31 13

CHAIN-LINK FENCES AND GATES

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes:

1. Fence framework, fabric, and accessories.
2. Excavation for post bases.
3. Concrete foundation for posts and center drop for gates.
4. Manual gates and related hardware.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Measurement and Payment: Section 01 22 00.

1.3 REFERENCES

A. ASTM International:

1. ASTM A121 - Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
5. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
6. ASTM A585 - Standard Specification for Aluminum-Coated Steel Barbed Wire.

7. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 8. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 9. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 10. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
 11. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
 12. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
 13. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
 14. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
 15. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- B. Chain Link Fence Manufacturers Institute:
1. CLFMI - Product Manual.

1.4 SYSTEM DESCRIPTION

- A. Fence Height: as indicated on Drawings.
- B. Line Post Spacing: At intervals not exceeding 10 feet.
- C. Fence Post and Rail Strength: Conform to ASTM F1043 Heavy Industrial Fence quality.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.
- D. Samples: Submit two 12x12 inch samples of fence fabric, illustrating construction and colored finish.
- E. Manufacturer's Installation Instructions: Submit installation requirements and post foundation anchor bolt templates.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.
- C. Operation and Maintenance Data: Procedures for submittals.

1.7 QUALITY ASSURANCE

- A. Supply material in accordance with CLFMI - Product Manual.
- B. Perform installation in accordance with ASTM F567.
- C. Sustainable Design Requirements:
 - 1. Recycled Content Materials: Furnish materials with recycled content.
 - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.
- D. Perform Work in accordance with CNMI's Department Public Works' standard.
- E. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

- B. Installer: Company specializing in performing work of this section with minimum 3 years experience.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.
- C. Identify each package with manufacturer's name.
- D. Store fence fabric and accessories in secure and dry place.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
 - 1. Anchor Fence Inc.
 - 2. Cyclone Fence Inc.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.

2.2 MATERIALS

- A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043. Type A on pipe exterior and interior.
- B. ~ OR ~
- C. Framing (Steel): ASTM A1011/A1011M; hot rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum Grade 50; coating conforming to ASTM F1043 Type B on pipe exterior and interior.
- D. Fabric Wire (Steel): ASTM A392 zinc coated wire fabric or ASTM A491 aluminum coated wire fabric.
- E. Barbed Wire: ASTM A121 galvanized steel or ASTM A585 aluminum coated steel; 12 gage thick wire, 3 strands, 4 points at 3 inch oc.

F. Concrete: Type specified in Section 03 30 00.

2.3 COMPONENTS

A. Line Post: 2 inch nominal pipe size (NPS).

B. Corner Post: 4 inch NPS.

C. Gate Post: 5 inch NPS.

D. Top and Brace Rail: 1 1/2 inch NPS, plain end, sleeve coupled.

E. Gate Frame: 2 inch NPS.

F. Fabric: 2 inch diamond mesh interwoven wire, 9 gage thick, top salvage, knuckle end closed, twisted tight, bottom selvage.

G. Tension Rod: 3/8" diameter with standard turnbuckle.

H. Stretcher Bar: one-piece length equal to the full height of the fabric, 3/16 inch x 3/4 inch minimum.

I. Tie Wire: No. 9 gage, galvanized wire.

2.4 ACCESSORIES

A. Caps: Galvanized pressed steel; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.

C. Extension Arms: Galvanized pressed steel, to accommodate 3 strands of barbed wire, single arm, sloped to 45 degrees.

D. Padlock: Cyber padlock 2" shackle with chain holder and boot cap.

2.5 GATES

A. General:

1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.

2. Factory assemble gates.
 3. Design gates for operation by one person.
- B. Swing Gates:
1. Fabricate gates to permit 180 degree swing.
 2. Gates Construction: ASTM F900 with welded corners. Use of corner fittings is not permitted.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install framework, fabric, accessories in accordance with ASTM F567.
- B. Set intermediate, terminal and posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- C. Line Post Footing Depth Below Finish Grade: ASTM F567.
- D. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.
- E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- F. Install top rail through line post tops and splice with 6 inch long rail sleeves.
- G. Install center and bottom brace rail on corner gate leaves.
- H. Place fabric on outside of posts and rails.
- I. Do not stretch fabric until concrete foundation has cured 7 days.
- J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- K. Position bottom of fabric 2 inches above finished grade.
- L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

- M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- N. Install bottom tension wire stretched taut between terminal posts.
- O. Install support arms sloped outward and attach barbed wire; tension and secure.
- P. Support gates from gate posts. Do not attach hinged side of gate from building wall.
- Q. Install gate with fabric and barbed wire overhang to match fence. Install three hinges on each gate leaf, latch, catches, foot bolts and sockets, torsion spring retainer, retainer or locking clamp.
- R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- S. Connect to existing fence at new terminal post.
- T. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.
- U. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.
- V. Center and align posts. Place concrete around posts, and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.
- W. Extend concrete footings 1 inch above grade, and trowel, forming crown to shed water.
- X. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

3.2 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch.
- C. Maximum Offset From Indicated Position: 1 inch.
- D. Minimum distance from property line: 6 inches.

3.3 SCHEDULES

- A. Well Site Perimeter: 6 feet high, coated fabric, three-strand barbed wire top, on 45 degree sloped arm, pointing out.
- B. Gate padlock: Provide one (1) padlock for each gate.

--END OF SECTION 32 31 13--

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SECTION 33 10 01

WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work includes providing new water piping and connecting to existing water piping systems and related work.
 - 1. Water pipelines: Provide and install distribution line, gate valves, air relief valves, blow-off valves, and other related appurtenances in accordance with the drawings, these specifications and the CUC's Standards.
 - 2. Coordination of Work: Coordinate all work under this section, particularly connection to existing systems and other activities that will affect water service with the Contracting Officer and the Water Division of the Commonwealth Utility Corporation. The Contractor shall comply with the Special Provisions regarding minimizing disruption of water service.

1.2 RELATED SECTIONS

- A. Section 02 00 00 - Existing Conditions
- B. Section 02 00 50 - Existing Underground Structures
- C. Section 31 23 16 – Excavation
- D. Section 31 23 17 – Trenching
- E. Section 31 23 23 – Fill
- F. Section 31 50 00 – Excavation Support and Protection

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
 - 1. Federal Specifications:

WW-P-421c	Pipe cast iron, pressure (for water and other liquids)
WW-V-58B	Valves, Gate, Cast Iron; Threaded and Flanged (for Land Use)
TT-P-51f	Asphalt Varnish

2. American National Standards Institute (ANSI) Publications:

A21.11	Rubber Gasket for Joint for Ductile Iron and Gray Iron Pressure Pipe and Fittings
B16.1-1967	Cast Iron Flanges and Flanged Fittings 25, 125, 250 and 800 lbs.

3. American Society of Mechanical Engineers (ASME) Publications:

B16.1-2010	Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
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4. American Society for Testing and Materials (ASTM) Publications:

A47-99(2009)	Ferritic Malleable Iron Castings
A48-03(2012)	Gray Iron Castings
A126-04(2009)	Gray Iron Castings for Valves, Flanges and Pipe Fittings
A269-10	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
A307-10	Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength.
A325-10	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
A513-12	Electrical-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
B61-08	Steam or Valve Bronze Castings
B62-09	Composition Bronze or Ounce Metal Castings

D1248-12	Polyethylene Plastics Extrusion Materials for Wire and Cable
D1785-12	Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
D2564-12	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
D 2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
D3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
D 3350-08	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

5. American Water Works Association (AWWA) Publications:

C104-08	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
C105-10	Polyethylene Encasement for Ductile-Iron Pipe Systems
C110-12	Ductile-Iron and Gray-Iron Fittings
C111-12	Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C115-11	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
C151-09	Ductile-Iron Pipe, Centrifugally Cast, for Water
C153-11	Ductile-Iron Compact Fittings for Water Service
C500-09	Metal-Seated Gate Valves for Water Supply Service
C503-05	Wet-Barrel Fire Hydrants

C507-11	Ball Valves, 6 In. Through 60 In.
C509-09	Resilient-Seated Gate Valves for Water Supply Service
C600-10	Installation of Ductile-Iron Water Mains and Their Appurtenances
C605-05	Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
C651-05	Disinfecting Water mains
C701-12	Cold-Water Meters–Turbine Type, for Customer Service
C703-02	AWWA Standard for Propeller-Type Meters for Waterworks Applications
C800-05	Underground Service Line Valves and Fittings
C900-07	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In., for Water Transmission and Distribution
C906-90	Polyethylene (PE) Pressure Pipe and Fittings, 4 In. through 63 In., for Water Distribution and Transmission
M20	Manual of Water Supply Practices, Water Chlorination and Chlorination Practices and Principles

1.4 SUBMITTALS

- A. Submit drawings for layout of valving systems, connections to existing systems, water service connections and special transition sections. Indicate locations and configurations of all fittings, valves, and other appurtenances and accessories on layout drawings. Do not have pipe, fittings, appurtenances and accessories delivered to the site until layout drawings have been approved.
- B. Manufacturer’s Data: Submit manufacturer’s standard drawings or catalog cuts of the following items:
 - 1. Pipe, fittings, joints, couplings, and gaskets

2. All Valves, including, but not limited to gate, check, pressure, float, air relief, altitude, pump control, and blow-off.
 3. Valve boxes
 4. Water Meters
- C. Standards Compliance: Submit manufacturer's certificates of conformance or compliance for each of the following items:
1. Pipes and fittings
 2. Pipe joint materials
 3. Valves
 4. Valves Boxes

1.5 QUALITY ASSURANCE

- A. All material shall be new and of current manufacture and shall be guaranteed against defects of workmanship in accordance with the general conditions and supplementary conditions.
- B. For assembly, installation and testing of work in this section use only thoroughly trained and experienced personnel who are familiar with the requirements for this work and with installation recommendations.

1.6 DELIVERY, STORAGE, AND HANDLING OF MATERIALS:

- A. Delivery and Storage: Inspect materials delivered to site for damage; unload and store with minimum handling. Store materials in enclosures or under protective covering; store rubber gaskets not to be installed immediately under cover, out of direct sunlight. Do not store directly on the ground. Keep interior of pipes and fittings free of dirt and debris.
- B. Handling: Handle pipe, fittings, valves and other accessories and appurtenances in such a manner as to ensure delivery to the trench in sound, undamaged condition.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE PIPE (PVC): LESS THAN 4-INCH DIAMETER

- A. Pipe-Polyvinyl chloride pipe less than four inches in diameter shall be schedule 80. PVC material shall conform to ASTM D1785. Each length of pipe shall be marked with the manufacturer's name, nominal size, schedule, and date of manufacture.
- B. Joints and Fittings - Joints shall be solvent weld, socket type conforming to ASTM D2564. Joints and fittings shall have pressure rating at least equivalent to that of the pipe.

2.2 POLYVINYL CHLORIDE PIPE (PVC): 4-INCH THRU 12-INCH DIAMETER

- A. Pipe - Polyvinyl chloride pipe shall conform to AWWA C900-07, Class 235 (DR 18). Each standard or random length shall have been factory tested twice the service pressure rating of the pipe. Each length of pipe shall be marked with the manufacturer's name, nominal size, pressure classification and date of manufacture.
- B. Joints - Joints shall be push-on type couplings or internal socket bell PVC unless shown otherwise on the drawings with rubber gaskets conforming to ASTM D3139. Internal socket bells of PVC pipe or separate couplings shall meet the same strength requirements as that of the pipe. All component parts of each joint including gaskets and couplings shall be clearly marked for use with the pipe for which they are intended.
- C. Fittings - Fittings shall be of ductile iron mechanical joint conforming to ANSI/AWWA C153 with push-on bell or hub design to fit the particular make of pipe furnished. Fittings shall have a pressure rating at least equivalent to that of the pipe used and shall be cement-mortar lined in accordance with ANSI A21.4 (AWWA C104).
- D. Water Main Warning Tape - Metallic impregnated warning tape shall be blue in color with "Caution - Buried Water Line Below" continuously printed on it. Tape shall be made by company regularly engaged in making metallic warning tapes, such as Griffolyn Company, Inc. The warning tape shall be installed 18 inches above the top of the pipe, and brought to ground surface at valve boxes.

2.3 VALVES, AND OTHER WATER ACCESSORIES

- A. Gate Valves:
 - 1. Valves 2" - 12" shall be resilient wedge type rated for 250 psig cold water working pressure. All ferrous components shall be ductile iron, ASTM A536. Valves 3" - 12" shall be in full compliance with AWWA C515. The words "D.I." or "Ductile Iron" shall be cast on the valve. The wedge shall be ductile iron or bronze encapsulated with EPDM rubber.

The gate valve stem and wedge nut shall be copper alloy in accordance with Section 4.4.5.1 of the AWWA C515 Standard. Stainless Steel stems are not acceptable. The NRS stem must have an integral thrust collar in accordance with Section 4.4.5.3 of AWWA C515 Standard. Two-piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and held in place on three sides by the wedge to prevent possible misalignment.

Valves shall be certified by NSF to Standard 61.

The operating nut shall be constructed of ductile iron and shall have four flats at stem connection to ensure even input torque to the stem. All gaskets shall be pressure-energized O-Rings. Handwheels shall be furnished only when called for or shown on plans.

Stem shall be sealed by three O-Rings. The top two O-Rings shall be replaceable with valve fully open and while subject to full rated working pressure. O-Rings set in a cartridge shall not be allowed.

All internal and external surfaces of the valve body and bonnet shall have a fusion-bonded-epoxy coating, complying with ANSI/AWWA C550, applied electrostatically prior to assembly.

Valves shall be American Flow Control's Series 2500 Ductile Iron Resilient Wedge Gate Valve, or approved equal.

2. Valves Boxes: Each gate valve on buried piping shall be provided with an adjustable cast-iron box of a size suitable for the valve on which it is to be used. The head shall be round and the lid shall have the word "WATER" cast on it. The least diameter of the shaft of the box shall be 10.25 inches for waterlines greater than 6 inches in diameter and 5.25 inches for waterlines 6 inches or less in diameter. Each box shall be given a heavy coat of bituminous paint. Provide a permanent identification system on the valve cover or concrete collar that indicates valve size and direction of flow. Provide a valve key for each below grade gate valve. Valve and key shall be supplied by the same manufacturer.
- B. Butterfly Valve: All butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed AWWA Standard C504 and NSF 61 approved.

Both ends shall be mechanical-joint per AWWA Standard C111 or per flanged ASME B16.1 (or as otherwise noted on plans). Accessories (bolts, glands, and gaskets) shall be supplied by the valve manufacturer.

All valves must use full AWWA C504 Class 150B valve shaft diameter, and full Class 150B underground-service-operator torque rating throughout entire travel, to provide capability for operation in emergency service.

Valve body and vane shall be high-strength Ductile Iron to ASTM A536 with ASTM A276 Type 316 stainless steel body seats.

Butterfly valve shall be CLOW 4500 or approved equal.

C. **Combination Air/Vacuum Release Valve:**

Combination air release valve shall be automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both Air Release and Air/Vacuum Valves and furnished as a single body type as indicated on the plans.

The valve body and cover shall be constructed of ASTM A126 Class B cast iron.

The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic floats, linkage, or bushings are not acceptable. Resilient seats shall be Buna-N.

The exterior of the valve shall be coated with a universal alkyd primer.

Manufacturer: Series 201C.2 (single body) as manufactured by Val-Matic Valve and Manufacturing Corporation, Elmhurst, IL, USA, or approved equal.

- D. **Fire Hydrant:** Hydrants shall conform to AWWA C503 or UL 246, "Wet Barrel" design. Hydrants shall be 6-inch diameter with a minimum 5-inch clear inlet valve opening, and provided with one 4-1/2 inch pumper connection and two 2-1/2 inch hose connections. Hydrants shall be of the non-flooding post type which shall not flood in the hydrant when the valve is closed, and shall be repairable without digging. Provide for a safety flange for post type hydrants. The hydrants shall be designed for 150 psi working pressure and 300 psi hydrostatic test pressure, and shall open counterclockwise. Working parts shall be bronze. Hose and pumper connections threads and operating nut shall be National Standard male hose threads with cap and chain. Each hydrant shall be preceded in the piping by a 6-inch gate valve. Provide with at least one coat of primer and two coats of yellow enamel (verify color with the Owner). Hydrant number and main size shall be stenciled on the hydrant barrel using black stencil paint as acceptable to CUC.

- E. Flush Hydrant: Flush hydrant shall be self-draining, compression type with 2-3/16" main valve opening. Inlet connection shall be 2-inch MJ. Outlet shall be 2-inch IP. Hydrant shall have a 3-inch ductile iron pipe riser with a cast iron stock top, and non-turning operating rod. Principal interior operating parts shall be brass and removable from the hydrant for servicing without excavating the hydrant. Hydrant shall be set in 4 cubic feet of crushed stone to allow for proper drainage of the hydrant. Recommendations of the AWWA should be followed when installing the hydrant.

Flush hydrant shall be Eclipse No. 2 Post Hydrant as manufactured by John C. Kupferle Foundry Co. or approved equal.

- F. Check Valve:
Check valve shall be of the flanged globe style, center-guided, silent, non-slam type. Check valve to have cast iron body, bronze disc and seat, and stainless steel spring with NSF 61 approved fusion bonded epoxy coating. Flange drilling to be ANSI B16.1 class 250. The valve shall have a low cracking pressure. It shall be capable of reducing water hammer while preventing flow reversal. All internal system shall be field replaceable.

Globe style silent check valve shall be Flomatic, model 402BTR, manufactured by Flomatic Corporation, or approved equal.

- G. Pressure Gauge:
All pressure gauges shall have a 3-1/2" dial with black enamel finish with stainless steel plate ring. Accuracy shall be 1/2 of 1 percent of scale range. The movement shall be constructed of stainless steel and monel, rustproof and corrosion resistant and equipped with recalibration mechanism.

Gauges shall be March Type 103 "Mastergauge", Marshall town Figure 23, Ashcroft Duragauge equivalent, or approved equal.

- H. Propeller Flow Meter:
The flow meter shall comply with the applicable provisions of the American Water Works Association Standard No. C704-02 for propeller type flowmeters. It shall be designed for a maximum continuous working pressure of up to 150 psi, and is fitted with AWWA Class D flanges. The meter flow tubes shall be coated with fusion-bonded epoxy for maximum corrosion protection.

1. Materials
 - a. Bearing Assembly: Impeller shaft shall be 316 stainless steel. Ball bearings shall be 440C stainless steel.
 - b. Magnets: (Permanent type) Alnico

- c. Bearing House: 316 stainless steel
 - d. Register: It shall be provided with an instantaneous flowrate indicator and six-digit straight-reading totalizer. The register shall be hermetically sealed within a die cast aluminum case, which includes a domed acrylic lens and hinged lens cover with locking hasp.
 - e. Impellers: It shall be manufactured of high-impact plastic, capable of retaining their shape and accuracy over the life of the meter.
- 2. Accuracy/Repeatability: $\pm 2\%$ of reading throughout full range.
 - 3. A straight run of full pipe with minimum length of five diameters ahead and minimum one diameter behind the meter shall be provided.
 - 4. Manufacturer: Model MW500 as manufactured by McCrometer, or approved equal.
- I. Pressure Reducing Control Valve with Low Flow By-Pass: The Pressure Reducing Control Valve with Low Flow By-Pass shall be a pilot operated diaphragm valve designed to automatically reduce a fluctuating higher upstream pressure to a constant lower downstream pressure regardless of varying flow rates. Flow requirements below the normal range of the main line Pressure Reducing Control Valve shall be handled by a valve mounted, direct acting, Low Flow By-Pass valve.

The main valve shall be a hydraulically operated, single diaphragm actuated, globe pattern valve. Y-pattern valves shall not be permitted. The valve shall contain a disc and diaphragm assembly that forms a sealed chamber below the valve cover, separating operating pressure from line pressure. The diaphragm shall be constructed of nylon reinforced Buna-N, and shall not seal directly against the valve seat and shall be fully supported by the valve body and cover. Rolling diaphragm construction will not be allowed and there shall be no pistons operating the main valve or any pilot controls.

The main valve body and cover shall be Ductile Iron ASTM A536, and all internal cast components shall be CF8M (316) Stainless Steel. All Ductile Iron components, including the body and cover, shall be lined and coated with an NSF 61 Certified Epoxy Coating applied by the electrostatic heat fusion process. All main valve throttling components (valve seat and disc guide) shall be Stainless Steel. The valve body and cover must be machined with a 360-degree locating lip to assure proper alignment.

The disc and diaphragm assembly shall contain a Buna-N synthetic rubber “Quad Seal” that is securely retained on 3-1/2 sides by a disc retainer and disc guide. Diaphragm assemblies utilizing bolts or cap screws for component retention will not be permitted.

The exposed portion of the Quad Seal shall contact the valve seat and seal drip-tight. The disc and diaphragm assembly must be guided by two separate bearings, one installed in the valve cover and one concentrically located within the valve seat, to avoid deflection and assure positive disc-to-seat contact. Center guided valves will not be permitted. All necessary repairs shall be made from the top of the valve while the body remains in line.

Pilot control systems for valves 3” and smaller shall contain a Flow Clean Strainer, Fixed Orifice Closing Speed, Adjustable Opening Speed Control, Low Flow By-Pass and Pressure Reducing Pilot. Pilot control systems for valves 4” and larger shall contain an external Y-Strainer, Fixed Orifice Closing Speed, Low Flow By-Pass and Pressure Reducing Pilot. All pilot control systems shall utilize stainless steel and must be equipped with Isolation Ball Valves on all body connections regardless of valve size. The adjustment range of the Low Flow By-Pass shall be 20-200 psi and the pressure-reducing pilot shall be 30-300 psi. The valve shall be Cla-Val Model 90-48 or approved equal with low-flow bypass assembly as per plans.

Pressure reducing valve (PRV-1) shall be Cla-Val Model 90-48 with a set inlet pressure of 144.06 psi and an outlet pressure of 40 psi. Pressure reducing valve (PRV-2) shall be Cla-Val Model 90-48 with a set inlet pressure of 89.79 and an outlet pressure of 40 psi. Pressure reducing valve (PRV-3) shall be Cla-Val 90-48 with a set pressure of 131.41 psi and an outlet pressure of 35 psi.

- J. Pressure Relief/Sustaining Control Valve: The Pressure Relief/Sustaining Control Valve shall maintain a constant upstream pressure by bypassing or relieving excess pressure and shall maintain close pressure limits without causing surges. Valve will remain closed until the upstream pressure exceeds a pre-determined set point. Valve will be fast opening and modulate to limit the upstream pressure to a pre-determined set point. If upstream pressure decreases below the pilot spring setting, the valve shall close. Valve will be slow closing to prevent surges.

The product shall comply with NSF/ANSI Standard 61 and certified lead free to NSF/ANSI 372 as a safe drinking water system component.

The main valve body and cover shall be Ductile Iron ASTM A536, and all internal cast components shall be Stainless Steel. All Ductile Iron components, including the body and cover, shall be lined and coated with an NSF 61 Certified Epoxy Coating applied

by the electrostatic heat fusion process. The pilot control system, including tubing and fittings shall be stainless steel.

The pressure relief/sustaining control valve shall be CLA-VAL Company Model No. 50-01 as manufactured by Cla-Val Co., or approved equal.

K. Service Lateral:

1. Water Meter: Water meter for service laterals shall be magnetic drive, sealed register, positive displacement type oscillating piston conforming to American Water Works Standard C-710-02.

All Meters shall have a composite outer case with a separate measuring chamber which can be easily removed from the case. All Meters shall be marked with the size and direction of water flow through the meter. Composite bottoms shall be provided. The materials used shall meet the requirements of NSF/ANSI Standard 61.

The register must be of the straight reading type with a large red test or sweep hand and shall include a low flow indicator on the dial face. The numeral wheel assembly shall be located at the bottom of the dial face with reading obtained from left to right. All reduction gearing shall be contained in a permanently hermetically sealed, tamperproof enclosure made from a stainless steel material, covered with a heat tempered glass lens. The register shall be attached to the meter utilizing a plastic bonnet register box. The register shall be secured to the main case by means of a tamper-resistant bonnet so that the register cannot be removed without the bonnet being destroyed. The register must be field replaceable.

The measuring chamber shall be a suitable synthetic polymer and shall not be cast as part of the main case. All piston assemblies shall be interchangeable in all measuring chamber assemblies of the same size. The measuring chamber piston shall operate against a replaceable control roller, allowing for repair to AWWA standards. The control roller shall rotate on a stainless measuring chamber steel pin, to provide added strength, wear resistance and corrosion resistance. There shall be an elastomeric seal or seals between measured and unmeasured water, preventing leakage around the measuring element.

All meters must be provided with a corrosion-resistant strainer, with an effective straining area at least twice the bore diameter which can be easily removed from the meter without the meter itself being disconnected from the pipeline.

Meters shall operate up to a working pressure of 150 pounds per square inch (psi), without leakage or damage to any parts. The accuracy shall not be affected by variation in pressure up to 150 psi.

Water meter shall be Sensus AccuStream Meters or approved equal.

2. Corporation Stops: Corporation stops shall be ball valve type made up of brass conforming to ASTM B62; and shall be suitable for the working pressure of the system. Inlet shall be male iron pipe thread or AWWA taper thread. Outlet shall be pack joint for PE pipe. Corporation stops shall be Ford Ballcorp Corporation Stop (no-lead alloy) series or approved equal.
 3. Curb Stops: Curb stops shall be solid one piece tee-head and stem ball valve with EPDM O-rings in the stem and molded EPDM seats supporting the ball. The ball shall be solid brass and coated with a fluorocarbon. All brass shall conform to ASTM B62; and shall be suitable for the working pressure of the system. Both ends shall be pack joint for PE pipe. Curb stops shall be Ford Ball Valve Curb Stop (no-lead alloy) series or approved equal.
 4. Curb Stop Riser Box: Curb stop riser box shall be two piece adjustable cast iron with internal key. Mueller H10314 or H103100; McDonald 5601, 5603, 5607L, 5606 or approved equal. All boxes in sidewalks, driveways and asphalt must have pentagon screw caps for concrete application approved by Owner's Representative. All curb-stop boxes must be serviceable and accessible at all times.
- L. Sample Tap: A ¾" gooseneck type lockable hose bibb connected to a ¾" diameter PVC. The sample tap shall connect to a ¾" Ball Valve curb stop. USA Blue book or approved equal.

2.4 CONNECTORS

- A. Flexible Couplings: Provide flexible couplings where called for on the drawings or where necessary in sizes and working pressure equal to the design pressure for the pipe for which they are to be installed. For buried pipes, they shall have cast-iron sleeves with flange and bolts of high-strength ductile iron. Gaskets shall be neoprene or natural rubber. For exposed pipes, they shall be Dresser Style 38, Smith Blair No. 411 or approved equal.

Couplings shall be of steel with stainless steel bolts, without pipe stop, and shall be sized fit the pipe shown on the plans. The thickness of the middle ring shall be not less than the thickness of the steel pipe on which it is used, and in no case shall it be

less than 1/4 of an inch in thickness. Bolts and nuts (provide locking nuts) for all couplings shall be Type 18-8 stainless steel.

- B. Flanged Couplings Adapters: Flanged adapters shall have at least four (4) anchor studs per coupling or equivalent. Bolts and nuts shall be Type 18-8 stainless steel.
- C. Clamp-Type Couplings: Clamp-type couplings shall be designed for a water working pressure equal to the design pressure for the pipe on which they are installed, and shall be equipped with rubber gaskets for water service. Couplings for pipe and fittings of size 12 inches and smaller shall be Victualic Style 77 for grooved ends (standard pipe), Style 99 for plain ends (welded steel pipe). An equal product from Gustin Bacon or approved equivalent will be acceptable. Clamp-type couplings with outlets shall be of the size indicated on the drawings and shall be Victualic outlet coupling, Style 72 or approved equivalent.

Buried clamp-style couplings shall be coated with a coal tar compound. The compound shall be 1/8-inch thick coating of EC-244, as manufactured by Minnesota Mining and Manufacturing Co., Bitumastic Super Service Black by the Koppers Co., or approved equivalent. The coating shall be applied in strict accordance with the manufacturer's recommendations.

- D. Insulating Flanges: Insulating flanges shall be used with couplings to connect pipes of dissimilar material or when indicated on the drawings. The insulating flanges shall consist of a central gasket, bolt sleeve and insulating washer with steel washers. The central gasket shall be glass reinforced. The insulating flanges shall be designed to operate at the ASA rating of the flange on which installed.
- E. Bolts and Nuts: All bolts, washer, and nuts not specified to be Type 18-8 stainless steel shall be hot dipped galvanized steel bolts unless otherwise shown on drawings. The material for steel bolts and nuts shall conform to the requirements of the current ASTM A325. If washers are used they shall be of forged or rolled steel.

All bolts shall be furnished with hexagonal or square heads and semi-finished hexagonal nuts.

The dimensions of all heads and nuts shall be not less than those required for the American Standard regular, and the height shall be sufficient to break the bolt in the body portion when tested. Threads shall be American Standard Screw Thread, coarse thread series.

- F. Adapters: Wherever indicated or whenever a transition from one type of pipe to another occurs, suitable adapters for pressure rating equal to the adjacent pipes shall be installed.

2.5 RESTRAINED JOINTS

Wedge action retainer glands shall be used on the mechanical joints of new fire hydrant installations; on PVC pipe specified to be restrained to a mechanical joint hub; on mechanical joints specified to be retained on the construction drawings; and on engineering approved situations where ground conditions are such that normal concrete thrust blocks would be impossible or ineffective. Set screw retainer glands shall be used on the mechanical joints of fittings used to relocate a main over or under a sewer, box culvert or other obstacle; on all flange coupling adapters; and on all ductile iron mechanical joints specified to be retained by retainer glands on the construction drawings.

- A. Retainer gland restraints for ductile iron pipe shall be "Mega-Lug 1100 Series" and retainer gland restraints for PVC pipe shall be "Mega-Lug 2200 Series" by EBBA Iron Sales, or approved equal.
- B. Joint preparation and installation shall be in accordance with manufacturer's recommendations.

2.6 PIPE SUPPORT

Pipe support shall be 2,000 psi cast-in-place concrete with ¼"x2" stainless steel restraint strap and 30# felt-liner around the full circumference, installed as shown in the plans.

2.7 SERVICE SADDLE

Service saddle shall be double strap type, stainless steel type 304, designed to hold pressures in excess of pipe working pressure.

PART 3 - EXECUTION

3.1 GENERAL

No more than one week's supply of material shall be distributed in advanced of pipe laying operations unless approved by the Owner's Representative.

3.2 PIPE LAYING AND JOINTING

Pipe, fittings, valve and accessories will be carefully inspected by the Contracting Officer before and after installation and those found defective will be rejected. Pipes and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, valves, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering section of condition. Proper facilities shall be

provided for lowering section of the pipe in trenches. Under no circumstances shall pipe, fittings, valves or any water line material; be dropped or dumped into trenches. Pipe shall be cut accurately to measurement established at the site and shall be worked into place without springing or forcing. Any pipe or fitting that does not allow sufficient space for proper installation of jointing material shall be replaced by one of the proper dimensions. Blocking or wedging between bells and spigots will not be permitted. Bell-and-spigot pipe shall be laid with the bell end and pointing in the direction of laying. The pipe shall be graded in straight lines, taking care to avoid formation of any dips or low points. Pipe shall be supported at its proper elevation and grade. Care being taken to secure firm and uniform support. Wood support blocking will not be permitted. The full length of each section of pipe and fittings shall rest solidly on the pipe bed, with recesses excavated to accommodate bells, joints and couplings. Anchors and support shall be provided where necessary and where indicated for fastening work into place. Proper provision shall be made for the expansion and contraction of pipe lines. Trenches shall be kept free of water until joints have been properly made. Open ends of pipe at the end of each day's work shall be closed temporarily with wood blocks or bulkhead. Pipe shall not be laid when conditions of trench or weather are unsuitable.

Installation of piping, fittings, and appurtenances shall be in accordance with the manufacturer's written instructions and in accordance with the following references:

- A. Ductile Iron Pipe - AWWA C600-10
- B. Polyvinyl Chloride Pipe - AWWA C605-05
- C. The locations of mains are shown on the drawings. All mains shall be installed to the grades and elevations shown on the drawings and shall provide a minimum cover of 3 feet from the top of the pipe to existing ground or paved surface. The allowable angle of deflection at any point shall not exceed the amount recommended by the pipe manufacturer for the particular pipe size used. Mechanical joint pipe and push-on restrained joint pipe shall be marked in such a manner that it can be determined after installation that the pipe is properly seated.
- D. Connections to Existing Lines: Connections to existing lines shall be made in a manner approved by the Owner's Representative and shall be accomplished with a minimum interruption of service on the existing line. Where connections to existing lines are made under pressure, these connections shall be installed in accordance with the recommendations of a manufacturer of pipe of which the line being tapped is made.
- E. Connections to Water Mains: Service lines shall be connected to the main by a corporation stop and a service saddle or clamp, with a stopcock except as otherwise indicated. The work shall include the connection to the property service line and be terminated as indicated on the drawings.

- F. Installation shall be in accordance with the general requirements for installation of pipelines and with the applicable requirements of AWWA C600, or AWWA C605. Pipe shall be laid in flat-bottom trench without blocks.

3.3 INSTALLATION OF VALVES

- A. Installation of Valves - Valves shall be installed in accordance with the applicable installation requirements specified herein before for the respective pipeline material of which valves are a part.

3.4 INSTALLATION OF METER ASSEMBLIES

- A. Meter assemblies shall be installed as shown in the plans and in accordance with the manufacturer's recommendation and with the CUC Standards. Location shall be as shown or as directed by the Owner's Representative.

3.5 DISINFECTION

- A. All new potable water lines and affected portions of existing potable water lines shall be flushed and disinfected in accordance with AWWA C601. Application shall be by the continuous feed method.

3.6 WATER WARNING TAPE

- A. The warning tape shall be installed 18 inches above the top of the pipe, and brought to ground surface at valve boxes.

3.7 FIELD TEST AND INSPECTIONS

- A. The Contracting Officer will conduct field inspection and witness all field tests specified in this Section. The Contractor shall perform all field tests, and provide all labor, equipment and incidentals required for testing. Approval will be by the Contracting Officer. All work shall prove to be in first class condition and constructed properly in accordance with the drawings and specifications. All deficiencies shall be completely retested at the Contractor's expense. Piping shall not be buried, covered or concealed until it has been inspected, tested and approved.

3.8 PIPE PRESSURE AND LEAKAGE TEST

All water mains and appurtenances including service laterals and service connection shall be subjected to a hydrostatic pressure test by the Contractor as directed by the Contracting Officer.

- A. PRESSURIZATION: After the pipe has been laid, all newly laid pipe or any valve section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing. Each valve section of the pipe shall be slowly filled with water, and the specified test pressure, based on the elevation of the test gauge, shall be applied by means of pump connected to the pipe in a manner satisfactory to the Owner. Valve shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. Allow the system to stabilize at the test pressure before conducting the leakage test.

The hydrostatic test shall be at least 2 hour duration. Test pressure shall not vary by more than 5 psi for the duration of the test.

- B. AIR REMOVAL: Before applying the specified test pressure, air shall be expelled completely from the pipe, valves and hydrants. If permanent air vents are not located at high points, the Contractor shall install corporation cocks at such points so that air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied.

At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the Owner.

- C. EXAMINATION: Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the Owner.

- D. LEAKAGE TEST: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled.

Leakage shall not be measured by a drop in pressure in a test section over a period of time.

- E. ALLOWABLE LEAKAGE: No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{133,200}$$

Where:

- L = allowable leakage, in gallons per hour
- S = length of pipe tested, in feet
- D = nominal diameter of the pipe, in inches
- P = average test pressure during the leakage test, in pound per square inch (gauge)

3.9 CHLORINATION OF WATER PIPELINES

Upon completion of the installation of the water system and pressure testing and as soon as is practicable thereafter, the Contractor shall flush and disinfect the water system.

The Contractor shall install temporary risers adjacent to certain valves for disinfection purposes prior to the start of backfill. The excavation necessary to expose these risers and the final backfill shall be performed by the Contractor.

The Contractor shall expose all service connections for chlorination. After completion of the chlorination and flushing, the Contractor shall backfill the connections.

- A. **DISINFECTION PROCEDURE:** The Contractor shall perform all work necessary for the disinfection of water pipelines under the supervision of the Contracting Officer.
- B. **PRELIMINARY FLUSHING:** Where conditions permit, main shall be flushed with maximum available pressure and velocity. Adequacy of flushing shall be determined by the absence of particles.
- C. **CHLORINATION:** The Contractor shall submit to the Contracting Officer, for approval, a sketch showing locations of sampling points and a plan of schedule delineating the method or steps he proposes to use to accomplish the work. The following methods of chlorination may be used.
 - 1. Flush new system adequately with chlorinated of at least 50 mg/l concentration.
 - 2. Retention of chlorinated water (50 mg/l) overnight.
 - 3. Expose interior surfaces of pipes with chlorinated water (200 mg/l) for 2 hours.
 - 4. **SAMPLING:** In all cases, microbiological samples shall be taken only after all chlorine has been flushed out as evidence by the ortho-tolidine test. Sampling shall be done by the Contractor under the coordination of the Contracting Officer.

5. DISPOSAL OF CHLORINATED WATER: The Contractor shall be responsible for the proper disposal of chlorinated water to safeguard public health and environment in accordance with local health requirements.
6. CERTIFICATION: New mains shall be certified after two samples that are collected 24 hours apart in newly chlorinated areas, and one sample that is collected in normally chlorinated area that are adjacent to and directly connected to new mains show the absence of coliforms.
7. REPETITION OF PROCEDURE: Disinfection of mains shall be repeated until samples show absence of coliforms.
8. PROCEDURAL GUIDELINE: The disinfection procedures herein above are guidelines only and do not guaranty certification after one application.

--END OF SECTION 33 10 01--

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