



City of Farmington
**BOUNDLESS JOURNEY ADVENTURE PARK
PHASE 2**

Farmington, New Mexico
January 13, 2026

Project Manual

PLAND COLLABORATIVE
600 1ST STREET NW, SUITE 100
ALBUQUERQUE, NEW MEXICO 87102
(505) 268-2266

TECHNICAL SPECIFICATIONS

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SECTION 01 10 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Owner's occupancy requirements.
 - 4. Work restrictions.
 - 5. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Boundless Journey Adventure Park – Phase 2
 - 1. Project Location: 312 E. Apache Street, Farmington, NM 87401
- B. Owner: City of Farmington
- C. Landscape Architect: Pland Collaborative, 600 1st Street NW, Suite 100, Albuquerque, NM 87102.
- D. The Work consists of the following: demolition, grading, concrete pavement, concrete retaining walls, play equipment, play area surfacing, irrigation, planting landscape mulches, site furnishings, fencing, rammed earth walls, site electrical and lighting.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a prime contract.

1.5 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed inside the designated area of Work during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.
 - 1. Coordinate with the Owner's representatives for extended work hours as needed.

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1.6 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-division format and CSI/CSC's "Master Format" numbering system.
 - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 - 2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

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**SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes procedures for:
 - 1. Schedule of Values.
 - 2. Applications for Payment.
 - 3. Contract modifications.

1.02 RELATED DOCUMENTS

- A. Agreement between Owner and Contractor.
- B. General Conditions of the Contract:
 - 1. Procedures for Change Orders and Contingency Modification Requests.
 - 2. General procedures for Schedule of Values, Applications for Payment, Certificates for Payment, Progress Payments and Document Closeout Value.
- C. Supplementary Conditions.

1.03 SCHEDULE OF VALUES

- A. Procedures:
 - 1. Submit for review by Architect a preliminary Schedule of Values within 7 days after date of Agreement Between Owner and Contractor.
 - 2. Revise to address review comments and resubmit.
 - 3. Final Schedule of Values: Revise Schedule to incorporate review comments and submit at least 7 days before submittal of initial Application for Payment.
 - 4. During construction, revise and resubmit Schedule of Values to incorporate approved Change Orders.
 - 5. Refer to Supplementary Conditions for further requirements regarding the schedule of values.
- B. Format: Typed schedule on standard form or electronic media printout approved by Architect. Sum of all values shall equal total Contract Sum.
- C. Content: Use Project Manual Table of Contents as basis for line items. Cross reference line items with number and title of corresponding specification section. Provide sufficient detail to allow computation of values for progress payments during construction.
 - 1. Include within each line item a directly proportional amount of Contractor's overhead and profit.
 - 2. Provide separate line items for materials and for installation when materials will be stored on site prior to installation such that cost of stored materials will be included separately on an Application for Payment.
 - 3. Provide separate line items for:
 - a. Each allowance included in Contract Sum.
 - b. Each alternate selected by Owner.
 - c. Each contract modification.
 - d. Bonds.
 - e. Insurance.
 - f. Documentation and Closeout.
 - g. Mobilization.
 - h. NPDES compliance as applicable.
 - i. Each Section of this project manual.

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- j. Closeout and documentation.
- k. Applicable taxes.

1.04 APPLICATIONS FOR PAYMENT

- A. Format: AIA Form G702 - Application and Certificate for Payment and AIA G703 or alternative form approved by Architect - Continuation Sheet or Contractor's electronic media driven form as approved by Architect.
- B. Payment period: Monthly or as otherwise stipulated in Agreement Between Owner and Contractor.
- C. Preparation:
 - 1. Use Schedule of Values for listing items in Applications for Payment.
 - 2. Complete each entry on Application of Payment form. Incomplete forms will be returned without action.
 - 3. List each authorized Change Order as a separate line item and in same format as other line items.
 - 4. Provide subtotals and total.
 - 5. Indicate total percentage of all work completed as of the date of the Application.
 - 6. Applications shall be signed and dated by authorized officer of Contractor. Signature shall be notarized.
- D. Include with Application for Payment appropriate invoices for materials stored on site.
- E. At request of Architect, provide substantiating data justifying dollar amounts in question.
- F. Submittal: Submit each Application for Payment.
 - 1. Initial Application for Payment: Submit after the following have been submitted and accepted by Architect and Owner.
 - a. Schedule of Values as required by Paragraph 1.2.A.
 - 2. Subsequent Applications for Payment:
 - a. Schedule of Values as required by Paragraph 1.2.A.
 - 3. Application of Payment at Substantial Completion: Submit after issuance of Certificate of Substantial Completion and in accordance with Section 01 77 00 - Closeout Procedures.
 - 4. Final Application for Payment: Submit after completion of final cleaning, final inspection, final submittals, and other final completion procedures specified in Section 01 77 00 - Closeout Procedures.

1.05 CONTRACT MODIFICATION PROCEDURES

- A. Changes in the Work shall be determined and Change Orders executed in accordance the General Conditions.
 - 1. Minor changes: Architect will advise of minor changes in Work not involving adjustment to Contract Sum or Time by issuing Supplemental Instructions (ASI).
 - 2. Architect requested Change Order: Architect may issue a Proposal Request (PR) with detailed description of proposed change and supplementary drawings and specifications as required.
 - 3. Architect will prepare Change Orders to adjust Contract Sum for:
 - a. Changes in the scope of work.
 - b. Differences in costs between products purchased and cash allowances stated in Section 01 21 00 - Allowances.
 - c. Work included in change orders must be approved by Architect and Owner.
 - d. Change Orders may be additive or deductive to the contract amount.
 - 4. Contractor proposed Change Order: Contractor may propose change by submitting a Modification Change Request (MCR) to Architect describing proposed change, reason for change, and its effect on Contract Sum and Time. Document requested substitutions in accordance with Section 01 63 00 - Product Substitution Procedures.
 - 5. A Modification Change Request (MCR) signed by the Owner for subsequent inclusion in a Change Order may instruct Contractor to proceed with a change in the Work. Document will describe changes and designate method of determining changes in Contract Sum and Time.

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- B. Documentation: Maintain adequate records and provide full information required for evaluation of proposed changes and to substantiate costs. The Contractor shall provide:
 - 1. Itemized product, labor, and equipment quantities and costs.
 - 2. Amounts for taxes, insurance, and bonds.
 - 3. Overhead and profit amounts.
 - 4. Justification for changes in Contract Time.
 - 5. Documented credits for deletions.
- C. Methods for determining adjustments to Contract Sum:
 - 1. Stipulated sum: Based on Architect's Proposal Request (PR) and Contractor's Modification Change Request (MCR) as approved by Architect. Completed Worksheet(s) shall be provided by Contractor for each Request to facilitate checking of itemized costs and percentages.
 - 2. Time and material: Maintain detailed records for work performed on time and material basis. Submit itemized account and full supporting data after completion of change within stated time limitations. Architect will determine allowable change in Contract Sum and Time. Supporting data shall include that which is indicated in the General Conditions and as follows:
 - a. Dates and times work was performed and by whom.
 - b. Invoices for products, equipment, and subcontracts.
- D. Revision of documents: After authorization of Change Order revise:
 - 1. Schedule of Values and Application for Payment forms to record each Change Order as a separate line item and adjust Contract Sum and Time.
 - 2. Progress Schedules to reflect changes in Contract Time and to adjust times for other work items affected by changes. Resubmit revised schedule.
 - 3. Record changes in Project Record Documents.

PART 2 PRODUCTS

2.01 Not used.

PART 3 EXECUTION

3.01 Not used.

END OF SECTION

SECTION 01 30 00 ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. General requirements for coordination of Work.
 - 2. Field engineering.
 - 3. Requirements for participation in and administration of:
 - a. Pre-construction conference.
 - b. Progress meetings.
 - c. Pre-installation conferences.
 - d. Progress schedule.

1.02 RELATED DOCUMENTS

- A. General Conditions: Contractor's schedules, logs, meetings and reports.
- B. Instructions to Bidders: Pre-Bid Conference.
- C. Section 01 10 00 - Summary.
- D. Section 01 40 00 - Quality Requirements:
- E. Section 01 50 00 - Temporary Facilities and Controls.

1.03 SUBMITTALS

- A. Provide in accordance with Section 01 33 00 - Submittal Procedures:
- B. Site mobilization plan (See Section 01 50 00 and General Conditions).
 - 1. Submit for Owner's approval prior to start of Work.
 - 2. Update as necessary during progress of Work to adjust for changed conditions and as approved by Owner.
 - a. Coordination drawings:
 - 1) Provide where coordination is critical for installation of components fabricated off site and where space is limited and maximum utilization of space is required.
 - 2) Show relationship and integration of components and construction entities, required installation sequence, dimensions, and tolerances.
 - 3. Staff assignment list and emergency contact information:
 - a. Prior to Pre-Construction Conference, provide to Architect a list of Contractor's principal staff assignments for Project. Indicate names, duties and responsibilities, addresses, emergency contact information and telephone numbers. Include resume of proposed Project Superintendent showing prior experience as superintendent on projects of similar size and scope. Naming more than one Project Superintendent to be in charge depending which is present at the site will not be acceptable. Design Professional shall be informed in writing prior to any proposed change in Project Superintendent during the progress of the Work. See also General Conditions.
 - b. Distribute contact information and post in field office coordination.

1.04 GENERAL COORDINATION REQUIREMENTS (See General Conditions).

- A. Scheduling: Coordinate scheduling, submittals and work of various specification sections to ensure efficient and orderly sequence of installation of interdependent construction elements. Ensure that work of one specification section is not installed in such a manner as to limit, preclude, or restrict work of another section.

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- B. Coordinate completion and clean up of work of separate specification sections in preparation for final inspection specified in Section 01 77 00 - Closeout Procedures.
- C. After acceptance of Work, coordinate access to facility for required maintenance, monitoring, adjusting, and correcting deficiencies to manner to minimize disruption of Owner's activities.
- D. Coordinate with Owner regarding work of Owner's forces and separate contractors. Ensure coordination of such work with Project Schedule.

1.05 FIELD ENGINEERING

- A. Locate or establish survey control and reference points prior to starting site construction. Protect points during construction and record locations with horizontal and vertical data on Project Record Documents in accordance with Section 01 78 00 - Closeout Submittals.
- B. Prior to start of construction, verify location of control points and layout information on Drawings relative to property, setback, and easement lines.
- C. Provide competent field engineering services. Establish elevations, lines, and levels utilizing recognized engineering survey practices. Periodically verify layouts.
- D. Promptly replace dislocated control and reference points based on original survey control.

1.06 PRE-CONSTRUCTION CONFERENCE

- A. Conference will be held after execution of the Agreement and prior to issuance of Notice To Proceed. Time and location will be coordinated with Owner and Architect. Meet at the site or other location convenient to all parties.
- B. Attendance: Owner, Architect, Consultants, Contractor, and major subcontractors and suppliers.
- C. Agenda:
 - 1. Designation and description of roles of responsible personnel representing Owner, Contractor, and Design Professional.
 - 2. Status of permits and Notice to Proceed.
 - 3. Site mobilization plan, use of premises by Contractor and Owner, Owner's occupancy requirements, work hours, regular school schedule and special school schedule considerations.
 - 4. Construction schedule, work sequence, and delivery priorities.
 - a. Material color selections.
 - 5. Bi-weekly job meeting schedule.
 - 6. Presentation and discussion of site mobilization plan specified in Section 01 50 00 - Temporary Facilities and Controls.
 - 7. Construction facilities, controls, and temporary utilities.
 - 8. Procedures for processing submittals, applications for payment, substitution requests, field decisions and communications, and contract modifications.
 - 9. Procedures for maintaining project record documents.
 - 10. Testing and inspection procedures.
 - 11. Contract closeout procedures.
 - 12. Emergency contact information.
 - 13. Other pertinent items.

1.07 PROGRESS MEETINGS

- A. Refer to General Conditions for requirements.

1.08 PRE-INSTALLATION CONFERENCES

- A. When required by an individual specification section, convene a pre-installation conference at site.

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- B. Require attendance of entities directly concerned with item of work.
- C. Notify Design Professional 7 days in advance of meeting.
- D. Prepare agenda and preside at conference. Record minutes, and distribute copies within 3 days to participants and Design Professional.
- E. At meeting, review conditions of installation, preparation and installation procedures, and coordination with related work.

1.09 PROGRESS SCHEDULE

- A. See the General Conditions for requirements.

1.10 COPYRIGHT

- A. The Drawings and Project Manual of this project are copyrighted by the Architect and consultants. Said drawings, details, and specifications shall NOT be reproduced in any manner by any contractor, sub-contractor, supplier, or manufacturer for the purpose of preparing required submittals.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Verify utility requirements and characteristics of equipment are compatible with facility utilities. Coordinate work of various specification sections having interdependent requirements for installing, connecting to, and placing in service such equipment.

PART 3 – EXECUTION

3.01 Not used

END OF SECTION

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Quality Requirements" for submitting test and inspection reports.
 - 2. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 5. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Except where noted otherwise on the Contract Drawings, electronic copies of CAD drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
 - 1. At the request of the Contractor and approval of the Owner, CAD drawing files may be obtained upon signing of requested release forms controlling the use of these files for specific use in the Work of this project. Request to provide files in a "software release versions" other than the version they were drawn in may be subject to cost charges for the time required to make such changes and any special administrative handling cost.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

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- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received for example, submittals requiring a color selection to be coordinated with other required color selections.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 working days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 working days for initial review of each submittal.
- D. Identification: Place a permanent label or title block on each submittal for identification.
 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately three by four inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.R1).
 - i. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

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2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 1. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Specification Section number and title.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.
- J. Use for Construction: Use only final submittals with mark indicating "Approved or Furnish as Corrected" taken by Architect.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Wiring diagrams showing factory-installed wiring.
 - f. Printed performance curves.
 - g. Compliance with specified referenced standards.
 - h. Testing by recognized testing agency.

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- i. Notation of coordination requirements.
 4. Submit Product Data before or concurrent with Samples.
 5. Number of Copies: Submit number established at Preconstruction Conference agreement but no less than four copies of Product Data, unless otherwise indicated. Architect will return one (minimum) copy. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal of Architect's CAD Drawings are otherwise permitted.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Templates and patterns.
 - g. Schedules.
 - h. Design calculations (if required by specification).
 - i. Relationship to adjoining construction clearly indicated.
 - j. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
 3. Number of Copies: Submit digital file in PDF format.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Sample source.
 - b. Number and title of appropriate Specification Section.
 3. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

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4. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample sets; remainder will be returned.
- E. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- F. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 1. Number of Copies: Submit one copy of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- E. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 1. Preparation of substrates.

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2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S / ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 1. **Approved**; no further action required; **Furnish as Corrected**, Make noted changes/corrections and proceed; **Rejected**, Note any comments and resubmit; **Revise and Resubmit**, Revise per comments and resubmit; **Submit Specified Item**, Revise and resubmit with specified item/manufacture; **See Attached Comments**, Comments are attached from Architect or others with information for further action or disposition of submittal.
- C. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

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SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Testing indicated to be provided by the Owner or their designated representative will require the Contractor to provide access, support services required by the specific testing; and the time and cooperation of Contract personnel as may be required for successful test to be carried out.
- C. Related Sections include the following:
 - 1. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

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- D. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- E. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

- A. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- B. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Recommendations on retesting and re-inspecting.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee

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payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.

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5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

1.7 QUALITY CONTROL

- A. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 2. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
- B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- C. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, security and protection facilities, including dust control and requirements for the provision of remote parking and transportation to and from the site. See drawings for additional requirements.
- B. Related Sections include the following:
 - 1. Divisions 02 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum.
 - 1. Where Owner Utilities are available they may be used. Water and electrical utilities are available. All temporary connections are to be approved by the Owner and restored to the original condition at the completion of the work.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm) galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts.

2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Waste and Recycling Containers: As required.

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- 2.3 Project Identification Sign: Contractor's Project Identification Sign size and location to be coordinated with Owner Representative.
- 2.4 CONTRACTOR PARKING: Contractor parking will be limited to an area designated by the Owner.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, and Owner, for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Use of Owner's water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity.
- E. Electric Power Service: Use of Owner's electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
 - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
 - 1. Provide Project Identification Sign: 4 feet x 8 feet, wood frame, exterior grade plywood construction. Sign shall be painted by professional sign painter. Exhibit lettering to Architect's design and colors. Sign shall list title of Project, contact at Owner, Architect, and Contractor.

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2. Erect on site at location established by the Owner.

- C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.
 1. Provide sufficient containers to allow for the segregation of materials for recycling or disposal as appropriate.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 1. Extent of Fence: As indicated by the Scope of Work on the drawings and to be coordinated with the Owner. Fencing will vary with the progress of the work and maintaining pedestrian and construction circulation separation.
- C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

3.5 UTILITIES, WATER SECTION POLICIES AND REQUIREMENTS

- A. Temporary domestic water service to construction sites: In order to protect the health of the domestic water system, Owner utilities must be contacted and authorization must be given prior to any connection being made to the domestic water system
- B. Any other direct connection to water distribution system: The minimum equipment requirement is as follows:
 1. Equipment requirements:
 2. Backflow prevention device: A reduced pressure backflow unit is the only authorized backflow prevention device.
 3. An isolating gate valve attached to the backflow prevention device.

END OF SECTION 01 50 00

SECTION 01 57 13 – TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 REFERENCE STANDARDS

- A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.
- B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).
- C. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.; 1999a (Reapproved 2014).
- D. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015 (Reapproved 2023).
- E. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.
- F. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.
- G. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017 (Reapproved 2021).
- H. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- I. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; 1995.
- J. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2009.

1.03 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, and in compliance with requirements of Construction General Permit (CGP)
- B. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
 - 1. Owner will submit a Notice of Intent (NOI) obtain permits and pay yearly fee required to the Department of Health and Environment (KDHE).

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2. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.
- C. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- D. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
- E. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 1. Control movement of sediment and soil from temporary stockpiles of soil.
 2. Prevent development of ruts due to equipment and vehicular traffic.
 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- F. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 1. Prevent windblown soil from leaving the project site.
 2. Prevent tracking of mud onto public roads outside site.
 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- G. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- H. Open Water: Prevent standing water that could become stagnant.
- I. Maintenance: General Contractor shall maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

- A. Furnish samples of the following before construction: See General Conditions for submittal procedures.
- B. Erosion and Sedimentation Control Plan:
 1. Submit within 2 weeks after Notice to Proceed
 2. Include:
 - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.

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- b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
 - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
 - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
 - e. Other information required by law.
 - f. Format required by law is acceptable, provided any additional information specified is also included.
- 3. Obtain the approval of the Plan by authorities having jurisdiction.
- 4. Obtain the approval of the Plan by Owner.
- C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 - MATERIALS

2.01 MATERIALS

- A. Mulch: Use one of the following:
 - 1. Straw or hay.
 - 2. Wood waste, chips, or bark.
 - 3. Erosion control matting or netting.
- B. Bales: Air dry, rectangular straw bales.
 - 1. Cross Section: 14 by 18 inches minimum.
 - 2. Bindings: Wire or string, around long dimension.
- C. Bale Stakes: One of the following, minimum 3 feet long:
 - 1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
 - 2. Wood, 2 by 2 inches in cross section.
- D. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
 - 1. Average Opening Size: 30 U.S. Std. Sieve maximum, when tested in accordance with ASTM D4751.
 - 2. Permittivity: 0.05 minimum, when tested in accordance with ASTM D4491/D4491M.

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3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
 4. Tensile Strength: 100 pounds-force minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
 6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533/D4533M.
 7. Color: Manufacturer's standard
- E. Silt Fence Posts: One of the following, minimum 5 feet long:
1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot
 2. Softwood, 4 by 4 inches in cross section.
 3. Hardwood, 2 by 2 inches in cross section.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
1. Width: As required; 20 feet minimum or as indicated on the drawings.
 2. Length: 50 feet minimum or as indicated on the drawings.
 3. Provide at each construction entrance from public right-of-way.
 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences or straw bales
1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
 - c. Along the toe of cut slopes and fill slopes.
 2. Space sediment barriers with the following maximum slope length upslope from barrier:
 - a. Slope of Less Than 2 Percent: 100 feet

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- b. Slope Between 2 and 5 Percent: 75 feet
 - c. Slope Between 5 and 10 Percent: 50 feet
 - d. Slope Between 10 and 20 Percent: 25 feet
 - e. Slope Over 20 Percent: 15 feet
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
- a. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
 - b. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Soil Stockpiles: Protect using one of the following measures:
- a. Cover with polyethylene film, secured by placing soil on outer edges.
 - b. Cover with mulch at least 4 inches thickness of sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay
- G. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
- 1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- H. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
- 1. Excavate minimum of 3 inches
 - 2. Place geotextile fabric full width and length, with minimum 2 inch overlap at joints.
 - 3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.
- B. Silt Fences:
- 1. Store and handle fabric in accordance with ASTM D4873/D4873M.
 - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 - 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 - 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.

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5. Install with top of fabric at nominal height and embedment as specified
 6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches with extra post.
 7. Fasten fabric to wood posts using one of the following:
 - a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gauge shank diameter.
 - b. Five staples per post with at least 17 gauge wire, 3/4 inch crown width and 1/2 inch long legs.
 8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
 9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet
- C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
 2. Install bales so that bindings are not in contact with the ground.
 3. Embed bales at least 4 inches in the ground.
 4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
 5. Fill gaps between ends of bales with loose straw wedged tightly.
 6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- D. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2-1/2 tons per acre anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
 2. Wood Waste: Apply 6 to 9 tons per acre
 3. Erosion Control Matting: Comply with manufacturer's instructions.
- E. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches depth.
 2. Wood Waste: Apply 2 to 3 inches depth.
 3. Erosion Control Matting: Comply with manufacturer's instructions.
- F. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.

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3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

- A. Inspect preventive measures weekly within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
 1. Promptly replace fabric that deteriorates unless need for fence has passed.
 2. Remove silt deposits that exceed one-third of the height of the fence.
 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
 2. Remove silt deposits that exceed one-half of the height of the bales.
 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site

3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION 329300

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SECTION 01 60 00 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION: Material and equipment incorporated into the Work shall conform to applicable specifications and standards, and shall comply with size, make, type, and quality specified, or as specifically approved in writing by Architect.

A. Manufactured and Fabricated Products

1. Design, fabricate, and assemble in accord with the best engineering and shop practices.
2. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
3. Two or more items of the same kind shall be identical, by the same manufacturer.
4. Products shall be suitable for service condition.
5. Equipment capacities, sizes, and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

B. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

C. It is the intention of the Section to provide the requirements to be met by all fasteners and anchoring devices which are generally exposed to view.

1. Items which are permanently installed and which will not require adjustment shall be anchored with one way screws. If both faces of the items are exposed the fastener shall be a sex bolt with one-way heads. Machine bolts and nuts may be used only if the threads are upset or the head of the bolt is welded to the item.
2. Items which are required to be removed periodically shall have anchoring devices with spanner heads or hexagonal socket heads.
3. Phillips head screws shall be used only for the anchoring of finish hardware such as butts, locksets, etc. No slotted head screws shall be used in any exposed fastening.
4. The requirements of this section of the specifications apply to fasteners & anchoring devices of electrical and mechanical items which are exposed to view in public spaces.

1.2 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to the Architect.

1. Maintain one set of complete instructions at the job site during installation and until completion. At the completion of the work, incorporate the instructions into the Operations and Maintenance manual.

B. Handle, install, connect, clean, condition, and adjust products in strict accordance with such instructions and in conformity with specified requirements.

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1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect for further instructions.
 2. Do not proceed with work without clear instruction.
- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.3 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.
1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals and that products are properly protected and undamaged.
- B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.4 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Maintain temperature and humidity within the ranges required by manufacturer's instructions. Arrange storage in a manner to provide easy access for inspection and make periodic inspections of store products to assure that products are maintained under specified conditions, and free from damage or deterioration.
- B. Protection After Installation: Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 01 60 00

SECTION 01 63 00 - SUBSTITUTIONS AND PRODUCT OPTIONS

PART 1 - GENERAL

1.1 PRODUCT OPTIONS:

- A. Substitutions: No substitutions will be considered unless a written request for approval has been submitted in accordance with the requirements as stated in the Instructions to Bidders, approved by Addendum.
 - 1. Form for written request is attached to this section and may be copied.
- B. Products List: Within 30 days after Contract Date, submit to Architect a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.
- C. Contractor's Options:
 - 1. For products specified only by reference standard, select any product meeting that standard.
 - 2. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named which complies with the specifications.
 - 3. For products specified by naming one or more products or manufacturers and "or equal" "approved equal" or "prior approved equal". Contractor must submit a written request for any product or manufacturer not specifically named in accordance with Instructions to Bidders.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

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SUBSTITUTION REQUEST FORM

TO: _____

PROJECT: Boundless Journey Adventure Park Phase 2

We hereby submit for your consideration the following product instead of the specified item for the above project:

<u>Section</u>	<u>Page</u>	<u>Paragraph/Line</u>	<u>Specified Item</u>
----------------	-------------	-----------------------	-----------------------

_____	_____	_____	_____
-------	-------	-------	-------

Proposed Substitution: _____

Attach complete product description, samples, photographs, performance and text data, warranty information, and other information necessary for evaluation. Identify specific model numbers, finishes, options, etc.

A. Will changes be required to building design in order to properly install proposed substitution?

Yes _____ No _____ If Yes, explain

B. Will the undersigned pay for changes to the building design, including engineering and drawings costs, caused by requested substitution?

Yes _____ No _____

C. List the differences between proposed substitution and specified item.

Specified Item	Proposed Substitution
----------------	-----------------------

_____	_____
-------	-------

_____	_____
-------	-------

D. Does substitution affect Drawing dimensions?

Yes _____ No _____

E. What affect does substitution have on other trades?

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F. Does manufacturer's warrantee of the proposed substitution differ from that specified?

Yes _____ No _____ If Yes, explain _____

G. Will substitution effect progress schedule?

Yes _____ No _____ If Yes, explain _____

H. Will substitution require more license fees or royalties than specified product?

Yes _____ No _____ If Yes, explain _____

I. Will maintenance and service parts be locally available for substitution?

Yes _____ No _____ If Yes, identify City name and
State _____ If No, explain

J. Will change in product effect outcome of LEED points?

Yes _____ No _____ If Yes, explain _____

Submitted by:

Signature

Firm

Address

For Architect's Use Only:

____ Submit Specified Item

____ No Exceptions Taken

____ Note Markings

____ Revise and Resubmit

____ Received Too Late

____ Rejected

____ Comments Attached

By: _____ Date: _____

Date _____ Remarks: _____

Telephone _____ Fax _____

END OF SECTION 01 63 00

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SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
 - 7. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting surveys.
 - 2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, and water-service piping; and underground electrical services.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

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3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
- C. Site Improvements: Locate and lay out site improvements.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- B. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Do not let dust migrate from the work area. Dispose of materials lawfully.

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- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended.
- E. Waste Disposal: Burying or burning waste materials on-site will not be permitted.
 - 1. Provide recycling of demolition and construction waste materials. Coordinate with City Recycling Services to divert materials from landfill disposal.

3.7 STARTING AND ADJUSTING

- A. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

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

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

END OF SECTION 01 73 00

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 01 Section "Execution" for progress cleaning of Project site.
 - 2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 4. Prepare and submit Project Record Documents, operation and maintenance manuals, property surveys, and similar final record information.
 - 5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner.
 - 6. Complete final cleaning requirements, including touchup painting.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

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1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Reinspection Fees: Should the status of the Work require re-observation by the Architect due to failure of the Work to comply with the Contractor's claims on initial observation the Owner will deduct the amount of the Architect's compensation for reinspection services from the final payment to the Contractor.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect.
 3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit two copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction.
 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Product Name
 - b. Date of Issue
 - c. Name of Contractor

1.6 WARRANTIES

- A. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Include Warranties as part of Operation and Maintenance Submittal.

BOUNDLESS JOURNEY ADVENTURE PARK – PHASE 2

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove snow and ice to provide safe access to building.
 - e. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - f. Wipe surfaces of electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - 1) Exterior items exposed to view are to be field painted to coordinate with the building exterior color scheme.
 - g. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 SUBMITTALS

- A. Initial Submittal: Submit one copy of each manual at least 21 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return review and if required return to Contractor for inclusion of additional materials and corrections as required.
- B. Operation and Maintenance Manual must be complete and available for Owners use prior to conducting any Testing and Demonstration activities.

1.4 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of systems.
 - 2. List of equipment.
 - 3. Table of contents.

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- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each operation, and maintenance manual.

2.2 MANUALS, GENERAL

- A. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment.
 - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 - 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions.
 - 2. Operating standards.
 - 3. Operating procedures.
 - 4. Operating logs.
 - 5. Wiring diagrams.
 - 6. Control diagrams.
 - 7. Piped system diagrams.
 - 8. Precautions against improper use.
 - 9. License requirements including inspection and renewal dates.
- B. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.

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8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- C. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- D. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture (if applicable).
 4. Reordering information for specially manufactured products.
- C. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- D. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- E. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
1. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents.
- C. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

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SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Sections include the following:
 - 1. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. At completion of training, submit one complete training manual(s) for Owner's use.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
 - 1. Requirement can be waived with Approval of Architect and Owner based on Contractor experience in training Owner's personnel.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate content of training modules with content of approved operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

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PART 2 - PRODUCTS - NA

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

END OF SECTION 01 79 00

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SECTION 03 10 00

CONCRETE FORMWORK

PART 1 GENERAL

1.1 WORK INCLUDED

- A. This section includes formwork for cast-in-place concrete and installation of embedded items. Design and construct formwork, shoring, and bracing to meet design and code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Cast-In-Place Concrete - Section 03 30 00

1.3 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. American Society for Testing and Materials (ASTM)
 - a. ASTM D 226-97a Standard Specification for Asphalt - Saturated Organic Felt used in Roofing and Waterproofing".
 - b. ASTM D 1751-83 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - 2. American Concrete Institute (ACI)
 - a. ACI 347-94 Recommended Practice for Concrete Formwork.
 - 3. PS 1 – Construction and Industrial Plywood.

1.4 SUBMITTALS

N/A

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials in accordance with accepted practice.
- B. Deliver form materials in manufacturer's packaging with installation instructions.
- C. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

PART 2 PRODUCTS

2.1 MATERIALS

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- A. Forms for Exposed Finish Concrete: Plywood complying with U.S. Product Standard PS-1-83 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better or metal, metal-framed plywood or other acceptable panel-type materials. Plywood shall be mill-oiled and edge-sealed, with each piece bearing legible inspection trademark. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
- B. Forms for Unexposed Finish Concrete: Use plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Forms for Round Piers or Columns: One-piece, disposable fiber forms or approved equal.
- D. Void Forms: Wax treated fiber board, 4" height, designed to resist 1000 psf pressure.
- E. Form Coatings: Commercial formulation that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- F. Chamfer Strips: 3/4" by 3/4" wood, PVC, or rubber.
- G. Expansion Joint Material: Asphalt saturated fiberboard, 1/2" thick, meeting the requirements of ASTM D 1751.
- H. Felt: Asphalt-saturated organic felt, weighing 30 pounds per 100 square feet, meeting the requirements of ASTM D 226.

PART 3 EXECUTION

3.1 COORDINATION

- A. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel. Set screeds accurately. Embedded items shall be accurately aligned and adequately supported. Verify installation of mechanical, plumbing, and electrical items to be embedded in concrete. Correct any unsatisfactory condition before proceeding further.

3.2 PREPARATION

- A. Remove loose dirt prior to placing concrete.
- B. Arrange and assemble formwork to permit stripping, so that concrete is not damaged during its removal.

3.3 INSTALLATION

- A. Formwork: Formwork shall support vertical and lateral loads that are applied until such loads can be supported by concrete structure. Formwork shall be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials. Construct forms to sizes, shapes, lines and dimensions shown. Perform surveys to obtain accurate alignment. Provide for recesses, chamfers, blocking, anchorages, inserts, and other features required in work. Select materials to obtain required finishes. Butt joints solidly and provide backup at joints to prevent leakage of cement paste.
- B. Chamfer Strips: Provide at exposed corners and edges.
- C. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris before concrete is placed. Retighten forms and

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bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

- D. Form Coating: Coat contact surfaces of forms with a form-coating compound before reinforcement is placed. Thin form-coating compounds with thinning agent and apply as specified in manufacturer's instructions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set anchorage devices and other embedded items accurately. Use setting drawings, diagrams, templates and printed instructions provided by supplier. Secure embedded items such that they are not displaced during placement of concrete.

3.5 JOINTS

- A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints unless noted otherwise.
- B. Control Joints in Slabs-on-Grade:
 - 1. Saw Cut: Contractor may saw cut control joints instead of using preformed strips. Saw cut joints shall be 1/8 inch wide. Saw cut depth should equal 1/3 of slab depth. Cut joints after concrete has hardened sufficiently to prevent raveling; usually 4 to 12 hours after slab has been cast and finished. Use diamond or silicone-carbide blades.
 - 2. Trowelled Control Joint: Contractor may trowel control joint into wet concrete at 1/2" depth.

3.6 REMOVAL OF FORMWORK

- A. General: Prevent excessive deflection, distortion, and damage to concrete when forms are stripped. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
- B. Formwork and supports at sides of concrete shall remain in place for 72 hours after concrete placement or until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it. This period represents cumulative number of hours, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 degrees F. Formwork and shoring which support the weight of concrete shall not be removed until concrete has attained 75% of required 28 day compressive strength.
- C. Do not superimpose any load on concrete until forms are removed and concrete is cured.

3.7 RE-USE OF FORMS

- A. General: Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are intended for successive concrete placement, thoroughly clean surfaces and remove fins and laitance. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

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- C. During cold weather, remove ice and snow from forms. Do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

END OF SECTION

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SECTION 032000 – CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. This section includes fabrication and installation of deformed bar and welded wire fabric reinforcing steel.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Formwork – Section 03 10 00.
- B. Cast In Place Concrete – Section 03 30 00.

1.03 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. American Concrete Institute (ACI)
 - a. ACI 301-02 Specifications for Structural Concrete for Buildings
 - b. ACI 315-99 Details and Detailing of Concrete Reinforcement
 - c. ACI 318-02 Building Code Requirements for Structural Concrete
 - 2. ASTM International
 - a. ASTM A 82/
A 82M-05 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - b. ASTM A 185/
A-185M-06 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - c. ASTM A 615/
A 615M-06 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 3. Concrete Reinforcing Steel Institute (CRSI).
Design Handbook – 2002 Edition.

1.04 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for reinforcing steel. Comply with ACI 15 requirements showing layout, bar schedules, stirrup spacing, diagrams of bent bars, and arrangements of reinforcing steel. Shop Drawings shall not be made by reproduction of the Control Drawings.

PART 2 – PRODUCTS

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2.01 MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60. Stirrups and ties may be Grade 40.
- B. Welded Wire Fabric: ASTM A 185, flat sheets.
- C. Steel Wire: ASTM A 82, 16 gage.
- D. Supports for Reinforcing Steel: Wire bar type and precast concrete block type meeting the requirements of CRSI Manual of Standard Practice.

2.02 FABRICATION

- A. Fabricate reinforcing steel in accordance with fabricating tolerances in ACI 315.
- B. Do not fabricate reinforcing steel until shop drawings are approved.

PART 3 – EXECUTION

3.01 PLACING BAR SUPPORTS

- A. General: Provide bar supports meeting the requirements of CRSI Specification for Placing Bar Supports.
- B. Slabs-on-grade: Use supports with sand plates or precast concrete blocks or horizontal runners where base material will not support chair legs.

3.02 PLACING REINFORCING STEEL

- A. General: Comply with CRSI Code of Standard Practice for “Placing Reinforcing Bars”.
- B. Clean reinforcing steel of loose rust and mill scale, earth, ice, and other materials, which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcing steel against displacement by formwork, construction, or concrete placement operations. Place reinforcing steel to obtain minimum coverages. Arrange, space and securely tie bars and bar supports to hold reinforcing steel in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 - 1. Concrete Cover:
 - a. Concrete cast against and permanently exposed to earth 3”
 - 2. Concrete exposed to earth or weather:
 - a. Bars larger than No. 5 2”
 - b. Bars No. 5 smaller 1-1/2”
- D. Rebar Splices: Locate at points of minimum stress or as shown on contract drawings. Unless noted otherwise, provide lap splices 30 bar diameters (18” minimum) in length.

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- E. Welded Wire Fabric Splices: Lap one complete wire spacing.
- F. Corner Reinforcing: Provide corner bars of same size and spacing as horizontal reinforcing steel. Lap with horizontal reinforcing 30 bar diameters of 18" minimum length.
- G. Reinforcing at Construction/Control Joints: Continue reinforcing steel through construction joints unless noted otherwise. Discontinue reinforcing steel 2 inches from performed construction joints in slabs-on-grade. Cut alternate longitudinal bars at weakened plane control joints in walls.

END OF SECTION

SECTION 03 3000 – CAST IN PLACE CONCRETE

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. This section covers cast-in-place concrete, including finishing, surface repair, and curing.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Formwork – Section 031000.
B. Concrete Reinforcement – Section 032000.

1.03 QUALITY ASSURANCE

- A. Reference Standards: Meet the requirements of the following codes, specifications, and standards.

1. American Concrete Institute (ACI)

- | | | |
|----|------------|--|
| a. | ACI 301-02 | Specifications for Structural Concrete for Buildings |
| b. | ACI 306-90 | Standard Specification for Cold Weather Concreting |
| c. | ACI 318-02 | Building Code Requirements for Structural Concrete |

2. ASTM International

- | | | |
|----|----------------|---|
| a. | ASTM C 31 | Standard Practice for Making and Curing Concrete |
| b. | C 31M-03a | Test Specimens in the Field |
| c. | ASTM C 33-03 | Standard Specification for Concrete Aggregates |
| d. | ASTM C 39 | Standard Test Method for Compressive |
| e. | C 39M-05 | Strength of Cylindrical Concrete Specimens |
| f. | ASTM C 94 | Standard Specification for Ready-Mixed |
| g. | C 94M-05 | Concrete |
| h. | ASTM C 131-03 | Standard Test Method for Resistance to Degradation of Small-
Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine |
| i. | ASTM C 136-06 | Standard Test Method for Sieve Analysis of Fine and Coarse
Aggregates |
| j. | ASTM C 143 | Standard Test Method for Slump of Hydraulic |
| k. | C 143M-05a | Cement Concrete |
| l. | ASTM C 150-05 | Standard Specification for Portland Cement |
| m. | ASTM C 171-03 | Standard Specification for Sheet Materials for Curing
Concrete |
| n. | ASTM C 172-04 | Standard Practice for Sampling Freshly Mixed Concrete |
| o. | ASTM C 173 | Standard Test Method for Air Content of Freshly |
| p. | C 173M-91 | Mixed Concrete by the Volumetric Method |
| q. | ASTM C 231-04 | Standard Test Method for Air Content of Freshly Mixed
Concrete by the Pressure Method |
| r. | ASTM C 260-01 | Standard Specification for Air Entraining Admixtures for
Concrete |
| s. | ASTM C 309-03 | Standard Specification for Liquid Membrane-Forming
Compounds for Curing Concrete |
| t. | ASTM C 330-05 | Standard Specification for Lightweight Aggregates for Structural
Concrete |
| u. | ASTM C 494 | Standard Specification for Chemical Admixtures for |
| v. | C 494M-05a | Concrete |
| w. | ASTM C 567-05a | Standard Test Method for Determining Density of Structural
Lightweight Concrete |

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- x. ASTM C 618-05 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- y. ASTM D 4318-05 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

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SECTION 03 3000 – CAST IN PLACE CONCRETE

1.04 SUBMITTALS

- A. Product Data: Submit the manufacturer's product data with application and installation instructions for proprietary materials and admixtures.
- B. Concrete Mix Design:
 - 1. Submit mix design per ACI-301, Section 4.
 - 2. Submit mixed design results of laboratory tests performed within the previous 6 months indicating aggregates from the proposed source comply with ASTM C 33 or C 330 as applicable.
 - 3. Submit the proposed use area for each mix design submitted (footings, stem walls, slabs, walls, columns).
- C. Test Reports: Submit copies of test reports for concrete compressive strength, air content, temperature, and slump.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, low alkali. Use one brand of cement throughout the project.
- B. Normal Weight Aggregates: ASTM C 33. Provide aggregates from a single source for exposed concrete.
- C. Lightweight Aggregates: ASTM C 330. Provide aggregates from a single source for each class of concrete.
- D. Water: Potable.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Water Reducing Admixture: ASTM C 494.
- G. Fly-Ash: ASTM C 618, Class F.
- H. Moisture-Retaining Cover: Provide waterproof paper, polyethylene film, or polyethylene-coated burlap, meeting ASTM C 171.
- I. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound meeting ASTM C 309; Type 1-D with fugitive dye for interior concrete and foundations; Type 2, white pigmented, for exposed exterior concrete except for exposed Architectural exterior concrete, use Type 1-D.
- J. Vapor Barrier shall comply with Section 071000 of these Specifications.
- K. The granular base shall meet the following grading requirements when tested per ASTM C 136.

Sieve Size (Square Openings)	Percent Passing by Weight
1 inch	100
3/4 inch	85-100
No. 4	45-95
No. 200	0-8

- L. The plasticity Index shall be no greater than 3 when tested per ASTM D 4318. The coarse aggregate shall have a percent wear of 50 or less than tested per ASTM C.

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SECTION 03 3000 – CAST IN PLACE CONCRETE

2.02 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial mixture or field experience methods as specified in ACI 301, Section 4. If the trial mixture method is used, employ an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs.
- B. Submit written reports to the Architect, or Engineer, of each proposed mix for each concrete class at least 15 days before the start of work. Concrete production shall begin after the approval of mixes.
- C. Structural lightweight concrete shall have a measured equilibrium density not exceeding 115 pounds per cubic foot when tested per ASTM C 567.
- D. Refer to the General Structural Notes for concrete strengths.
- E. Admixtures
 - 1. Use air-entraining admixture in all concrete, except air entrainment may be omitted from concrete to receive a steel trowel finish. The entrained air content for exterior concrete shall be 4-7 percent, and for interior concrete, the air content shall be 3-6 percent. Structural lightweight concrete may have an entrained air content of up to 10 percent.
 - 2. Use water-reducing admixture conforming to ASTM C 494, Type A, in all concrete unless the Structural Engineer approves.
 - 3. Use high-range water-reducing admixture conforming to ASTM C 494, Type F, in all concrete slabs unless the Structural Engineer approves.
 - 4. All other admixtures shall have the written approval of the Architect or Structural Engineer.
 - 5. Calcium chloride is not permitted.
 - 6. All admixtures, except high-range water reducers, shall be added to the concrete at the batch plant.
 - 7. Concrete for slabs to receive a steel trowel or float finish shall not contain fly ash and a high-range water reducer.

PART 3 – EXECUTION

3.01 COORDINATION

- A. Coordinate the installation of joint materials and moisture barriers with the placement of forms and reinforcing steel. Set screeds accurately. Accurately align and adequately support embedded items. Verify installation of mechanical, plumbing, and electrical items to be embedded in concrete. Correct any unsatisfactory condition before proceeding further.

3.02 PREPARATION

- A. Before placing concrete, clean and roughen the surface of previously placed concrete. Clean reinforcing steel. Remove debris, providing clean-outs at the bottom of forms when necessary. Moisten surfaces to receive concrete unless otherwise prepared. Remove excess water before placing concrete.

3.03 CONCRETE PLACEMENT

- A. General: Comply with ACI 301.

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- B. Place concrete continuously in layers not deeper than 24 inches. Do not place concrete against concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints. Deposit concrete as nearly as practicable to its final location to avoid segregation. Do not use vibrators to transport concrete.
- C. Maintain reinforcing in proper position during concrete placement operations.
- D. Consolidate concrete immediately after placing, with mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for concrete consolidation per ACI recommended practices.
- E. Bring slab surfaces to the correct level with straightedge and strike-off. Use bull floats or darbies to smooth the surface. Do not disturb slab surfaces before beginning or finishing operations.
- F. Cold Weather Concreting: Protect concrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures. Comply with ACI 306.1.
- G. Hot Weather Concreting: When hot weather conditions impair the quality and strength of concrete, reduce the delivery time of ready-mix concrete, lower the temperature of materials, or add a retarder to ensure that the concrete is plastic. Retempering with water is not allowed.

3.04 FINISH OF FORMED SURFACES

- A. Rough Form Finish: Provide where formed concrete surfaces are not exposed to view. Tie holes and surface imperfections shall be repaired and patched, and fins and other projections exceeding 1/4" in height should be rubbed down or chipped off.

3.05 FINISH OF HORIZONTAL SURFACES

- A. At the tops of foundation walls and grade beams, finish with a texture matching adjacent formed surfaces unless otherwise indicated.

3.06 SLAB FINISHES

- A. Float Finish: Begin floating when surface water disappears and concrete has stiffened sufficiently to permit power-driven or hand floats operation. Consolidate the surface with power-driven floats or hand-floating if the area is small or inaccessible to power units. The final surface finish shall have a minimum FF =35 and a minimum FL =25 per ALI requirements.
- B. Scratch Finish: Apply scratch finish to slab surfaces receiving floor topping. Roughen the surface before the final set using stiff brushes or brooms.
- C. Trowel Finish: Apply trowel finish to all slab surfaces unless noted otherwise. After floating, begin the first trowel and finish using a power-driven or hand trowel. Finish concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance. The finished surface shall have a minimum FF =35 and a minimum FL =25 per ALI requirements.
- D. Broom Finish: Apply on exterior slabs, ramps, steps, and sidewalks. Immediately after the concrete has received a float finish, draw a broom or burlap belt across the surface to give a coarse transverse scored texture.

3.07 CONCRETE CURING AND PROTECTION

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- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Start initial curing as soon as free water has disappeared from the concrete surface after placing and finishing. Continue curing for at least 7 days.
- B. Moisture-retaining-cover curing: Cure all interior concrete slabs with a moisture-retaining cover for the first 7 days. After that time, remove the cover, and the slab should be allowed to dry. Cover concrete surfaces with moisture-retaining cover for curing concrete, place in the widest practicable width with sides and ends lapped at least 3” and sealed. Repair any holes or tears in the cover during the curing period.
- C. Curing compound: exterior concrete slabs may be cured using a curing compound. All vertical concrete (walls, beams) shall be cured using curing compound – apply compound to the vertical surface as soon as the forms are removed. Apply the curing compound uniformly per the manufacturer’s printed instructions. Do not use curing compounds on interior slabs.

3.08 CONCRETE SURFACE REPAIRS

- A. Patching Surface Imperfections: Remove loose material and patch surface imperfections and holes left by tie rods with cement mortar. Surface imperfections include honeycomb, excessive air voids, sand streaking, and cracks.

3.09 FOR EXPOSED-TO-VIEW SURFACES

Blend white Portland cement and standard Portland cement so that, when dry, the patching mortar matches the surrounding color. To verify the mixture and color match, provide test areas at inconspicuous locations before patching. Compact mortar in place and strike-off slightly higher than the surrounding surface.

3.10 FIELD QUALITY CONTROL

- A. The Contractor shall employ the services of a qualified testing laboratory to perform tests and submit test reports.
- B. Sampling Fresh Concrete: ASTM C 172.
- C. Slump: ASTM C 143; one test for each set of compressive strength test specimens.
- D. Air Content: ASTM C 173 or C 231 for each set of compressive strength test specimens.
- E. Concrete Temperature: Test hourly when the air temperature is 40 degrees F. and below, when 80 degrees F and above, and when compression test specimens are made.
- F. Compression Test Specimen: ASTM C 31, one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when Field cure test specimens are required. Mold one set of standard cylinders for the volume of concrete specified below or a fraction thereof.
 - 1. Slabs on Grade or Metal Deck 30 cubic yards
 - 2. Footings and stem walls 50 cubic yards
 - 3. All other locations (unless noted otherwise) 30 cubic yards
- G. Compressive Strength Tests: ASTM C 39; test 1 specimen at 7 days, 2 specimens at 28 days, and retain one specimen in reserve for later testing. Additional Tests: The testing laboratory might conduct additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure as directed by the Architect. The testing laboratory may conduct tests to determine the

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adequacy of concrete by cored cylinders complying with ASTM C 42 or other methods as directed by the Architect or Engineer. The Contractor shall pay for such tests and any additional testing required when verifying unacceptable concrete.

END OF SECTION

SECTION 03 90 00

RAMMED EARTH WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Permit Drawings
- B. New Mexico Administrative Code, Title 14, Chapter 7, Part 4: 2003 New Mexico Earthen Building Materials Code.

1.2 SUMMARY

- A. This Section specifies stabilized earth, including formwork, reinforcing, mix design, placement procedures, and finishes.
- B. Stabilized earth includes the following:
 - 1. Rammed earth walls.

1.3 SUBMITTALS

- A. General: Submit laboratory test reports for stabilized earth materials and mix design test to the Architect and the building inspector for review prior to construction. Test reports shall include efflorescence testing.
- B. Actual rammed earth samples showing color and texture will be submitted to the Architect for approval.

1.4 QUALITY ASSURANCE

- A. Testing Service: Engage a testing agency acceptable to Architect to perform material evaluation tests and to verify design mixes.
- B. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

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- A. Forms for exposed finish stabilized earth: Plywood, metal, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
 - 1. Use overlaid plywood complying with U.S. Product Standard PS-1 “A-C or B-B High Density Overlaid Concrete Form,” Class I.
- B. Form release agent: Provide commercial formulation form release agent with a maximum of 350 g/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect stabilized earth surfaces and will not impair subsequent treatments of surfaces.
- C. Form ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of stabilized earth upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed surface.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars:
 - 1. #5 and larger: ASTM A 615, Grade 60, deformed.
 - 2. #4 and smaller: ASTM A 615, Grade 40, deformed.

2.3 STABILIZED EARTH MATERIALS

- A. Portland cement: ASTM C 150, Type I or II.
 - 1. Use one brand of cement for each color (gray, tan, and white throughout Project unless otherwise acceptable to Architect.
 - 2. Cement content shall be a minimum of 13.5% by weight of dry mix.
- B. Earth: The soil shall be “Natural Fines” as available from Mesa Sand and Gravel mesasandandgravel.com, or approved equal. The soil shall not contain rock more than 1 1/2” in diameter and clay lumps more than 1/2” in diameter.
- C. Water: Potable.
- D. Integral Color: Davis Colors Kailua (677), Palomino (5447), Santa Fe (1117) and Terra Cotta (10134) to match other walls and rammed earth walls constructed in Phase 1.

2.4 RELATED MATERIALS

- A. Adobe Water Repellent: SILOX Adobe Water Repellent or approved equal.

2.5 PROPORTIONING AND DESIGNING MIXES

- A. Following are the mixes for each type of stabilized earth:

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1. Rammed earth: Add water at about 10% of the cement/soil dry mix weight (this is the amount that, when added and mixed, will give a material consistency that can be balled up in the hand, dropped from waist height, and will break into several coherent clods (neither shattering nor “splatting”), i.e., the universally recognized hand-drop test for moisturized rammed earth.)
- B. Mixes of stabilized earth are designed to attain, at a minimum:
 1. Rammed earth: 1,500 psi minimum, 28-day compressive strength.
- C. Adjustment to stabilized earth mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in Work.

2.6 STABILIZED EARTH MIXING

- A. Rammed earth: Using a mechanically powered rotary mixer on a clean, dry surface on-site, kept continuously clean of extraneous debris and partially cured cement-stabilized earth. Material shall be placed and rammed within 60 minutes of wetting or shall be discarded.

PART 3 - EXECUTION

3.1 GENERAL

- A. Coordinate the installation of joint materials, conduit, junction boxes, and other related materials with placement of forms and reinforcing steel.

3.2 FORMS

- A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until stabilized earth structure can support such loads. Construct formwork so stabilized earth members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:
 1. Provide Class A tolerances for surfaces exposed to view.
 2. Provide Class C tolerances for other surfaces.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent form lines at exposed surfaces.

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- C. Fabricate forms for easy removal without hammering or prying against surfaces. Provide crush plates or wrecking plates where stripping may damage stabilized earth surfaces. Shape wood inserts to form keyways, reglets, recesses, and the like for easy removal.
- D. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- E. Provisions for Other Trades: Provide openings in stabilized earth formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- F. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive stabilized earth. Remove chips, wood, sawdust, dirt, or other debris just before placing stabilized earth. Retighten forms and bracing before placing stabilized earth, as required, to maintain proper alignment.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with stabilized earth.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect. Horizontal reinforcing in rammed earth, except as noted, shall be placed in forms, without ties, between lifts.
- D. Place reinforcement to maintain minimum coverages as indicated for stabilized earth protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during stabilized earth placement operations. Set wire ties so ends are directed into stabilized earth, not toward exposed surfaces.

3.4 JOINTS

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.
- B. For any rammed earth lift that will not receive the next lift within 2 hours, thoroughly roughen the exposed surface. Such joints in walls shall also slope to the outside at a pitch of 3 to 12.
- C. Continue reinforcement across construction joints except as indicated otherwise.

3.5 INSTALLING EMBEDDED ITEMS

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- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by stabilized earth. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

3.6 STABILIZED EARTH PLACEMENT

- A. Inspection: Before placing stabilized earth, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Build rammed earth in layers of 8 inch maximum finish thickness, compacted to 92% ASTM D698 Proctor Density. For any rammed earth lift that will not receive the next lift within 2 hours, thoroughly roughen the exposed surface (except top lifts). Such joints in walls shall also slope to the outside at a pitch of 3 to 12.
- C. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect stabilized earth work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures. Snow shall be removed from the base of the wall to prevent wicking and subsequent freeze-thaw spalling.
- D. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a stabilized earth mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- E. Hot-Weather Placement:
 - 1. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in stabilized earth.
 - 2. Fog spray forms and reinforcing steel just before placing stabilized earth.

3.7 STABILIZED EARTH PERSONNEL

- A. Provide names and experience records of ramming crew and crew foremen for approval by Engineer prior to work; keep these names available onsite. At all times during any stabilized earth work, at least one member of the stabilized earth crew fluent in the language of any workers and that of the Contractor shall be onsite for coordination with Contractor.

3.8 STABILIZED EARTH CURING AND PROTECTION

- A. Protect freshly placed stabilized earth from premature drying and excessive cold or hot temperatures. (Moisture curing, as is typically used for reinforced concrete, has been

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found to exacerbate efflorescence, and should not be done unless directed by Architect in writing.) Provide water-spray curing as required.

- B. Walls are to be sealed with a breathable sealer within 7 days of completion of the rammed earth.
- C. During construction, the tops of the walls must be protected from moisture until the roof or other water protection has been placed.

3.9 REMOVING FORMS

- A. General: Formwork not supporting weight of stabilized earth, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing material, provided stabilized earth is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

3.10 REUSING FORMS

- A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive stabilized earth placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed surfaces except as acceptable to Architect.

3.11 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. General: The Contractor will employ a testing agency to perform tests and to submit test reports.
- B. Sampling and testing for quality control during stabilized earth placement includes the following, or as directed by Engineer.
 - 1. Conduct compressive strength tests per ASTM C39 on the following:
 - a. Compression test cylinders molded in accordance with ASTM D698 and at maximum density +/- 1.0 pcf. for rammed earth. Mold and cure cylinders out of direct sunlight and at 100% relative humidity.
 - 2. Test program is two-phased as follows:
 - a. Phase One: For each day's work, obtain 12 test specimens of the rammed earth mix. Test 4 specimens at 7 days, 4 at 14 days, and 3 at 28 days (hold the last specimen). Phase One continues until 36 specimens have been cast.
 - b. Phase Two: For each day's work, obtain 4 test specimens of the rammed earth mix. Test 2 specimens at 7 days, 1 at 14 days, and 1 at 28 days.

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3. Results of Phase One accelerated testing will be used to develop curves for each mix relating early age to percent of 28-day design strength. Criteria for satisfactory 7- and 14-day strengths will then be established.
 4. Strength level of stabilized earth will be considered satisfactory if average of sets of three consecutive 28-day strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 100 psi.
- C. Test results will be reported in writing to Architect, Structural Engineer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, name of testing service, date of stabilized earth placement, stabilized earth type and class, location of batch in structure, design compressive strength at 28 days, and specimen compressive breaking strength.
- D. Additional Tests: The testing agency will make additional tests of in-place stabilized earth when test results indicate specified strengths have not been attained in the structure, as directed by Engineer. Testing agency may conduct tests to determine adequacy of stabilized earth by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION 03 90 00

SECTION 26 0500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SCOPE

- A. This section includes administrative items related to submittals, permits, substitutions, owner training, project closeout, and general requirements for performance of work by the Division 26 contractor. Reference Division 1 for other requirements.

1.2 SUBMITTAL REQUIREMENTS – DIVISION 26

- A. Engineer will commence review only when all Division 26 submittals have been received, due to interrelations between different sections. Review may be delayed if certain other related divisions have not been received, for example elevators or HVAC equipment.
- B. Organize submittals by section and name files with section number and title.
- C. All data required for review must be contained in the files provided to the Engineer. Links to manufacturer's websites will not be accepted.
- D. Re-submittals must contain markups that clearly delineate the changed items. Engineer will not re-review the entire submittal package in order to find the changes.
- E. Electronic submittals (pdf format) are preferred and can be reviewed faster. Paper submittals will also be accepted, but mixed format submittals are not acceptable.
- F. No fabrication or work which requires submittals shall begin until submittals are returned with the Engineer's approval.
- G. The Contractor shall coordinate each submittal with the requirements of the Work and of the Contract Documents. In the event that significant deviations are necessary between the submittals and the Contract Documents, he shall notify the Engineer in writing at the time of submission.
- H. The Contractor shall visit the project site, verify dimensions and existing conditions as far as possible without beginning work, and coordinate submittals accordingly. In the event that significant deviations are found between the existing conditions and the Contract Documents, he shall notify the Engineer in writing at the time of submission.
- I. Engineer's review does not constitute acceptance or responsibility for accuracy of dimensions, and will not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.
- J. Engineer's review does not relieve the Contractor of any requirements in the Contract Documents, nor shall it constitute approval of any deviation from the Contract Documents, unless such deviations are specifically stated by the Engineer in the submittal review.

1.3 PERMITS

- A. Permits necessary for the performance of the work under this contract shall be secured and paid for by the Contractor. Final inspection by the Engineer will not be made or certificate of final payment issued until certificates of satisfactory inspection from the inspection authorities are delivered. Reference Division 1 for permit requirements.

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1.4 TRAINING

- A. The electrical contractor shall conduct a 4 hour minimum training session with owner's designated staff to review all electrical equipment installed under this contract. At a minimum, the session will include operation and maintenance, programming, and basic operation of the systems.
- B. Contractor shall physically demonstrate the operation of each piece of equipment.
- C. A sign in sheet and agenda indicating a list of all equipment reviewed shall be included in the close out documents.

PART 2 DIVISION 26 SCOPE

2.1 ELECTRICAL WIRING AND CONTROL EQUIPMENT

- A. All line voltage wiring and conduit systems required by any Division shall be the responsibility of the Division 26 contractor. Every attempt will be made to reflect these requirements on the electrical sheets, but it is the Division 26 contractor's responsibility to obtain a complete drawing set, familiarize himself with the complete project scope, and coordinate with other Divisions.
- B. Responsibilities of the Division 26 contractor include but are not limited to:
 - 1. Installation and wiring of variable frequency drives (VFDs furnished by Division 23, startup and programming of VFDs shall be by VFD manufacturer's representative)
 - 2. Wiring to duct smoke detectors, including signal wiring to fire alarm system
 - 3. Wiring to fire/smoke dampers, including signal wiring and provision of disconnecting means at dampers
 - 4. Raceways for control circuits in all Divisions
 - 5. Field wiring of motor overload protection and starters (where required by equipment manufacturer)
 - 6. Field wiring of integral transformers in equipment (where required by equipment manufacturer)
- C. The Division 26 Contractor must coordinate with the Division 23 Contractor regarding the requirements of electrical control components. Any changes or additions required due to the specific nature of equipment furnished shall be the complete responsibility of the Contractor furnishing the equipment.
- D. The Division 26 Contractor must coordinate with the Division 23 Contractor to ensure that all required components of control systems are included and fully understood. The Owner shall not incur any additional cost as a result of lack of such coordination.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

- A. The Contractor shall carefully examine the drawings and specifications, visit the site of the work, fully inform himself as to all existing conditions, dimensions and limitations before starting work.
- B. If discrepancies are found between existing conditions and Contract Documents, Contractor shall notify Engineer for direction before proceeding. No claim for additional cost or time extension will be allowed without proper notice plus prior determination of time and cost to the owner.

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- C. If existing active or non-active services (which are not shown on plans) are encountered that require relocation or disconnection, the Contractor shall notify the Engineer for a decision on proper handling of these services. The Contractor shall not proceed with the work until so authorized.
- D. Damage to existing improvements caused by the contractor or a party to the contractor during the demolition or construction phase shall be repaired prior to contract date of substantial completion at no additional expense to the owner.

3.2 DEMOLITION AND MODIFICATION OF EXISTING SYSTEMS

- A. The demolition plan shall be used as a schematic guide. Additional demolition may be required to complete the work indicated on the Contract Documents. If additional demolition scope is required, notify Engineer for direction before proceeding.
- B. If concealed conditions are found that are of an unusual nature not ordinarily encountered in work of this kind, and these conditions will impact the cost, schedule, or design of the project, notify Engineer for direction before proceeding. No claim for additional cost or time extension will be allowed without proper notice plus prior determination of time and cost to the owner.
- C. Division 26 contractor is responsible for disconnection of all electrical systems in walls, floors, and ceilings scheduled for removal in the Contract Documents.
- D. Division 26 contractor is responsible for provision of temporary wiring and connections when required to maintain existing systems in service during construction.
- E. Verify that all electrical equipment to be relocated or reused is in working order prior to removal. If the existing material is found to be deficient, contractor shall notify Engineer for direction before proceeding.
- F. When performing work on energized equipment or circuits, use personnel experienced and trained in similar operations.
- G. Coordinate with general contractor for repair of adjacent construction and finishes damaged or exposed during demolition work. Repairs shall match existing finishes, and include paint on entire wall where required to match color.
- H. Unless otherwise noted in drawings, all existing removed equipment shall be stockpiled at the site at a location approved by Owner until an inspection by the Owner's representative determines what will be salvaged. All equipment not salvaged shall be properly disposed of off-site by Contractor.
- I. Division 26 contractor is responsible for properly disposing of existing hazardous materials removed under Division 26, including but not limited to:
 - 1. Fluorescent Lamps: remove from the site and properly disposing of them with a fluorescent lamp recycling company. Any used bulbs should be removed and placed in a new fluorescent lamp cardboard container. The cardboard container should be properly labeled. Boxes shall be stored and handled so that the used fluorescent lamps will not be crushed.
 - 2. Lighting Ballasts: Inspect ballasts to be removed. Ballasts with a "No PCB" label may be disposed of as normal construction debris. Ballasts without a "No PCB" label shall be assumed to contain PCBs:
 - a. Non-leaking ballasts with PCBs shall be disposed of at a landfill that will accept them. If no such landfill is available, treat as leaking below.
 - b. Leaking ballasts shall be transported off-site by a PCB transporter to an EPA-approved chemical processing site.

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3.3 PERFORMANCE OF NEW WORK

- A. Provide, install, and coordinate all Division 26 work indicated by Contract Documents. This consists of furnishing all labor, equipment, supplies and materials in addition to performing all operations including cutting, channeling and underground trenching, back fill and tamping necessary for the installation of complete power, lighting, or other systems as shown.
- B. Perform all electrical work in a neat and workmanlike manner in full compliance with all applicable, adopted codes; including, but not limited to: the national electrical code (NEC), UBC, IBC, NFPA, and ADA. all local and state requirements will be observed during the performance of this work.
- C. If any if discrepancies are found between Contract Documents and any associated legal or safety requirements, Contractor shall notify Engineer in writing. The Engineer will modify the Contract Documents as required. If the Contractor proceeds with any work he knows to be in variance of legal or safety requirements, the Contractor will assume all responsibility for this work. He will promptly correct the work when notified, without additional cost to the Owner.
- D. Coordinate all phases of the electrical work with the Architect and General Contractor. Schedule work to minimize disruption and inconvenience to the Owner.
- E. Obtain from system suppliers all wiring diagrams for all equipment and ensure that manufacturer's electrical requirements are met. Any incorrect wiring or devices installed by Contractor without the wiring diagram shall be corrected at Contractor's expense.
- F. Obtain permission from Structural Engineer before drilling or cutting structural members.
- G. Contact utility companies (power, gas, water, sewer, telephone, cable tv, etc.) prior to trenching in order to identify underground utilities. Contractor shall locate secondary service feeders, underground electrical branch circuits, sprinkler lines, etc., prior to trenching. Any cut or damaged underground utilities shall be repaired or replaced at Contractor's expense.
- H. When installing service equipment or metering equipment, coordinate with utility company to ensure that their standards are being met. If any discrepancy is found between utility standards and Contract Documents, notify Engineer for direction.
- I. Coordinate exact locations of electrical components and connections:
 - 1. Where devices are shown in casework, coordinate exact locations with architectural casework details prior to rough-in.
 - 2. Verify final locations of all sinks with the plumbing contractor prior to rough-in of nearby electrical devices. Any above counter electrical devices found within 8" of a sink, and any disposal receptacles found outside the under-sink space, shall be relocated at electrical contractor's expense.
 - 3. The owner reserves the right to relocate any electrical device up to a distance of 12", prior to installation, without additional charge.
 - 4. Coordinate the exact location of equipment requiring electrical connections with other trades prior to rough in. Where there is a question of adequate clearance or coordination between trades, Contractor will submit dimensioned drawings for Engineer's review prior to rough in.

3.4 ELECTRICAL PROJECT CLOSE OUT REQUIREMENTS

- A. Before substantial completion can be granted, the following items must be completed:
 - 1. AHJ inspection shall be completed and work approved
 - 2. All Division 26 equipment shall be installed and connected
 - 3. All Division 26 systems shall be online, tested, adjusted and calibrated

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4. Engineer's substantial completion inspection shall be performed
- B. Prior to consideration of Final Payment, the Contractor shall:
 1. Provide typed panel directories installed in each panelboard. Directories shall not be printed from drawings unless all circuiting is identical to that shown in drawings.
 2. Have all electrical equipment labeled per requirements in 26 05 53
 3. Provide Record As-Built Drawings to Engineer. As-Built Drawings shall consist of clear, legible markups of the Contract Documents indicating the following:
 - a. Any installed circuiting that deviates from circuiting on plan
 - b. Any equipment size or locations that deviate from plan
 - c. Any other significant deviations from design
 4. Provide copies of permits and/or inspection certificates.
 5. Provide Operating and Maintenance Manual(s).
 6. Return keys to the Owner.
 7. Deliver all spare parts.
 8. Touch up any damaged finishes.
 9. Clean all affected electrical equipment and systems as needed to remove construction debris such as paint, dust, grease, etc.
 10. Remove all existing equipment labels that are no longer accurate.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes building wire and cable, conduit and tubing, surface raceway, boxes, wiring devices, wiring connectors, and connections.

1.2 SYSTEM DESCRIPTION

- A. Wiring Products:
1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
 2. Stranded conductors for control circuits.
 3. Conductor not smaller than 12 AWG for power and lighting circuits.
 4. Conductor not smaller than 16 AWG and stranded conductors for control circuits.
 5. Increase wire size in branch circuits to limit voltage drop to a maximum of 2 percent.
- B. Wiring Methods:
1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation.
 2. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation.
 3. Above Accessible Ceilings: Use only building wire, Type THHN/THWN insulation.
 4. Wet or Damp Interior Locations: Use only building wire, Type THWN insulation in raceway, or PVC jacketed armored cable as allowed below under raceway products.
 5. Exterior Locations: Use only building wire, Type THWN XHHW insulation in raceway, or direct burial cable service- entrance cable, armored cable, or metal clad cable.
 6. Underground Locations: Use only building wire, Type THWN insulation, in raceway.
- C. Conductor sizes are based on copper. Aluminum conductors as indicated by “AL”. Conductors shall not be substituted without written approval from the Engineer.
- D. Raceway and boxes shall be located as indicated on Drawings, and at other locations where required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.
- E. Use hinged enclosures for large pull boxes.
- F. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- G. Raceway Products:
1. Concealed Dry Locations - Home Runs over 20 Amps:
Use rigid steel and aluminum conduit, or electrical metallic tubing. Use sheet-metal boxes.
 2. Concealed Dry Locations - Branch Wiring and Home Runs 20 Amps or Less:
Use rigid steel and aluminum conduit, electrical metallic tubing, or metal clad cable. Use sheet-metal boxes.
 3. Exposed Dry Locations (all ampacities):

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- Use rigid steel and aluminum conduit, electrical metallic tubing. Use sheet-metal boxes. Use flush mounting outlet boxes in finished areas.
4. Wet Interior Locations (ie, crawl spaces) - Home Runs over 20 Amps:
Use rigid steel conduit, or nonmetallic conduit rated for the environmental conditions. Use nonmetallic boxes.
 5. Wet Interior Locations - Branch Wiring and Home Runs 20 Amps or Less:
Use rigid steel conduit, nonmetallic conduit rated for the environmental conditions, or PVC jacketed armored cable. Use nonmetallic boxes.
 6. Underground More than 5 Feet outside Foundation Wall:
Use rigid steel conduit, or nonmetallic conduit rated for the environmental conditions. Use cast metal boxes or nonmetallic handhole.
 7. Underground Within 5 Feet outside Foundation Wall:
Use rigid steel conduit, or nonmetallic conduit rated for the environmental conditions. Use cast metal boxes.
 8. In or Under Slab on Grade:
Use rigid steel conduit, or nonmetallic conduit rated for the environmental conditions. Use cast metal boxes.
 9. Exposed Outdoor Locations:
Use rigid steel conduit. Use cast metal outlet, pull, and junction boxes.
 10. In Slab Above Grade:
Use rigid steel conduit, or nonmetallic conduit rated for the environmental conditions. Use cast or sheet metal boxes.

- H. Minimum Raceway Size: 1/2 inch unless otherwise specified.

PART 2 PRODUCTS

2.1 SURFACE METAL RACEWAY

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Wiremold
 2. Equal
- B. Product Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway, with manufacturer's standard Ivory enamel finish. Furnish manufacturer's standard accessories; match finish on raceway.

2.2 WIREWAY

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Square D
 2. Equal
- B. Product Description: General purpose or Raintight type wireway with screw cover and manufacturer's standard enamel finish.

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2.3 WALL SWITCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
- B. Single Pole Switch:
 - 1. Hubbell, Model 1221.
 - 2. Leviton, Model 1221.2.
 - 3. Eagle, Model 1221.
- C. Double Pole Switch:
 - 1. Hubbell, Model 1222.
 - 2. Leviton, Model 1222I.
 - 3. Eagle, Model 1222.
- D. Three-way Switch:
 - 1. Hubbell, Model 1223.
 - 2. Leviton, Model 1223.2.
 - 3. Eagle, Model 1223.
- E. Four-way Switch:
 - 1. Hubbell, Model 1224.
 - 2. Leviton, Model 1224.2.
 - 3. Eagle, Model 1224.
- F. Key Switch, Single Pole:
 - 1. Hubbell, Model 1221.2L.
 - 2. Leviton, Model 1221.2L.
 - 3. Eagle, Model 1221.2L.
- G. Key Switch, Three-Way:
 - 1. Hubbell, Model 1223.2L.
 - 2. Leviton, Model 1223.2L.
 - 3. Eagle, Model 1223.2L.
- H. Indicator Switch:
 - 1. Hubbell, 1221.L.
 - 2. Leviton, 1221.LH
 - 3. Eagle, 1221.L.
- I. Description: NEMA WD 1, heavy duty, AC quiet wall switch.
- I. Color: per architect
- J. Current Rating: 20 amperes.
- K. Ratings: Match branch circuit voltage and load characteristics.

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2.4 WALL DIMMERS-NA (see Section 26 09 23)

2.5 RECEPTACLES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
- B. Duplex Convenience Receptacle:
 - 1. Hubbell, Model 5362.
 - 2. Leviton, Model 5362.
 - 3. Eagle, Model 5362.
- C. GFCI Receptacle:
 - 1. Hubbell, Model GF 5362
 - 2. Leviton, Model 6899
 - 3. Eagle, Model GF 5362
- D. TR (Tamper Resistant) Receptacle:
 - 1. Hubbell : DRS 15GRYTR
 - 2. Hubbell : GF 82 GYTR (GFCI)
 - 3. Equal
- E. Color: per architect.

2.6 WALL PLATES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
- B. Decorative Cover Plate:
 - 1. Hubbell.
 - 2. Leviton.
 - 3. Approved equal.
- C. Jumbo Cover Plate:
 - 1. Hubbell.
 - 2. Leviton.
 - 3. Approved equal.
- D. Weatherproof Cover Plate: Gasketed cast metal plate with hinged and gasketed device cover.

PART 3 EXECUTION

3.1 EXISTING WORK

- A. Remove exposed abandoned raceway, boxes, wire, and cable, including abandoned raceway and cable above accessible ceiling finishes.

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- B. Disconnect abandoned circuits and remove raceway, wire, and cable. Remove abandoned boxes when associated wire and cable is removed.
- C. Maintain access to existing boxes and wiring connections remaining active and requiring access.
- D. Extend existing circuits using materials and methods compatible with existing electrical installations, or as specified.

3.2 INSTALLATION

- A. Route raceway and cable to meet Project conditions.
- B. Use 10AWG conductors for 20 ampere branch circuits longer than 100 feet, unless otherwise specified on drawings.
- C. Pull all conductors into raceway at same time.
- D. Do not rest cable on ceiling grid panels.
- E. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape un-insulated conductors and connector with electrical tape to 150% of insulation rating of Conductor.
- F. Verify continuity of each branch circuit conductor.
- G. Arrange supports to prevent misalignment during wiring installation
- H. Group related conduits and support using conduit rack. Construct using steel channel and provide space on each for 25% additional conduits.
- I. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers and split hangers
- J. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports. Do not attach conduit to ceiling support wires.
- K. Route all conduits parallel and perpendicular to structure.
- L. Route conduit in and under slab from point-to-point. Do not cross conduits in slab.
- M. Maintain 12 inches between conduit and surfaces with temperatures exceeding 104°F.
- N. Install no more than equivalent of three 90-degree bends between boxes.
- O. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- P. Provide #200 nylon pull string in each empty conduit except sleeves and nipples.
- Q. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- R. Mount raceway channel plumb and level.

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- S. Set wall mounted boxes at elevations to accommodate mounting heights indicated
- T. Adjust box location up to 10 feet prior to rough-in when required to accommodate intended purpose.
- U. Do not install flush mounting box back-to-back in walls; install boxes with minimum 24 inches separation.
- V. Verify outlet and switch boxes are installed at proper heights meeting ADA requirements.
- W. Do not install switches behind door swings.
- X. Install switches with OFF position down.
- Y. Do not share neutral conductors between circuits unless specifically allowed in design drawings.
- Z. Install receptacles with grounding pole on bottom.
- AA. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- BB. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, and above accessible ceilings.
- CC. Operate each wall switch with circuit energized and verify proper operation.
- DD. Verify that each receptacle device is energized and Test each receptacle device for proper polarity.
- EE. Test each GFCI receptacle device for proper operation.
- FF. Do not install flush mounting box back-to-back in walls. Provide a minimum of six inches of separation. Provide a minimum of 24 inches of separation in acoustic rated walls.
- GG. Coordinate mounting heights and locations of outlets mounted above counters, benches and back splashes.
- HH. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- II. Use tamper resistant receptacle types in all school spaces where children are present (classrooms, media centers, restrooms, corridors, etc).

END OF SECTION 260519

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 SUBMITTALS

- A. Action submittals: Product Data for each type of product.
- B. Closeout Submittals: As part of As-Built Plans required by Section 26 05 00, show built locations of grounding features, including the following where applicable:
 - a. Test wells.
 - b. Ground rods.
 - c. Ground rings.
 - d. Grounding connections for separately derived systems.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location, environmental conditions, and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

- A. Grounding and bonding conductor sizes: As specified in Contract Drawings, or larger.
- B. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- C. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.

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2.3 CONNECTORS

- A. All grounding and bonding connectors: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors:
 - 1. Mechanical type, cast silicon bronze, solderless compression or exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
 - 2. Compression type, copper or copper alloy, with two wire terminals.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- G. Conduit Hubs: Mechanical type, terminal with threaded hub.
- H. Ground Rod Clamps: Mechanical type, copper or copper alloy.
- I. Straps: Solid copper, cast-bronze clamp or copper lugs. Rated for 600 A.
- J. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- K. Water Pipe Clamps:
 - 1. Mechanical type, two pieces with zinc-plated or stainless-steel bolts. Tin-plated aluminum or Die-cast zinc alloy, listed for direct burial.
 - 2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; size and spacing per Construction Drawings.
- B. Ground Plates: 1/4 inch (6 mm) thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Bury at least 24 inches (600 mm) below grade.

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- C. Grounding Bus (if specified in Construction Drawings): Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
 - 3. Connect to service grounding electrode.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install wire-type equipment grounding conductors with all feeders and branch circuits.
- B. Conduit or cable sheath is not allowed to be used as an equipment grounding conductor, unless explicitly called for or allowed in a particular location on Construction Drawings.
- C. Where current carrying conductors are increased in size to mitigate voltage drop, the wire type equipment grounding conductor must also be increased by the same percentage in cross sectional area (per NEC 250).
- D. Patient Care Areas (where applicable) meet grounding requirements of NFPA 99 and NFPA 70.
- E. Poles Supporting Outdoor Lighting Fixtures:
 - 1. If the pole structure is supplied by only a single branch circuit, a separate grounding electrode (rod) is not required. Bond the equipment grounding conductor of the supply circuit to pole base rebar and exposed metallic pole components.
 - 2. If the pole structure is supplied by multiple branch circuits, install an 8 ft ground rod at the pole, and bond to pole base rebar, exposed metallic pole components, and equipment grounding conductors of all supply circuits.
 - 3. If the above is not possible due to site conditions, contractor shall submit RFI to Engineer for direction. Owner shall not be responsible for any added cost incurred if alternate grounding strategies are installed without Engineer's direction.

3.3 FENCE GROUNDING

- A. Fences enclosing transformers, generators, or solar/wind generation equipment: bond to the grounding electrode(s) associated with the equipment.
- B. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

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3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code (for example, equipment grounding conductors for circuits must follow the same path as the circuit). Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System (where applicable): Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Interconnect ground rods with conductors below grade unless otherwise indicated. Make connections without exposing steel or damaging coating if any.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building (if present). Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. If dielectric fittings are present in interior piping, submit RFI for direction before bonding.
 - 4. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. For all grounding connections: inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 2. At each location where a maximum ground-resistance level was specified on Construction Drawings: test ground resistance and provide test report to Engineer as part of Closeout Documents.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.

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- c. If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce resistance.

END OF SECTION 26 05 26

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
 - 2. Labels and Signs.
 - 3. Bands and tubes.
 - 4. Tapes and stencils.
 - 5. Tags.
 - 6. Paint for identification.
 - 7. Cable Ties and fasteners for labels and signs.

1.2 IDENTIFICATION REQUIRED

- A. EQUIPMENT:
 - 1. Voltage designation for each piece of electrical distribution equipment.
 - 2. Nameplate for each piece of electrical distribution equipment, using name as shown on Construction Drawings.
 - 3. Nameplate for each piece of control equipment, indicating system and function.
 - 4. Emergency instructions or warning labels as specified in Construction Drawings, or required by Authority Having Jurisdiction.
- B. RACEWAYS:
 - 1. Identify all conduit runs longer than 6 feet.
 - 2. Install bands at changes in direction, at penetrations of walls and floors (each side), at junction boxes and terminations, and straight runs.
 - 3. Identification spacing: at 50-foot (15-m) maximum intervals in straight runs, and at 20-foot (7.6-m) maximum intervals in congested areas.
- C. UNDERGROUND:
 - 1. Install underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- D. BOXES:
 - 1. Identify the covers of each junction and pull box with voltage, circuit number, and emergency power designation where applicable.
- E. CONDUCTORS:
 - 1. Identify each power conductor at panelboard gutters, pull boxes, and outlet and junction boxes.
 - 2. Identify each control-circuit conductor in pull and junction boxes, manholes, handholes, and terminations, with the conductor or cable designation, origin, and destination.

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- F. WORKING SPACE: In unfinished and utility spaces only, apply floor marking tape or tape and stencil to finished surfaces showing working clearances, labeled “KEEP CLEAR”. Workspace shall comply with NFPA 70.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PRODUCT PERFORMANCE REQUIREMENTS

- A. Comply with NFPA 70 and NFPA 70E.
- B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- C. Comply with ANSI Z535.4 for safety signs and labels.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Temperature Change: 100 deg F (67 deg C), ambient; 150 deg F (100 deg C), material surfaces.

2.2 PRODUCT COLOR AND LEGEND REQUIREMENTS

- A. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
 - 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Colors for 240-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - 4. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 - 5. Color for Neutral: White or gray.
 - 6. Color for Equipment Grounds: Bare copper, Green, Green with a yellow stripe.
 - 7. Colors for Isolated Grounds: Green with white stripe.
- B. Warning Label Colors:
 - 1. Identify system voltage with black letters on an orange background.

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- C. Equipment Identification Labels:
 - 1. Black letters on a white field, or vice versa.

2.3 LABELING PRODUCTS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.
- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, flexible label with acrylic pressure-sensitive adhesive.
 - 1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
- D. Self-Adhesive Labels: Polyester, Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 - 1. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
 - b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
 - c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBE PRODUCTS

- A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameters sized to suit diameter and that stay in place by gripping action.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg F (93 deg C). Comply with UL 224.

2.5 TAPE AND STENCIL PRODUCTS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.
- C. Tape and Stencil: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers placed diagonally over orange background and is 12 inches (300 mm) wide. Stop stripes at legends.
- D. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white or yellow and black stripes and clear vinyl overlay.
- E. Underground-Line Warning Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

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2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 4. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".
 5. Tape Product :
 - a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility where required, compounded for direct-burial service.
 - b. Width: 4 inches (75 mm).
 - c. Overall Thickness: 5 mils (0.125 mm).
 - d. Foil Core Thickness: 0.35 mil (0.00889 mm).
 - e. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
 - f. Tensile according to ASTM D 882: 70 lbf (311.3 N) and 4600 psi (31.7 MPa).
- F. Stenciled Legend: In nonfading, waterproof, high contrast ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.6 TAG PRODUCTS

- A. Write-on Tags:
1. Polyester Tags: 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment.
 2. Marker for Tags:
 - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - b. Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGN PRODUCTS

- A. Baked-Enamel Signs:
1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 3. Minimum Nominal Size: 7 by 10 inches (180 by 250 mm).
- B. Metal-Backed Butyrate Signs:
1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch (1-mm) galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 3. Nominal Size: 10 by 14 inches (250 by 360 mm).
- C. Laminated Acrylic or Melamine Plastic Signs:
1. Engraved legend.
 2. Thickness:

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- a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
- b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
- c. Engraved legend with black letters on white face or white letters on a dark gray background.
- d. Punched or drilled for mechanical fasteners with 1/4-inch (6.4-mm) grommets in corners for mounting, or self-adhesive where suitable for environment.
- e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIE PRODUCTS

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black, except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 12,000 psi (82.7 MPa).
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 7000 psi (48.2 MPa).
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.

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- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.
- H. System Identification for Raceways and Cables: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side. Secure tight to surface of conductor, cable, or raceway.
- I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions.
- K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- L. Vinyl Wraparound Labels:
 - 1. Secure tight to surface at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- M. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- N. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
- O. Self-Adhesive Labels:
 - 1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- P. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- Q. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- R. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- S. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

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1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- T. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- U. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- V. Underground Line Warning Tape:
 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
 2. Install underground-line warning tape for direct-buried cables and cables in raceways.
- W. Write-on Tags:
 1. Place in a location with high visibility and accessibility.
 2. Secure using cable ties (UV-stabilized if outdoor, or plenum-rated if in plenum).
- X. Baked-Enamel Signs:
 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- Y. Metal-Backed Butyrate Signs:
 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- Z. Laminated Acrylic or Melamine Plastic Signs:
 1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- AA. Cable Ties: General purpose, for attaching tags, except as listed below:
 1. Outdoors: UV-stabilized nylon.
 2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION METHODS

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

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- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 20 A: Identify with self-adhesive raceway labels or vinyl tape applied in bands.
- D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags or self-adhesive wraparound labels.
- E. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes or self-adhesive wraparound labels.
- F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels, Baked-enamel warning signs or Metal-backed butyrate warning signs.
 - 1. Apply to exterior of door, cover, or other access.
 - 2. For equipment with multiple power or control sources, apply to door or cover of equipment.
 - 3. Install labels straight and level.
- G. Arc Flash Warning Labeling: Self-adhesive labels.
- H. Emergency Operating Instruction Signs: Self-adhesive labels, Baked-enamel warning signs, Metal-backed butyrate warning signs, Laminated acrylic or melamine plastic signs. White legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer load shedding Insert emergency operations.
- I. Equipment Identification Labels:
 - 1. Indoor Equipment: Self-adhesive label, Baked-enamel signs, Metal-backed butyrate signs, Laminated acrylic, or melamine plastic sign.
 - 2. Outdoor Equipment: Laminated acrylic or melamine sign or Stenciled legend 2 inches (50 mm) high or more.
 - 3. Install labels straight and level.

END OF SECTION 26 05 53

SECTION 26 5600
EXTERIOR LIGHTING SUPPORTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Luminaire poles and mounting accessories.
- B. Related Sections include the following:
 - 1. Section 26 51 19 "LED Lighting Fixtures" for interior and exterior luminaire requirements.

1.3 DEFINITIONS

- A. Luminaire: Complete lighting fixture, including ballast housing if provided.
- B. Pole: Luminaire support structure, including tower used for large area illumination.
- C. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

- A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4.
- B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4.
- C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4.
- D. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.
 - 1. Wind speed for calculating wind load for poles exceeding 50 feet in height is 80 mph.
 - 2. Wind speed for calculating wind load for poles 50 feet or less in height is 80 mph.

1.5 SUBMITTALS

- A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.

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2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photoelectric relays.
6. Ballasts, including energy-efficiency data.
7. Materials, dimensions, and finishes of poles.
8. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
9. Anchor bolts for poles.11.
10. Pole foundations.
11. Design data, include IES files for all fixture types.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70E and IEEE C2, "National Electrical Safety Code."
- C. Comply with NFPA 70. National Electrical Code.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Package aluminum poles for shipping according to ASTM B 660.
- B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 1. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
 2. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4.
 1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.

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2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 1. Materials: Shall not cause galvanic action at contact points.
 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
 3. Anchor-Bolt Template: Plywood or steel.
- D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete" or in structural/civil details. Grout around each base.
- E. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.
- F. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4.

2.2 STEEL POLES

- A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; 1-piece construction up to 40 feet in height with access handhole in pole wall.
 1. Shape: Round, straight.
 2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- B. Steel Mast Arms: Single-arm type, continuously welded to pole attachment plate. Material and finish same as pole.
- C. Brackets for Luminaires: Detachable, cantilever, without underbrace.
 1. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.
 2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
 3. Match pole material and finish.
- D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet above finished grade.]
- F. Intermediate Handhole and Cable Support: Weathertight, 3-by-5-inch handhole located at mid-point of pole with cover for access to internal welded attachment lug for electric cable support grip.

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- G. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.
- I. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- J. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.
- K. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
 - 3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected by Architect from manufacturer's full range.

2.3 ALUMINUM POLES

- A. Poles: Seamless, extruded structural tube complying with ASTM B 429, Alloy 6063-T6 with access handhole in pole wall.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Valmont Square, 4- Bolt Poles.
 - 2. Shape: Square, straight.
 - 3. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- D. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- E. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.
 - 1. Finish: Same as pole.
- F. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- G. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

2.4 POLE ACCESSORIES

- A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

PART 3 EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Fasten luminaire to indicated structural supports.
 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- B. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources.
- C. Provide excavation and concrete foundation for lighting poles.

3.2 POLE INSTALLATION

- A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:
 1. Fire Hydrants and Storm Drainage Piping: 60 inches.
 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
 3. Trees: 15 feet.
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division 03 Section "Cast-in-Place Concrete" or structural/civil details.
- D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
 1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.

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2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
 3. Install base covers, unless otherwise indicated.
 4. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
1. Dig holes large enough to permit use of tampers in the full depth of hole.
 2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.
- F. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
1. Make holes 6 inches in diameter larger than pole diameter.
 2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at 28 days, and finish in a dome above finished grade.
 3. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.
 4. Cure concrete a minimum of 72 hours before performing work on pole.
- G. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.
- H. Raise and set poles using web fabric slings (not chain or cable).

3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Division 16 section "Grounding and Bonding." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

- A. Ground poles and support structures according to Division 16 Section "Grounding and Bonding."
1. Install wire type equipment grounding conductor in circuits supplying pole luminaires. Bond EGC to metallic components of pole accessories and foundations and any other exposed metal parts.
 2. Grounding electrodes at pole bases are not required unless multiple circuits supply pole structure, or if specifically indicated on design drawings.

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed fixture, base, and pole for damage. Replace damaged fixtures and components.

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3.6 CLEANING

- A. Clean electrical parts and remove foreign materials.
- B. Remove dirt and debris from enclosure.
- C. Clean finishes and touch up damage.

END OF SECTION 265600

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SECTION 312000 – EARTHWORK AND SITE GRADING

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes general excavating and filling and related items necessary to complete the project per these specifications.
- B. The Contractor shall be fully responsible for acquainting himself with existing site conditions. He must carefully examine soil and structural characteristics before submitting his bid.

PART 2 - EXCAVATION AND FILL

- A. Rough grading of the site shall consist of excavation and placement of fill material for establishing required grades, leveling, and filling holes, pits, and other depressions, developing construction landforms, and performing all other necessary earthworks per the drawings and specifications.
- B. Before rough grading, the Contractor shall clear the entire site of all weeds, debris, construction tailings, and large rocks. No additional allowance will be made for rock removal, site clearing and grading, filing, compacting, disposal, or removal of any unclassified materials.
- C. Remove old fills if they directly impede the completion of any item of landscape construction or at the Landscape Architect's specific request.
- D. The Contractor shall dispose of excess and unrequired material from excavations.
- E. The Contractor shall protect excavations and trenches from cave-in per the recommendations of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc., Seventh Revised Edition 1977, or AGC Manual.
- F. The Contractor shall excavate to the proper depth, with allowances for clearances to install services and forms.

PART 3 - PRODUCTS

- A. Fill soil shall be free of rocks two (2) inches or more in diameter, vegetation (especially weeds), debris, and construction residue. Break up clods larger than 6 inches in diameter before compacting.

PART 4 - EXECUTION

4.01 HARD CONSTRUCTION AREAS

- A. The Contractor shall conform to the information provided in the plans and details.
- B. The Contractor shall compact soil to 95% modified Proctor, top 8 inches of subgrade, under all walks, slabs, and other hard construction areas.

4.02 SOFT LANDSCAPE AREAS

- A. The Contractor shall note that the finish grade indicated on the plans includes soil amendments as specified in Section 02480 - Landscape Work.
- B. The Contractor shall compact soil to 85% modified Proctor, top 8 inches of subgrade, under all planted areas.

4.03 WEATHER LIMITATIONS

- A. Do not place controlled fill when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees F., it shall be the responsibility of the Contractor to protect all areas of the completed surface

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SECTION 312000 – EARTHWORK AND SITE GRADING

against any detrimental effects. The Contractor shall recondition, reshape, and recompact any areas damaged by freezing per the requirements of this specification without cost to the Owner.

4.04 FINISHING (LANDSCAPE AREAS)

- A. Finish grading: Prior to planting areas shall be finished graded in accordance with the drawings and specifications. The Contractor shall establish a smooth and continuous finish grade, free of water-retaining depressions, with special attention given to transition between varying grades. The Landscape Architect shall approve all finish grading.
- B. The Contractor shall construct the finished surface so that the average surface elevation of the earth shall not be higher or lower than 0.05 feet of required elevation.
- C. The finish grading shall include specified soil amendments suitable for lawns and additional landscape as specified in this division.

SECTION 32 13 13 CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete sidewalks, integral curbs, pedestrian paved areas and parking areas.

1.02 RELATED REQUIREMENTS

- A. Section 03 10 00 - Concrete Forming and Accessories.
- B. Section 31 20 00 – Earthwork and Site Grading
- C. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
- D. ACI 305R - Hot Weather Concreting; 2010.
- E. ACI 306R - Cold Weather Concreting; 2010.
- F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- H. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.
- I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.
- J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
- K. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- L. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.
- M. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- N. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- O. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- P. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).
- Q. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on joint filler, admixtures, and curing compound.
- C. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.
- D. Product Data: Submit reports for each concrete material and mix design test.

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- E. Samples for Pigment Color Selection: Submit manufacturer's complete sample chip set, including pigment number and required dosage rate for each color.

1.05 QUALITY ASSURANCE

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Steel form material, profiled to suit conditions.
- B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
 - 1. Thickness: 1/2 inch (12 mm).
- C. Form Release Agent: Colorless mineral oil that will not stain concrete, absorb moisture, impair natural bonding of concrete finish coatings, or affect color characteristics of concrete finish coatings.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 80 (80,000 psi) (550 MPa) yield strength; deformed billet steel bars; unfinished.
- B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.
- C. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi (280 MPa) yield strength; deformed billet steel bars; unfinished finish.
- D. Dowels at Expansion Joints: ASTM A 615/A 615M Grade 40 (280); smooth steel bars; unfinished finish.

2.03 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.
- B. Cement: ASTM C150/C150M, Normal - Type I Portland cement, gray color.
- C. Fine and Coarse Mix Aggregates: ASTM C33/C33M.
 - 1. Fine Aggregates: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
 - 2. Coarse Aggregates: Clean, uncoated, processed from natural rock or stone containing no clay, loam or foreign matter. Unless otherwise noted or mass concrete, use aggregate meeting #57 or #67 grading requirements.
- D. Water: Clean, and not detrimental to concrete.
- E. Air-Entraining Admixtures: ASTM C260/C260M.
- F. Chemical Admixtures: ASTM C494/C494M, Type B - Retarding, Type C - Accelerating, Type D - Water Reducing and Retarding, Type E - Water Reducing and Accelerating, Type F - Water Reducing, High Range, and Type G - Water Reducing, High Range and Retarding.
 - 1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- G. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C 979.
 - 1. Mixing of colorant for colored concrete shall occur at the plant. Job site or transit mixing of pigments will not be acceptable.
 - 2. Color(s): As selected by Architect from manufacturer's full range of earth tone colors.
 - 3. Manufacturers:
 - a. Butterfield Color : www.butterfieldcolor.com.
 - b. Davis Colors : www.daviscolors.com.
 - c. Lambert Corporation : www.lambertusa.com.
 - d. Solomon Colors: www.solomoncolors.com.

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- e. Substitutions: See Section 01 60 00 - Product RequirementsSee Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Acid Etch Solution: Muriatic type mixed to a ____ percent solution.
- B. Curing Compound: ASTM C309, Type 1, Class B.
- C. Evaporation Retarder: ACI 302: "Evaporation Retardant/Monomolecular Film", temporary protection from rapid moisture loss.

2.05 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- D. Concrete Properties:
 - 1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; as noted on plans
 - 2. Water-Cement Ratio: Maximum 45 percent by weight.
 - 3. Total Air Content: 4-7 percent, determined in accordance with ASTM C173/C173M.
 - 4. Maximum Slump: 4 inches (100 mm).
 - 5. Maximum Aggregate Size: 3/4 inch (19 mm).

2.06 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

- A. See Section 31 20 00 for construction of base course for work of this Section.
- B. Prepare subbase in accordance with State of New Mexico Highways standards.
- C. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- D. Rework subgrade as required by soil compaction control and earthwork sections if weather or other conditions deteriorate previously prepared subgrade.
- E. Maintain moisture and degree of compaction specified in soil control until concrete is installed.
- F. Verify gradients and elevations of base are correct.

3.03 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.04 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

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- D. Concrete pours and keyway to run parallel with length of drives.
- E. Form shall be full depth of concrete.
- F. Leave forms in place for at least 12 hours after placing and finishing concrete.
- G. Clean and oil forms each time they are used.

3.05 REINFORCEMENT

- A. Place reinforcement at midheight of slabs-on-grade.
- B. Place reinforcement as indicated.
- C. Interrupt reinforcement at expansion joints. Continue steel reinforcement across construction joints.
- D. Place dowels to achieve pavement and curb alignment as detailed.
- E. Place dowels at curb and gutters if poured separately.
- F. Place smooth dowels at expansion joints as detailed on drawings.

3.06 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

3.07 PLACING CONCRETE

- A. Place concrete as specified in Section 03 30 00.
- B. Place concrete in accordance with State of New Mexico Highways standards.
- C. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.
- D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
- E. Paving shall not be done when it is raining.

3.08 JOINTS

- A. Align curb, gutter, and sidewalk joints.
- B. Place 3/8 inch (10 mm) wide expansion joints at 20 foot (6 m) intervals and to separate paving from vertical surfaces and other components and in pattern indicated.
 - 1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch (13 mm) of finished surface.
- C. Provide scored joints.
 - 1. At intervals shown on drawings.
- D. Construction Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1 1/2 inches (38 mm) into concrete.
- E. Expansion Joints: Form expansion joints of preformed joint-filler strips abutting building elements, concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
 - 1. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) 1 inch below finished surface for the installation of joint sealant.
 - 2. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
- F. Contraction (Control) Joints: Construct contraction joints in slabs-on-grade to form panels of patterns as noted or shown. Use tool cuts 1/8 inch (3 mm) wide by one-fourth of slab depth or inserts 1/4 inch (6 mm) wide by one-fourth of slab depth or saw cutting to a depth not less than 10 percent of slab thickness with a 1 inch (25 mm) minimum depth.
 - 1. Tooled Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces. Tool edges in exposed slabs.

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2. Saw Cutting: Slabs may be sawed if cut immediately and within 2 hours following final troweling using a “Soff-cut” saw or early entry dry-cutting saw system. Install cuts as soon as concrete will support weight of saw and operator without disturbing final finish.
3. If joint pattern is not shown, provide joints at a maximum spacing in feet equal to two times the slab thickness in inches.

3.09 FINISHING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Evaporation Retarder: In hot, dry, and windy weather apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq ft x h (1 kg/sq m x h) before and during finishing operations. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- C. Area Paving: Light broom, texture perpendicular to pavement direction.
- D. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius (6 mm radius).
- F. Curbs and Gutters: Light broom, texture parallel to pavement direction.
- G. Inclined Vehicular Ramps: Broomed perpendicular to slope.
- H. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.10 TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch (6 mm) in 10 ft (3 m).
- B. Maximum Variation From True Position: 1/4 inch (6 mm).
- C. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).

3.11 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
 2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
 3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd (76 cu m) or less of each class of concrete placed.
 1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
 2. Perform one slump test for each set of test cylinders taken.
 3. One specimen tested at 7 days, two specimens tested at 28 days.
- C. Air Content Test: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
- D. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 def C) and below, when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
- E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

3.13 SCHEDULES

- A. Place concrete to thicknesses, coloring and pattern indicated on plans.
- B. Place concrete to thicknesses indicated in civil sheets.
- C. Unless otherwise noted, place concrete to thicknesses indicated in geotechnical report.

END OF SECTION

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SECTION 321400 - UNIT PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES

Furnish and install sand base and unit concrete pavers as specified in all areas indicated on the drawings and according to the details and these Specifications.

1.02 SUBMITTALS

Provide Owner's Representative with sample of pavers prior to installation.

1.03 NOTIFICATION

Notify Owner's Representative two (2) days prior to the placement of any pavers.

1.04 PRODUCT HANDLING

Paving stones shall be delivered and unloaded at job site bound in such a manner that no damage occurs to the product during handling, hauling and unloading.

PART 2 - MATERIALS

2.01 CONCRETE PAVERS

Concrete pavers shall be made from no-slump concrete. Pavers shall be made under extreme pressure and vibration and shall have: an average compressive strength of 8,000 psi with no individual unit under 7200 psi; average water absorption of 5% with no unit greater than 7% per ASTM C140; and freeze-thaw resistance equal to Section 8 of ASTM C67. Pavers shall be in the shape, size and color as indicated on the drawings.

2.02 SAND

- A. The sand laying course shall be well graded clean washed sharp sand with 100% passing a 3/8" sieve and a maximum of 3% passing a No. 200 sieve size (commonly known as manufactured concrete sand or limestone screening). DO NOT USE MASON SAND.
- B. Sand for joints shall be clean masonry sand containing minimum 30% of 1/8" particles.

PART 3 - EXECUTION

3.01 PREPARATION:

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Unsuitable, unstable or unconsolidated subgrade material to a depth of 6" shall be excavated and replaced if necessary with engineered fill composed of dense, graded aggregate. Compact to 12" depth all subgrade areas to 95% modified Proctor density.

3.02 BASE COURSE

Shall be as shown on drawings. The base course shall be shaped to grade and cross section with an allowable tolerance of 1/4" (5 mm).

3.03 BEDDING COURSE

- A. The finished base course shall be approved before the placement of the sand bedding course.
- B. The uncompacted sand bedding course shall be spread evenly over the area to be paved and screeded to a level that will produce 1" (25 mm) thickness when the paving stones have been placed and vibrated.
- C. Once screeded and leveled to the desired elevation, sand bedding course shall not be disturbed in any way.

3.04 PLACING PAVERS

- A. Install unit pavers with joints between 1/16" and 3/16" wide in the pattern indicated on the drawings. Do not step on sand bedding course; work from paver side during installation. Tamp concrete unit pavers into place.
- B. String lines shall be used to hold all pattern lines true.
- C. Gaps at the edge of the paver surface shall be filled with standard edge stone or with stones cut to fit. Cutting shall be accomplished to leave a clean edge to the traffic surface using a masonry saw. Whenever possible, no cuts shall result with a paver less than 1/3 of original dimension.
- D. Where gaps are less than 1-5/8" (40 mm), the gaps shall be filled with a sand cement mortar no leaner than 4:1.
- E. Paving stones shall be vibrated into the sand bedding course using a vibrator capable of 3,000 to 5,000 pounds compaction force with the surface clean and joints open.
- F. After vibration, joint sand shall be spread over the paving stone surface, allowed to dry, and vibrated into joints with additional vibrator passes and brushing so as to completely fill joints.
- G. Surplus material shall be swept from the surface.
- H. Upon completion of work covered in the Section, the Contractor shall clean up all work

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areas by removing all debris, surplus materials and equipment from the site.

END OF SECTION

SECTION 32 8400 - LANDSCAPE IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The work consists of installing a complete underground irrigation system as shown on the Drawings and as specified hereafter. The Contractor shall furnish all labor, equipment, materials, and permits necessary for the completion of the system or, unless specified, to be furnished by others.
- B. The irrigation system shall include the furnishing, installation, and testing of all pipes, fittings, valves, heads, controllers, wires, air release, and vacuum valves, backflow preventers, inlet, and discharge piping; automatic drain valves, manual drain valves, valve boxes, water meters, and other components pertinent to the system, or otherwise noted on the Drawings.
- C. The Contractor shall perform all trenching, excavating, boring, backfilling, compacting, concrete work, electrical work, welding, and any other work necessary to complete the irrigation system.

1.02 SITE INVESTIGATION

- A. The Contractor shall examine related work and surfaces before starting the work of this section. In writing, the Contractor shall report to the Owner's Representative conditions that could prevent the proper execution of irrigation installation. Deviations from Drawings and Specifications shall be executed only with the express permission of the Owner's Representative and at no cost to the Owner. The Contractor shall notify the Owner's Representative in writing before proceeding with the system's installation of obvious inadequacies or inappropriate design on the Drawings.

1.03 CODES, RULES, AND SAFETY ORDERS

- A. All work and materials shall be in full accordance with the latest local rules and regulations of safety.

1.04 PROTECTION

- A. The Contractor shall furnish and maintain all warning signs, shoring, barricades, red lanterns, and other protection devices, as required by the Division of Industrial Safety Orders and local ordinances.

1.05 DEVIATIONS OF LAYOUT

- A. Reasonable changes in the location of piping, valves, or other irrigation components on the Drawings may be considered before installation.
- B. The Owner's Representative must approve deviations from specified locations before installation.
- C. Any changes in the location of irrigation components shall be at no cost to the Owner.

1.06 COORDINATION

- A. The Contractor shall coordinate and cooperate with other on-site contractors to ensure rapid and efficient completion of all contracted work.

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1.07 SUBMITTALS

- A. The Contractor shall prepare and make five sets of submittals providing the manufacturer's specifications and "cut sheets" on the following components:
- | | |
|---------------------------------|-------------------------------------|
| 1. Manual and automatic valves. | 10. PVC fittings. |
| 2. Backflow preventer. | 11. Detectable line marking tape. |
| 3. 24 Volt wire. | 12. Enclosures. |
| 4. Piping and tubing. | 13. Drains. |
| 5. Joint materials. | 14. Controller. |
| 6. PVC primer and cement. | 15. Filters. |
| 7. Heads. | 16. HDPE pipe. |
| 8. Valve boxes. | 17. Threaded joint sealant or tape. |
| 9. Wire splicing materials. | 18. HDPE fittings. |
- B. Each set of submittals shall be bound or provided electronically in PDF format and clearly labeled with the project name and date.
- C. The Contractor shall not proceed with the irrigation system work until the Owner's Representative approves the irrigation submittals.

1.08 RECORD DRAWINGS

- A. The Contractor shall provide an updated set of "Record Drawings," showing daily changes to the irrigation installation and other changes from the original Drawings and Specifications. All gate valves, manual drains, wire splice, and automatic and manual valve locations shall be shown with actual measurements to reference points to be easily located in the field.
- B. At the time of final acceptance, the Contractor shall furnish one electronic copy and one paper copy of "Record Drawings" prepared by a qualified draftsman in AutoCAD format, showing the entire completed system as installed. This drawing shall be accurate and to scale. The symbols for valves, heads, piping and other components shall be the same as originally shown on the Drawings. Draft the changes on a hard copy of the irrigation sheets. Add any additional changes to the irrigation legend, plans, and details. The final drawings shall be dated and clearly labeled "RECORD DRAWING."

1.09 CONTROLLER CHART

- A. The Contractor shall provide two controller charts for each controller. The chart shall show the area covered by each automatic valve station on the controller, with a different color used to show each valve's coverage area. The chart shall be a reduced and legible drawing of the current "Record Drawing" system to fit the inside of the controller's locking cover.

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- B. The chart shall be completed and approved before the final observation and acceptance of the irrigation system.
- C. Hermetically seal the approved chart between two pieces of plastic, each containing a minimum of 20 mils thick.
- D. The Contractor shall install one chart in each controller enclosure and provide one chart for each controller to the Owner's Representative.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials shall be new and without flaws or defects of any type and be the best of their class and kind. All materials shall have a minimum warranty of one year against material defects or defective quality.
- B. All materials shall be the brands, and types noted on the Drawings, as specified herein, or approved equal.
- C. The irrigation system was designed around equipment manufactured by specific companies as a standard. Approved equal equipment by other manufacturers may be used only with the approval of the Owner's Representative. Submit a request for approval of non-specified materials to the Owner's Representative seven (7) days before the opening of bids. Submission of irrigation sprinkler heads for approval as equal shall only be considered if submitted heads match the precipitation rate, gallons per minute, and spacing of specified sprinkler heads.
- D. Mark Irrigation components for use with recycled water per the Uniform Plumbing Code.

2.02 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88M, Type B, water tube, drawn temper.
- B. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- D. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.03 PVC PIPE AND FITTINGS

- A. All mainline PVC pipe, from the point of connection to the zone valve, with a diameter of two inches (2") or less shall be Schedule 40 PVC and shall conform to ASTM D 1785; mainline pipe with a diameter of two and one-half inches (2-1/2") or greater shall be Class 200 "O" ring gasket pipe, SDR 21; lateral line piping downstream of the zone valves which is 2-1/2" in diameter and greater shall be Class

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200 SDR 21 and shall conform to ASTM D 2241. Lateral line piping downstream of the zone valves, which is two inches (2") in diameter or less, shall be Schedule 40 PVC and conform to ASTM D 1785. All PVC pipes shall be continuously marked with identification of the manufacturer, type, class, and size and shall be free of holes, foreign material, blisters, wrinkles, dents, or sunburn.

- B. Polyethylene Pipe shall be linear, low density polyethylene drip tubing with 50 PSI maximum operating pressure at 100 degree F, compatible with all standard 3/4" (OD) tubing.
- C. Fittings on PVC lines shall be Schedule 40 PVC, Type 1, Cell Classification 12454, and comply with ASTM D 2466.
- D. Fittings for polyethylene pipe shall be PVC barbed insert fittings, conforming to ASTM D 2609.
- E. Clamps for fittings on polyethylene pipe shall be Keystone SAE Type' J' stainless steel pinch clamps or equal.
- F. All threaded PVC nipples shall be Schedule 80 molded PVC pipe.
- G. All galvanized nipples shall be Schedule 40 galvanized steel pipe.

2.04 HDPE

- A. Mainline and lateral piping shall be as specified on the drawings. PE pipe shall be DR 11, IPS diameters, of a 4710 Bimodal Resin with a Slow Crack Growth Resistance, PENT, of >2000 hours per ASTM F1473 and a Cell Classification of 445574C per ASTM D3350. PE pipe shall be made according to the following standards:
 - 1. Pipe diameters 3" and larger shall be per ASTM F714 or ASTM D3035, and pressure rated 200 psi when using a Design Factor of .63.
 - 2. Pipe diameters 2" and smaller shall be per ASTM D3035, and pressure rated 200 psi when using a Design Factor of 0.63. Pipe may be supplied in coils which must be straightened and re-rounded by the Contractor before use.
- B. Sections of pipe shall be joined using butt fusion unless noted on the Drawings.

2.05 HDPE FITTINGS

- A. PE Fittings shall be made from PE 4710 resin with a cell classification of 445574C per ASTM D3350. PE fittings shall be as manufactured by The Harrington Corporation or equal.
- B. Fittings shall be for IPS diameter pipe.
- C. The "ends" of butt fusion fittings shall have thicknesses that match the thickness of the pipe or fittings to which they are fused.
- D. Join fittings using appropriate heat fusion methods per ASTM F2620.
- E. Reductions on tees: Reducing on the run or branch tee's shall be such that the size of the "main body" is that of the largest leg of the tee.

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F. Butt Fusion Fittings

1. Molded butt fusion fittings shall be DR 11 per ASTM D3261.
2. Fabricated butt fusion fittings shall be per AWWA C906 and the following additional requirements.
 - a. Tees and elbows shall be made from DR 9 pipe with ends machined to DR 11.
 - b. Tees and 90-degree bends shall be 3 segments.
 - c. 45-degree bends and bends of lesser angle shall be 2 Segment.
 - d. Reducers shall be of the "swage reducer" style made from DR 11 pipe with ends DR 11 thickness.
 - e. Branch saddle-reducing tees are not permitted. Reduce, whether fabricated or molded, tees and reducers with size x size tees and reducers.

G. Electrofusion fittings with electrofusion couplings; electrofusion branch saddles with branches no larger than 2"; electrofusion x FNPT saddles; and electrofusion swivel saddles shall be DR 11 per ASTM F1055. Electrofusion branch saddles with branches greater than 2" are not permitted. Electrofusion swivel saddles shall be manufactured by The Harrington Corporation or approved equal.

H. Flange Adapter Systems

1. Flange adapters shall be molded or machined from stock and be SDR 11, complying with ASTM F2880.
2. Back-up rings shall be ductile iron per ASTM A536 and DR 11.
3. Accessories shall be 1/8" neoprene gaskets and Grade 5 or stronger, zinc plated cap screws or threaded rod and nuts.

I. Threaded Transitions: HDPE x MNPT brass or stainless-steel transitions shall be DR 11.

1. Mechanical Joint Adapters: Mechanical joint adapters shall be DR 11 with stiffeners and comply with AWWA C906.

2.06 VALVES AND VALVE BOXES

- A. Valves: Valves for use in electrically controlled automatic control systems shall be diaphragm actuated and hydraulically operated solenoid valves as specified on the Drawings.
- B. Gate valves shall be as specified on the Drawings.
- C. Valve Boxes: Valve boxes shall be as noted on the Drawings. Valve box colors shall be as follows:
 1. Green: Turf areas (potable water.)
 2. Tan: Gravel mulch areas (potable water.)
 3. Purple: Reclaimed water.

2.07 HEADS

- A. Heads shall be as specified on the Drawings.

2.08 CONTROLLER

- A. The controller shall be as specified on the Drawings.

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2.09 BACKFLOW PREVENTER

- A. The backflow prevention device shall be as specified on the Drawings.

2.10 PRIMER, CEMENT, AND THREADED JOINT SEALANT

- A. The primer shall conform to ASTM F 656 and meet NSF. Cement shall be low VOC, NSF approved, and meet ASTM D 2564. Cement and primer shall be IPS Weld-On depending on the size and schedule of pipe and fittings as follows:
 - 1. Schedule 40 PVC Pipe and Fittings up to 6" Dia.: P-68 Primer and 705 Cement
 - 2. Schedule 80 PVC Pipe and Fittings up to 4" Dia.: P-70 Primer and 705 Cement
 - 3. Schedule 80 PVC Pipe and Fittings larger than 4" Dia.: P-70 Primer and 711 Cement
- B. All threaded connections between metal to metal, PVC to metal, and PVC to PVC shall be made using Spears Blue 75 thread sealant or Polytetrafluoroethylene (PTFE) thread seal tape. PTFE thread seal tape shall comply with MIL-T-27730A Specifications, have a minimum thickness of 3.5 mils, and be 99% pure PTFE. Do not use thread sealing compound on threaded connections between sprinkler and nipple or bubbler and nipple. Use thread sealant or PTFE tape per the manufacturer's installation instructions.
- C. All "O" ring gasket and pipe spigot end shall be lubricated using the lubricant recommended or supplied by the pipe manufacturer. If the pipe manufacturer does not provide a lubricant for the pipe, use IPS Weld-on EZ Flush pipe lubricant, NSF approved.

2.11 WIRE

- A. Wire for the 120-volt wiring shall be solid copper (or stranded copper in larger wire sizes), an underground feeder for direct burial, and PVC insulated. The size of the wire shall be #12 AWG.
- B. Wire for the decoder cabling shall be as specified on the Drawings, PVC insulated UL-approved underground cabling for direct burial in the ground.
- C. Wire Splicing Materials: All wire splices shall be made water-tight using a 3M DBR/Y direct bury splice kit or approved equal.
- D. Grounding wire, ground rods, and wire clamps for controllers shall be as specified by the controller manufacturer.
- E. Mark the Control wires with the associated valve number with E-Z Coder WDR or equal wire marking tape at each valve, at the controller, and at wire splices.

2.12 DETECTABLE LINE MARKING TAPE

- A. Detectable line marking tape for irrigation main and lateral lines shall be manufactured by T.A. Christy Enterprises or approved equal and shall consist of a minimum 5.0 mil (0.0050") overall thickness; five-ply composition; ultra-high molecular weight; 100% virgin polyethylene; acid, alkaline, and corrosion resistant.
- B. The tape width shall be a minimum of 6".

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- C. Elongation properties shall be per ASTM D882-80A and less than 150% at break.
- D. Tensile strength shall be per ASTM D882-80A and not less than 7800 PSI.
- E. The tape shall have a minimum 20-gauge (0.0020") solid aluminum foil core, adhered to a 2.55 mil (0.00255") polyethylene backing.
- F. Tape color and legend combination shall be following APWA requirements. The color shall be blue for irrigation lines with potable water supply, and the legend shall read "CAUTION: IRRIGATION LINE BURIED BELOW." The color for irrigation lines with non-potable water supply shall be purple, and the legend shall read "CAUTION: RECYCLED/RECLAIMED WATER LINE BURIED BELOW."

2.13 OTHER MISCELLANEOUS FITTINGS AND MATERIALS

- A. All other miscellaneous fittings and materials shall be as specified on the Drawings.

PART 3 - EXECUTION

3.01 GENERAL

- A. This section includes specifications for all items installed as a part of the irrigation system but is not limited to other constructions or minor equipment installation necessary for the system not indicated herein. In any case, the Contractor shall install all materials and equipment neatly and professionally per the manufacturer's recommendations and specifications, local and state codes, as shown on the Drawings, and as specified herein.

3.02 PRODUCT HANDLING

- A. The Contractor shall be responsible for correct procedures in loading, unloading, stacking, transporting, and handling all materials for the system. The Contractor shall avoid rough handling, which may affect the equipment's useful life. Handle pipes following the manufacturer's recommendations on loading, unloading, and storage.

3.03 POINT OF CONNECTION

- A. Existing water main line locations shown on the Drawings are schematic. The Contractor shall fill potholes and field-check to determine actual locations as an incidental requisite to the construction contract.
- B. The proposed controller location indicated on the Drawings is approximate. The Owner's Representative shall determine the controller's location in the field.
- C. Where connections to existing pipe or stub out are required, the Contractor shall make necessary adjustments if the pipe or stub-out is not exactly as shown, at no additional cost to the Owner.

3.04 STATIC PRESSURE TEST

- A. The design pressure of the irrigation system is shown on the Drawings. Before the construction of the irrigation system, the Contractor shall, in the presence of the Owner's Representative, provide a gauged

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test of available static pressure at the point of connection. If the actual static pressure is less than the design static pressure, the Contractor shall not proceed with the work until the Owner's Representative provides written direction.

3.05 EXCAVATION AND TRENCHING

- A. The Contractor shall stake the location of each pipe run and all sprinkler heads and valves before trenching. The Owner's Representative shall approve each run of the system before installation.
- B. Excavation and trenching for pipelines shall be a true and straight line, with the trench banks as nearly vertical as practical. The width of the trenches shall not be greater than necessary to permit proper joining, tamping, backfilling, bedding, or any other installation procedures that may be necessary. Trench widths shall be wide enough to provide a minimum horizontal and vertical separation of 4" between pipes in the same trench.
- C. In areas where trees are present, trench lines shall be adjusted on the site to eliminate any damage to tree roots.
- D. Trench depths shall be sufficient to provide the specified pipe cover as described elsewhere in these Specifications or as noted on the Drawings. In rocky areas, increase the trench depth and width as needed to provide a minimum of 6" pipe bedding at the bottom and sides of the pipe.
- E. Depth of Bury: Cover over mainline and lateral piping shall be as noted on the Drawings.

3.06 PIPE AND FITTINGS INSTALLATION

- A. The Contractor shall join HDPE pipe sections using butt fusion. Join fittings using appropriate heat fusion methods per ASTM F2620.
- B. Installation of PVC pipe and fittings shall be per ASTM D 2774, the manufacturer's recommendations, and the procedures described in these Specifications.
- C. Exercise caution handling, loading, unloading, and storing PVC pipe and fittings. All PVC pipes shall be stored and transported in a vehicle with a bed long enough to allow the pipe to lie flat without subjecting it to undue bending or concentrated external load at any point. The pipe shall be protected from damage by exposure to sunlight. Replace any dented, damaged, or defective pipe before or after laying with a sound pipe at no cost to the Owner.
- D. Before installation, clean all dirt and foreign matter inside the pipe and keep it clean during and after laying the pipe. When work is not in progress, close the pipe's open ends and fittings so that no trench water, earth, or other foreign substances enters the pipe or fittings. Where pipe ends for future expansion or connections, they shall be valved and capped as directed on the Drawings.
- E. Assemble all PVC pipes and fittings to permit the pipe or fittings to be jointed at the true parallel position of the fittings. Placement of pipe which causes excessive bending and stress on pipe and fittings

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shall not be permitted. No excess piping or fittings shall be permitted in the system's installation, as this may increase pressure loss or potential for blockage.

- F. Before installing the pipe, remove all rocks over 1-inch diameter, rubbish, and from the trenches. If the adjacent soil is rocky, the trenches shall be bedded and filled with clean dirt or sand to provide a minimum of 6" clearance between the pipe and the native soil. The Owner's Representative shall approve the material used for pipe bedding and trench filling. The full length of each section of the pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, joints, and couplings.
- G. Do not lay pipe in water or when trench or weather conditions are unsuitable for the work. Remove any encountered or accumulated water in the trenches and excavations to keep them free and clear of water during the work. Do not lay the pipe when the temperature is 32 degrees F or below.
- H. PVC pipes expand or contract at the rate of +/- 3/8" per 100' per 10 degrees F change of temperature. Therefore, install the pipe to provide for expansion and contraction as per the manufacturer's recommendations.
- I. The minimum horizontal and vertical clearance between lines in the same trench shall be 4".
- J. After installing all piping, risers, valves, thrust blocks, and others, open the control valve and run a full head of water to flush out the system. Provide caution for releasing any entrapped air in the system. Cap the risers and test the pressure per the specifications after thoroughly flushing it. Install the heads and complete backfill operations after the pressure test.

3.07 SOLVENT WELDING PROCEDURE

- A. Make all solvent weld joints per the solvent manufacturer's recommendations and ASTM D 2855.
- B. Squarely cut the PVC plastic pipe utilizing a miter box mounted hacksaw or PVC specialty saw with a blade of 18 or 24 teeth per inch.
- C. Remove interior and exterior burrs and bevel the exterior to produce a 10-15 degree bevel.
- D. Thoroughly clean the mating pipe end and the fitting socket with a clean, dry cloth.
- E. Using a properly sized applicator (approximately half the diameter of the pipe), apply a light coating of primer to the inside of the fitting socket, then apply a thin coat to the outside of the pipe end. Apply a second, light coat of primer to the inside of the fitting socket to avoid puddling of primer in the fitting.
- F. Apply a uniform coat of cement to the outer pipe end with a properly-sized applicator (approximately half the diameter of the pipe).
- G. In like manner, apply a thin coating of cement to the inside of the fitting socket.
- H. Re-apply a light coat of cement outside the pipe end and quickly insert it into the fitting to the full depth of the fitting socket while rotating the pipe or fitting approximately one-quarter turn to ensure even distribution of cement.

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- I. Hold in position for approximately 30 seconds.
- J. Wipe off any excess solvent cement that forms as a bead around the outer shoulder.
- K. The Contractor shall not use excessive solvent cement that could cause burrs or obstructions inside the pipe joint.
- L. Allow solvent weld joints to cure for 24 hours before applying pressure to the system.

3.08 BACKFILLING

- A. Upon completion of a particular section of the irrigation system, and after sufficient time has elapsed for curing solvent weld joints, partial backfilling shall begin, leaving all joints, risers, and connections exposed for visual inspection during the hydrostatic testing. Finish backfill operations for all sections after completing the hydrostatic test.
- B. The Owner's Representative shall approve all backfill material. Backfill material shall be free from rock, large stones, brush, sod, frozen material, or other unsuitable substances that may damage the pipe or compromise compaction during the backfilling operations.
- C. If the Owner's Representative finds the material from the excavation or trenching unsuitable for use in the backfill, it shall be removed from the site and properly disposed of by the Contractor at his own expense. The Contractor shall then, at no cost to the Owner, arrange for, purchase, and furnish suitable backfill material consisting of earth, loam, sandy clay, sand, or other approved materials free of large clods of earth or sharp stones and capable of attaining the same relative density of the surrounding ground.
- D. In rocky areas, the trench depth shall be 6" below the normal trench depth to allow for 6" of suitable backfill as padding for the pipe and a minimum of 6" of suitable backfill on all sides of the pipe as padding against a rock in the trench wall.
- E. All mainline and lateral piping shall have detectable line marking tape installed in the trench six (6") inches above the pipe. After placing the pipe in a trench and the first 6" layer of backfill is placed and compacted, place the detectable marking tape continuously in all trenches before finishing backfill operations.
- F. Place backfill in horizontal layers not exceeding 6" in depth. Backfill shall be thoroughly tamped or water-compacted to nearly original density or to avoid settling. Place backfill to the original ground level. If settlement of trenches occurs within one (1) year from the completion date, the Contractor shall refill trenches, re-seed, re-sod, or re-install landscape mulch in the repaired areas.

3.09 SADDLE TAPS

- A. No saddle taps shall be permitted unless approved by the Owner's Representative.

3.10 THRUST BLOCKS

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- A. Provide concrete thrust blocks where necessary to resist system pressure, including at all direction changes, size changes, valves, and terminations. Provide concrete thrust blocks at any other system points with an unbalanced thrust line for equipment 2-1/2" or larger, or as indicated on the Drawings. Thrust blocks shall not obstruct the outlets of fittings for future connections. Thrust blocks shall be poured against undisturbed earth and per the Drawings.

3.11 SLEEVED CROSSING

- A. Unless noted on the Drawings, sleeve all piping installed under sidewalks, roadways, and parking lots in a Class 200 PVC pipe two (2) sizes larger than the pipe to be sleeved. Place the wire in a separate sleeve from the pipe crossing. The sleeve shall be Class 200 PVC minimum 2" size or larger as required to accommodate the quantity of wire to be sleeved. Seal the ends of sleeves with duct tape after installing wire or piping.

HEAD INSTALLATION

- B. Heads shall be of the type and model specified and installed per the Drawings. Install heads with a 4" space between the edge of the head and curbs, walks, walls, driveways, and building walls. Install heads in the vertical position, backfilled, and compacted to 90% modified Proctor.
- C. Head spacing shall not exceed the spacing shown on the Drawings and shall be in the location and configuration shown on the Drawings. The Contractor shall verify turf area dimension while staking head location and space heads to achieve uniform coverage.
- D. After all piping and risers are in place and connected, open all control valves and use a full head of water to flush out the system before installing the heads. If water pressure without the heads installed is insufficient to provide adequate water flow from end risers, the Contractor shall cap off enough heads closest to the water source to provide adequate flushing of the end riser assemblies.

3.12 CONTROLLER INSTALLATION

- A. The controller location is indicated on the Drawings. The Contractor shall familiarize with the requirements of making the power connections at the locations noted (120-volt supply to the controller) and shall include the cost to complete this portion of the work in the irrigation system's quote.
- B. Mount and wire the controller per the manufacturer's recommendations and as specified herein and on the Drawings.
- C. Unless indicated in the Drawings, the Contractor shall direct-wire the 120-volt power supply to the controller.
- D. Connect remote control valves to the controller in the numerical sequences as shown on the Drawings or as directed by the Owner's Representative.
- E. Controllers shall be grounded as specified by the manufacturer and as indicated on the Drawings.

3.13 AUTOMATIC CONTROL VALVE INSTALLATION

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- A. Automatic control valves shall be of the type and size indicated on the Drawings. Installation shall be according to these Specifications, the Drawings, and the manufacturer's recommendations.
- B. The valve boxes shall be of the size and type per the Drawings.
- C. Waterproof valve wire splices using 3M DBR/Y direct bury splice kit connectors or approved equal. The Contractor shall provide a 36" wire expansion coil to facilitate raising splices to ground level without cutting wires.

3.14 DECODER CONTROL VALVE WIRING

- A. Wire installation procedures shall conform to local codes.
- B. The Contractor shall install the decoder control valve wiring in the same trench as the irrigation mainline. When the wires cannot be in the mainline's trench, install them in the lateral pipe trench. Lay all wires below the pipe. Do not lay the wire on top of the pipe. Lay the wires loose in the trench and taped together at 10'-0" intervals. When trenches used for piping are not appropriate for routing wire, the Contractor shall install wire in a separate trench at 18" bury depth.
- C. Wire splices, other than at valve box locations, shall be kept to a minimum and, if needed, be made only at common splice points and placed in a wire splice box. Waterproof wire splices using 3M DBR/Y direct bury splice kit connectors or approved equal.
- D. At control wire splices, the Contractor shall provide a 36" wire expansion coil to facilitate raising splices to ground level without cutting wires.
- E. Continual wire shall be one color, and in no case shall wires of different colors be spliced together.
- F. Install surge protection as noted on the Drawings.

3.15 120 VOLT CONTROLLER POWER WIRING

- A. The Contractor shall familiarize themselves with the work required to complete this installation portion. Install all 120-volt wiring per local electrical codes. The 120-volt service shall consist of one (1) black and one (1) white wire. The neutral wire shall be bonded.
- B. A licensed electrician shall supply the 120-volt power to the controller and backflow preventer locations.

3.16 TESTING

- A. Upon completion of the irrigation system's mainline, the entire mainline shall be tested with the Owner's Representative for one hour at 100 PSI unless otherwise noted. Before testing, partially backfill the mainline, leaving all joints and connections exposed for visual inspection. Flush all dirt from the system and fill the line with water to remove air. The mainline shall be brought to static pressure. Install a pressure gauge and temporary valve at the end of the mainline to permit air pressure. Retain a pressure of 100 PSI for one hour and repair any leaks that may occur. Retest the system until the system passes the test.

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- B. Upon completion of the lateral piping sections, each lateral system shall be pressure tested, with the Owner's Representative present for one hour at 100 psi. Test the lateral system before installing the flex nipples or swing joints on systems using flex nipples or swing joints. Partially backfill the lateral lines before testing, leaving all joints and connections exposed for visual inspection. Flush all air and dirt from the system and cap all open fittings. The testing procedure shall be the same as used for the main line. Repair any leaks occurring during the hydrostatic test. Retest the system until the system passes the test. If, after one hour, 100 psi pressure has been retained, install the heads, and complete the backfill operations.
- C. The Contractor shall be responsible for paying construction observations for retesting any lines or system components that fail the initial pressure or performance test. Costs shall include the observer's time at the observer's standard rate, travel time, and travel expenses.

ADJUSTING OF SYSTEM

- D. After testing and installation, the Contractor shall adjust all valves for the proper operating pressure and all heads for uniform coverage and flow. The Contractor shall wire the controller to have station numbers correspond with valve numbers indicated on the Drawings or as directed by the Owner's Representative. Indicate the valve number on the controller panel for each station. The Contractor shall program the controller to provide optimum system performance.

3.17 CLEAN UP

- A. The Contractor shall keep a neat and orderly area where is installing the system. Disposal of rubbish and waste material resulting from the installation shall be continual. Upon completion of the system, the Contractor shall remove from the Owner's property, at his own expense, all temporary structures, rubbish, waste material, tools, and equipment resulting from or used in the installation of the system.

3.18 PROTECTION OF EXISTING UTILITIES

- A. The Contractor shall locate all existing cables, conduits, piping, and other utilities or structures encountered above or below ground. The Contractor shall take all necessary precautions to prevent damage to the existing utilities and improvements. The Contractor shall repair or replace damaged utilities to their original condition at no expense to the Owner.

3.19 ROCK

- A. No additional compensation should be paid if the Contractor encounters rock or other unfavorable trenching conditions. When material from the excavation or trenching is unsuitable for use as backfill, additional backfill material suitable for this purpose shall be brought in at the Contractor's expense. The Contractor shall remove and dispose of all unsuitable materials from the trench unnecessary in the backfill operation.

3.20 FINAL ACCEPTANCE

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- A. The Contractor shall issue a notice of completion to the Owner's Representative requesting a final observation when the system is balanced, adjusted, and operating properly, and after completing all work and clean-up. The Owner's Representative shall respond to the notice of completion and shall appear with the Owner for an observation of the project. During the final observation, the Contractor shall demonstrate the system's operation in its entirety. In reviewing the work, no allowance for deviation from the original Drawings and Specifications shall be made unless prior approval.
- B. The Owner's Representative shall note any inconsistency to the Specifications or Drawings and give the Contractor a written copy of necessary corrections. The Contractor shall complete all corrections promptly and then issue a request to the Owner's Representative to inspect the corrected work. Final acceptance should occur when all corrections are complete.

3.21 OPERATIONAL INSTRUCTION

- A. After the system has been tested and accepted, the Contractor shall instruct the Owner's Representative on the operation and maintenance of the system.
- B. The Contractor shall provide the Owner with two (2) keys for each of the following:
 - 1. Manual gate valves
 - 2. Manual drain valves
 - 3. Valve boxes
 - 4. Controller enclosure
 - 5. Backflow preventer enclosure
 - 6. Any locking assembly in need of key access
- C. The Contractor shall provide the Owner with two copies of a Maintenance Manual bound in a three-ring binder. The maintenance manual shall include copies of the approved submittals, operation manuals and manufacturer's warranties on all irrigation products.

3.22 SYSTEM MAINTENANCE AND GUARANTEE

- A. Maintenance of the irrigation system shall begin immediately following the system's installation and shall continue until the entire project is accepted. Maintenance shall include repair of defects or damages, adjustments and fine-tuning of the system, and repairs of damages resulting from vandalism, erosion, weather, and the like.
- B. For one (1) year from final acceptance of the entire project, the Contractor shall promptly furnish and install any parts or materials that prove defective in material or quality without cost to the Owner. Damage to the landscape or other property due to irrigation system line breaks shall be repaired and brought to original condition by the Contractor at no expense to the Owner.
- C. In the fall, at the Owner's request, the Contractor shall drain the system and prepare the system for winter. In the spring, at the Owner's request, the Contractor shall reactivate the system, repair any

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defects or damage and adjust the system. The Contractor shall instruct the Owner as these services are performed.

- D. For one (1) year from final acceptance of the system, the Contractor shall repair any settlement of trenches by one of the following methods as directed by the Owner's Representative.
1. Turf areas: Bring to grade by top-dressing (raking topsoil into the grass).
 2. Turf areas: Bring to grade with planting soil mixture and install seed mix to match existing turf.
 3. Sod areas or tree/shrub planting areas: Remove existing sod or mulch. Fill the depression with planting soil mixture and replace it with new sod or mulch to match existing.
- E. Repair by any of the above methods shall result in a smooth, level area.

3.23 OBSERVATIONS

- A. The following shall be the minimum required observations during construction. The Owner's Representative may perform additional observations at any time. The Contractor shall notify the Owner's Representative, in writing, 48 hours in advance of each observation. Do not alter the sequence of required observations from the list below. The Contractor shall not proceed with work without the written approval of previous sequences. The Contractor shall attach a copy of the written observation approvals to all applications for payment.
- B. Required observation list and sequence:
1. Staked locations of mainline, valves, laterals, and heads.
 2. Installation and pressure test of mainline.
 3. 24-volt control wire installation and operations of all valve zones.
 4. Installation and pressure test of automatic valves and lateral lines before installation of flex nipples and heads.
 5. Head placement, coverage, and operating pressure before planting.
 6. Final project review.
 7. 11 months after final project acceptance.

END OF SECTION

SECTION 32 9223 – SODDING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Work under this section consists of preparing all areas indicated on the Drawings for grass sodding according to the specifications and furnishing and installing all sod, fertilizer, and soil amendments as specified herein.

1.02 REFERENCE STANDARDS

- A. ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.

1.03 SUBMITTALS

- A. Furnish samples of the following before construction:
 - 1. Organic amendments.
- B. The Contractor shall provide soil test results for any imported fill into landscape areas before the start of landscape construction. A laboratory specializing in soil testing for landscaping, the nursery and garden industries, and agricultural applications shall complete soil testing and recommendations.
- C. Furnish supplier literature and chemical analysis (or botanical analysis for sod) of the following before construction:
 - 1. Organic amendments.
 - 2. Chemical fertilizer.
 - 3. Soil conditioner.
 - 4. Sod.
- D. Furnish the following materials the same day are delivered to the project site:
 - 1. Delivery tickets indicating a quantity of material delivered for:
 - a. Organic amendments.
 - b. Chemical fertilizer.
 - c. Soil conditioner.

PART 2 - PRODUCTS

2.01 SOD

- A. Sod shall be as specified on the Drawings. A sample of sod and a written submittal of the seed mix shall be submitted a minimum of fifteen (15) days prior to laying of sod. Sod shall be vigorous, well-rooted, healthy turf free from disease, insect pests, weeds, other grasses, stones, and other harmful or deleterious matter.
- B. An approved mechanical sod cutter shall cut sod to a thickness of not less than 1" or more than 2". Cut sod pieces at a maximum of 18" wide. Handling of sod shall be done to prevent tearing, breaking, drying, or any other damage. Install the sod on the site no more than 24 hours after cutting.

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- C. Sod shall have no more than 2" of loose thatch. The sod shall be dense enough so that the top 10% can lift an entire strip without breaking.

2.02 FERTILIZER

- A. Fertilizer shall be a granular form fertilizer with a guaranteed analysis of 18-24-12 or as specified on the recommendations of the soil test results.

2.03 ORGANIC AMENDMENTS

- A. Acceptable organic amendment products include the following:
 - 1. "Premium Compost", a homogenous blend of local manures, well-aged greenwaste and organic products, as available from Soilutions, 9008 Bates Rd, SE, Albuquerque, NM 87105 (505-877-0220), or equal.
- B. Each delivery shall have a load ticket to be collected and provided to the Owner's Representative. The load ticket shall list:
 - 1. Type of Mixture
 - 2. Source of Mixture.
 - 3. Approximate volume of load.
 - 4. Date of Delivery or loading.
 - 5. Name of the individual representing the source.

2.04 SOIL CONDITIONER

- A. Granulated 85% sulfur.

PART 3 - EXECUTION

3.01 SOD BED PREPARATION

- A. Before starting soil preparation, the Contractor shall clear the soil of rocks and lumps of 1" diameter and larger, vegetation, and debris to a minimum depth of 12". The finish grade shall be established and approved as meeting the requirements of the grading plan.
- B. For areas to be sodded:
 - 1. Rip all areas to a depth of 12."
 - 2. Apply a uniform 2" layer of organic amendment, 4 lbs. of fertilizer per every 1000 square feet, 10.6 pounds of soil conditioner per every 1000 square feet, and 1 lb gypsum per every 10000 square feet to the entire area.
 - 3. After application of organic amendment, fertilizer, soil conditioner, rototill all areas at cross directions to a minimum depth of 6 inches. After rototilling is complete at cross directions, drag to an even grade, then roll for firmness.
- C. If the Contractor has imported fill (or has cut below the existing finish grade) into a landscape area, then the Contractor shall coordinate with the Owner's Representative to have samples of the fill (or the soil at

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the cut grade) submitted to an independent soil testing laboratory for nutritional analysis. The Contractor shall pay the cost of the soil testing. The Contractor shall revise the specified fertilizer, organic amendments, and soil conditioner to comply with the recommendations specified in the soil test report. The Contractor shall provide and incorporate additional fertilizers and soil amendments into the fill and cut in the landscape area per the recommendations specified on the soil test report.

3.02 SOD INSTALLATION

- A. Before laying sod, bring the finish grade to a firm, even surface, free from stones and lumps 1" in diameter and larger, and shaped to provide drainage per the Drawings. The Owner's representative shall inspect and approve before laying any sod.
- B. Lay sod over moistened soil, lightly raking the soil ahead of each sod strip. Sod shall be laid perpendicular to the direction of the slope and shall have staggered joints. Fit all pieces together tightly so no joint is visible, and sod tamped firmly and evenly by hand—stake as required on slopes.
- C. Roll all areas after completing sodding. Roll in two directions perpendicular to each other. After rolling, repair and reroll any areas where depressions or other irregularities occur.
- D. Water all sodded areas immediately after final rolling with a fine spray to a depth of 4". Irrigate using the automatic underground irrigation system in all sodded areas as often as necessary to promote healthy grass growth. Schedule mowing during maintenance so the grass is maintained at a height no shorter than two (2) inches and no greater than three (3) inches.
- E. The Contractor shall not lay sod during freezing temperatures or over frozen soil. Suppose sod cannot be installed due to freezing temperatures or frozen soil. In that case, the Contractor shall postpone the installation of sod until the temperature and soil conditions meet the requirements of these specifications.

3.03 MAINTENANCE AND PROTECTION

- A. Maintenance and protection shall continue until the entire project is accepted. Acceptance shall occur after all sod is well rooted.
- B. Maintenance shall include watering, weeding, cultivating, fertilizing, removal of dead material and debris, and other operations that may be necessary for the health of the sod and the general appearance of the landscaped areas.
- C. Protection shall include care or replacement of the sod from damages resulting from trespass, erosion (including water erosion), weather, vandalism, disease, and others.

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3.04 WARRANTY

- A. The sod shall be guaranteed to be in a live, healthy, and normal growing condition through twelve months from the date of final acceptance by the Owner's Representative. The Contractor shall not be held responsible for replacing sod lost through vandalism and other destruction after the contract's final acceptance.
- B. The Contractor shall monitor the condition of the sod at regular intervals during the warranty period to verify that the sod is receiving proper maintenance. The frequency of monitoring visits shall be as required to ensure proper maintenance. The Contractor shall notify the Owner's Representative in writing of unfavorable conditions to the health of the sod at any time during the warranty period. Inadequate or improper maintenance by the Owner during the warranty period will not relieve the Contractor of his warranty obligation unless such improper maintenance continues beyond the date the Contractor has notified the Owner and Owner's Representative.
- C. Sod that is dead or in an unhealthy, impaired growth condition during the warranty period shall be removed and replaced by the Contractor. Replacement material shall match the quality and species of the sod originally specified. The Owner's Representative shall approve the replacement before installation. Sod replaced during the first six months of the warranty period shall be under warranty until the end. Sod replaced after the first six months of the warranty period shall be under warranty for six months after the replanting date.

3.05 OBSERVATIONS

- A. The following observations shall be the minimum required inspections during construction. The Contractor shall make additional observations at any time at the discretion of the Owner's Representative.
- B. The Contractor shall notify the Owner's Representative in writing 48 hours before each required observation.
- C. The sequence of required observations shall not be changed from the sequence listed below. The Contractor shall not proceed with the work of the next sequence without the written approval of the work of the previous sequence.
- D. Required observation list and sequence:
 - 1. Installed automatic irrigation system, tested, and approved.
 - 2. Each phase of soil preparation in the process.
 - 3. Finish grade.
 - 4. Sod shall before laying.
 - 5. Sod after installation.
 - 6. Sod at final project review.
 - 7. Sod 11 months after final project acceptance.

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END OF SECTION

SECTION 32 9300 – PLANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Work under this section consists of planting trees, shrubs, vines, and ground covers, furnishing all labor, equipment, and materials, and performing all work in connection with the Drawings and Specifications.

1.02 PLANT NAMES

- A. The botanic and common names used for the plants on the Drawings generally conform with the approved names given in Standardized Plant Names, 1980 Edition, published by The American Joint Committee on Horticultural Nomenclature. A variety of names not shown therein generally conform with the names accepted in the nursery trade.

1.03 PLANT MATERIAL SUBSTITUTIONS

- A. Do not substitute plant materials without the written permission of the Owner's Representative. The use of materials differing in kind, quality, or size from that specified shall be allowed after the Owner's Representative is convinced that all means of obtaining the specified materials have been exhausted. When bids are submitted, the Contractor is assumed to have located the materials necessary to complete the job as specified. All requests for substitutions shall be submitted no later than five (5) working days before the opening of bids.

1.04 SUBMITTALS

- A. Furnish samples of the following before construction:
 - 1. Backfill amendment.
 - 2. Soil conditioner.
 - 3. Mulch.
- B. Furnish supplier literature and chemical analysis of the following before construction:
 - 1. Backfill amendment.
 - 2. Soil conditioner.
- C. Furnish the following materials the same day delivered to the site.
 - 1. Backfill amendment.
 - 2. Soil conditioner.

PART 2 - MATERIALS

2.01 PLANT MATERIALS

- A. A complete plant list, including quantities, sizes, and other requirements, is shown on the Drawings. If discrepancies occur between quantities indicated in the plant list and the planting plan, the plant quantities indicated on the planting plan shall govern.

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2.02 PLANT MATERIAL QUALITY

- A. Plant material quality, size, and condition shall be per American Standard for Nursery Stock, 1986, as published by the Committee on Horticultural Standards of the American Association of Nurserymen, Inc., the Drawings, and the following requirements:
1. All plants shall be typical of their species or variety. All plants shall have normal, well-developed branches and vigorous root systems. They shall be sound, healthy, vigorous, and free from defects, disfiguring knots, abrasions of the bark, sun scale injuries, plant diseases, insect eggs, borers, and all other forms of infections.
 2. Unless otherwise stated on the Drawings or approved by the Owner's Representative, all plants shall be nursery-grown and tagged with nursery labels indicating species and variety.
 3. Container-grown plant material shall have been grown in its delivery container for not less than six (6) months but not more than two (2) years. Any rootbound material is not acceptable.
 4. Multi-stem: All countable stems, in the aggregate, shall average the size specified. To be considered a stem, the division of the trunk shall be no more than six inches from ground level.
 5. Balled and burlapped plant material shall have a solid ball of the earth of a minimum specified size held securely by burlap and stout twine or rope. Light poultry binding is acceptable; stout wire or wire baskets are acceptable only as a temporary means for securing burlap until a tree is in place. Broken or loose balls shall be rejected.
 6. Unless specifically noted on the Drawings, all trees shall have a single trunk that is straight and free of "dog legs," "crooks," "Y-crotches," or other disfiguring shapes. Do not prune the central leader of any tree. Trees with double leaders are not acceptable.
 7. All plant material shall have a uniform shape around its complete circumference. Plant materials with irregular branching patterns or branching patterns more highly developed on one side than on the other are not acceptable.
 8. The Owner's Representative shall review all plant material at the Contractor's yard before delivery to the job site. Review all plant materials at the job site before and after planting.
 9. At the Contractor's option, the Owner's Representative could review plant material at a wholesale nursery before the delivery of materials to the Contractor's yard. However, at no additional expense to the Owner, the Contractor shall be responsible for all travel expenses incurred by the Owner's Representative for any travel outside the Albuquerque or Santa Fe metropolitan area.
 10. Plant Photographs: When plant material is located outside the Albuquerque Metropolitan Area, Contractor may submit color photographs in digital format of each required species and size of plant material as it will be furnished to the project. Take photographs from an angle depicting the true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three plants in photograph or three photographs showing the average plant, the best

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quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

11. The Owner's Representative shall judge the quality and acceptability of all plant materials. All rejected material shall be immediately removed from the site and replaced with acceptable material at no additional cost to the Owner.

2.03 PLANTING SOIL MIXTURE

- A. Planting Soil Mixture shall be a mixture of one part backfill amendment to two parts existing soil.

Acceptable backfill amendment products include the following:

1. "APS Mix", a homogenous blend consisting of 70% aged compost (1/2" minus) and 30% white vitric tuff (Moisture-lite), as produced by Gro-Well, Inc., 9000 Bates Rd, SE, Albuquerque, NM 87105 (505-877-8670), or equal.
2. "Lawn and Garden 1/4" Minus Compost", a homogenous blend of composted manures, greenwaste and organic products, as produced by Gro-Well, Inc., 9000 Bates Rd, SE, Albuquerque, NM 87105 (505-877-8670), or equal.

"Mediterranean Mix", a homogenous blend of compost, pumice, and composted woody materials, as available from Soilutions, 9008 Bates Rd, SE, Albuquerque, NM 87105 (505-877-0220), or equal.

3. Each delivery shall have a load ticket to be collected and provided to the Owner's Representative. The load ticket shall list:
 - a. Type of Mixture
 - b. Source of Mixture.
 - c. Approximate volume of load.
 - d. Date of Delivery or loading.
 - e. Name of the individual representing the source.

2.04 SOIL CONDITIONER

- A. The soil conditioner shall be granular 85% sulphur bentonite fertilizer, Tiger-sul Tiger 85CR Sulfphur Organic, or equal.

2.05 MULCH

- A. Mulch shall be as specified on the Drawings.

PART 3 - EXECUTION

3.01 PLANTING OPERATIONS

- A. Before planting operations, landscape areas shall be cleared of rocks and lumps greater than 1" diameter, vegetation, and debris to a minimum depth of 12", and finish grading shall be complete. Planting operations shall be performed only during favorable weather conditions per accepted practice.

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Deliver plant materials to be planted on the same day to the site. Unless otherwise approved by the Owner's Representative, locate all plant materials per the planting plans except when adjustments due to field conditions are required. The site of all trees and shrubs shall be staked by the Contractor and reviewed by the Owner's Representative before installation. Represent tree locations using 1" x 2" x 12" wood stakes or colored flags. Indicate the tree's name on the stake or flag to identify it easily. Determine shrub locations by colored flags or containerized plant material placement.

3.02 PLANTING

- A. Perform all planting and backfilling per accepted nursery practice, the Drawings, and the following requirements:
 - 1. The Contractor shall take care when backfilling planters to provide adequate compaction of the fill material to prevent settling.
 - 2. Prepare all planting pits and install plants as shown on the Drawings. Set plants plumb and straight.
 - 3. Remove wire basket, wood box, plastic, twine, or rope before backfilling. Remove the burlap except for the bottom of the root ball before backfilling.
 - 4. Backfill for planting pits shall consist of the specified planting soil mixture and 0.16 pounds of soil conditioner per cubic foot of backfill. The plant shall be positioned in the hole and backfilled. The backfilling shall be completed and material-tamped. When the pit is nearly filled, water thoroughly and allow water to soak away. Add more backfill to finish grade if settling of backfill occurs after watering.
 - 5. After completion of planting, prune all trees per the Owner's directions.

3.03 MULCHING

- A. Complete mulching shall be as indicated on the Drawings.

3.04 MAINTENANCE AND PROTECTION

- A. Maintenance and protection of trees, shrubs, and ground covers shall begin immediately following each plant's installation and continue until the entire project is accepted. Maintenance shall include watering, weeding, cultivating, removal, and replacement of dead plant material, removal of debris, resetting of trees to upright positions, restoration of earth basins, and other operations necessary for the health of the planted stock and general appearance of the landscaped areas. Maintenance and protection shall include repairing plant damage and replacing severely damaged plants resulting from trespass, erosion (including watering), weather, vandalism, disease, and other hazards.

3.05 WARRANTY

- A. All plant materials shall be guaranteed to be in a live, healthy, and normal growing condition from the date of final acceptance by the Owner's Representative through one twelve-month growing season. The Contractor shall not be held responsible for replacing plants and materials lost through vandalism or other destruction after the contract's final acceptance.

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- B. The Contractor shall monitor the condition of the landscape at regular intervals during the warranty period to verify that the landscape is receiving proper maintenance. The frequency of monitoring visits shall be as required to ensure proper maintenance. The Contractor shall notify the Owner's Representative in writing of unfavorable conditions to the health of the plant materials at any time during the warranty period. Inadequate or improper maintenance by the Owner during the warranty period shall not relieve the Contractor of his warranty obligation unless such improper maintenance continues beyond the date the Contractor has notified the Owner and Owner's Representative.
- C. The Contractor shall remove and replace plant materials that are dead or in an unhealthy, impaired growth condition during the warranty period as directed by the Owner's Representative at no additional cost to the Owner. Replace plant materials with equal qualities, sizes, and species. The Owner's Representative shall approve all replacements before planting. Plants replaced during the first six months of the warranty period shall be under warranty until the end. Plants replaced after the first six months of the warranty period shall be under warranty for six months after the replanting date.

3.06 REVIEWS

- A. The following reviews shall be the minimum required during construction. Conduct additional reviews at the discretion of the Owner's Representative.
- B. The Contractor shall notify the Owner's Representative, in writing, 48 hours in advance of each review.
- C. The required review sequence shall not change from the sequence listed below. The Contractor shall not proceed with the work of the next sequence without the approval of the work of the previous sequence.
- D. Required review list and sequence:
 - 1. Plant material at the Contractor's yard before delivery to the job site.
 - 2. Staked locations of material before planting.
 - 3. Planting holes and planting soil mixture preparation.
 - 4. Plant material at the job site before and during planting.
 - 5. Final project completion.
 - 6. 11 months after the final project acceptance.

END OF SECTION 329300