QUAD PORTAL – OLD MAIN

UTAH STATE UNIVERSITY
LOGAN, UTAH

OCTOBER 2021

CACHE LANDMARK ENGINEERING
95 W GOLF COURSE ROAD SUITE 101
LOGAN, UTAH

DOCUMENT 000101

PROJECT TITLE PAGE

1.1 PROJECT MANUAL VOLUME 1

A. USU Quad Portal—Old Main

B. Utah State University

C. Logan, Utah

D. Owner Project No.

E. Engineers Project No. 690-2101

F. Cache Landmark Engineering

G. 95 W Golf Course Rd Ste 130

H. Logan, Utah 84321

I. Phone: 435-713-0099

J. Fax: 435-713-0055

K. Issued: October 1, 2021

END OF DOCUMENT 000101

DOCUMENT 000107

SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

A. Civil Engineer/ Project Manager

1. Lance Anderson/ Cache Landmark Engineering
2. 323733-2202

B. Landscape Architect:

1. Jennifer Maughan/ Cache Landmark Engineering
2. 12016192-5301

END OF DOCUMENT 000107

SECTION 000110

TABLE OF CONTENTS

DIVISION 00 – PROCURMENT AND CONTRACTING REQUIREMENTS

00 0101 PROJECT TITLE PAGE

00 0107 SEALS PAGE

00 0110 TABLE OF CONTENTS

00 2600 PROCUREMENT SUBSTITUTION PROCEDURES

00 4000 PROCUREMENT AND CONTRACTING DOCUMENTS (NOT INCLUDED)

- Procurement and Contraction Documents to be provided by Gramoll Construction

006000 PROJECT FORMS (NOT INCLUDED)

- CSI Form 1.5C Substitution Request (During the Bidding phase)
- CSI Form 13.1A Substitution Request (After the Bidding phase)
- CSI Form 1.5A Subcontractors and Major Material Suppliers List
- DFCM Application and Certificate for Payment
- DFCM Request for Information
- CSI Form 13.2B Request for Interpretation Log
- Engineer's Supplemental Instructions
- Engineer's Proposal Request
- DFCM Proposal Request
- DFCM Construction Change Directive
- DFCM Change Order
- DFCM Certificate of Substantial Completion
- DFCM Contractor's Affidavit of Payment
- TC-721G – Utah State Tax Exemption Certificate for Governments and Schools
- Refer to www.dfcm.utah.gov For DFCM Project For Templates

007200 DFCM GENERAL CONDITIONS (NOT INCLUDED)

- Refer to www.dfcm.utah.gov for General Conditions dated May 25, 2005

007300 DFCM SUPPLEMENTARY CONDITIONS (NOT INCLUDED)

- Refer to www.dfcm.utah.gov for Supplementary Conditions dated July 15, 2008 and July 1, 2009

DIVISION 01 – GENERAL REQUIREMENTS

011000 SUMMARY

012300 ALTERNATES

012900 PAYMENT PROCEDURES

013100 PROJECT MANAGEMENT AND COORDINATION

013200 CONSTRUCTION PROGRESS DOCUMENTATION

001330 SUBMITTAL PROCEDURES
014000 QUALITY REQUIREMENTS
014100 REGULATORY REQUIREMENTS
015000 TEMPORARY FACILITIES AND CONTROLS
015639 TEMPORARY TREE AND PLANT PROTECTION
015713 TEMPORARY EROSION AND SEDIMENT CONTROL
016000 PRODUCT REQUIREMENTS
017000 EXECUTION
017700 CLOSEOUT PROCEDURES
017839 PROJECT RECORD DRAWINGS

DIVISION 02 – EXISTING CONDITIONS

024116 STRUCTURE DEMOLITION
024119 SELECTIVE DEMOLITION

DIVISION 31 – EARTHWORK

311000 SITE CLEARING
312000 EARTH MOVING
312500 EROSION CONTROL

DIVISION 32 – EXTERIOR IMPROVEMENTS

321216 ASPHALT PAVING
321314 USU CAST-IN-PLACE EXTERIOR CONCRETE
321413.14 INTERLOCKING CONCRETE UNIT PAVING ON CONCRETE BASE
321726 TACTILE WARNING SURFACING
323300 SITE FURNISHINGS
328423 UNDERGROUND SPRINKLERS
329001 COMMON PLANTING
329113 SOIL PREPARATION
329120 TOPSOIL PLACEMENT AND GRADING
329223 SODDING
329300 PLANTS

DOCUMENT 002600

PROCUREMENT SUBSTITUTION PROCEDURES

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise, requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to Construction Manager. Procurement Substitution Request must be made in writing by prime contract Bidder only in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than 5 days prior to date of bid opening.

2. Submittal Format: Submit three copies of each written Procurement Substitution Request, using CSI Substitution Request Form 1.5C.
3. Submittal Format: Submit Procurement Substitution Request, using format provided on Project Web site.

    a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
    b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:

        1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
        2) Copies of current, independent third-party test data of salient product or system characteristics.
        3) Samples where applicable or when requested by Architect.
        4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
        5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
        6) Research reports, where applicable, evidencing compliance with building code in effect for Project.
        7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.

    c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
    d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Engineer's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Engineer's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 002600

SECTION 011000

SUMMARY

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. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Future work.
4. Purchase contracts.
5. Access to site.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and Drawing conventions.
9. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: USU Quad—Old Main

1. Project Location: USU Old Main Quad, Logan, Utah.

B. Owner: Utah State University.

1. Owner's Representative: Lorin Wilcox, 435.720.2288

C. Engineer: Lance Anderson, 435.713.0099.

D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

E. Construction Manager: Grammol Construction.

1. Construction Manager for this Project is Project's constructor. The terms "Construction Manager" and "Contractor" are synonymous.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. To widen and repave Old Main East Entrance plaza, widen sidewalks to the south, sidewalk connection to parking, and bike parking, as well as relocate specified light poles, existing tree and existing statues. Install new pavers throughout the east side of Old Main. The protection and relocation of existing statutes on the plaza.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.

1.6 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

B. Concurrent Work: Owner has awarded and will award separate contracts for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1.7 PURCHASE CONTRACTS

A. General: Owner has negotiated Purchase contracts with suppliers of material and equipment to be incorporated into the Work. Owner will assign these Purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if required, and installation of material and equipment in the Contract Sum unless otherwise indicated.

1. Contractor's responsibilities are same as if Contractor had negotiated Purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.

1.8 ACCESS TO SITE

A. General: Each Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. General: Each Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

C. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to area shown on plans
2. Driveways, Walkways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

D. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

E. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.9 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 7 days in advance of activities that will affect Owner's operations.

B. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less 7 days notice to Owner of activities that will affect Owner's operations.

C. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Engineer will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work on the site, to normal business working hours of
1. As Approved by Utah State University

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Construction Manager or Owner not less than 7 days in advance of proposed utility interruptions.
2. Obtain Construction Manager's or Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Construction Manager or Owner not less than 7 days in advance of proposed disruptive operations.
2. Obtain Construction Manager's or Owner's written permission before proceeding with disruptive operations.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. 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. Imperative mood and streamlined language are generally used in the Specifications. 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.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012300

ALTERNATES

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. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A schedule of alternates is included at the end of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

END OF SECTION 012300

SECTION 012900

PAYMENT 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. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. **Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.**

1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Engineer at earliest possible date, but no later than **seven** days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract, as described in Section 011000 "Summary."

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Engineer.
    c. Engineer's Project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange schedule of values consistent with format of DFCM schedule of values
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of **five** percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site.

6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.

8. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
9. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling **five** percent of the Contract Sum and subcontract amount.
11. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Engineer by the 15th of the month. The period covered by each Application for Payment is one month, ending on the **last day of the month**

1. Submit draft copy of Application for Payment **seven** days prior to due date for review by Engineer.

D. Application for Payment Forms: **EJCDC Document C-620** or similar form for Applications for Payment.

1. Other Application for Payment forms proposed by the Contractor shall be acceptable to **Engineer** and Owner. Submit forms for approval with initial submittal of schedule of values.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. **Engineer** will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit **one** signed and notarized original copies of each Application for Payment to **Engineer** by a method ensuring receipt **within 24 hours**. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from **subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application**.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Sustainable design action plans, including preliminary project materials cost data.

7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.
17. Data needed to acquire Owner's insurance.

J. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706.
5. AIA Document G706A.
6. AIA Document G707.
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

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. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF file.
3. 3 paper copies, of sufficient size to display entire period or schedule, as required.

B. Startup construction schedule.

1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at monthly intervals.

H. Material Location Reports: Submit at monthly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Unusual Event Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations interim milestones and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

C. Time Frame: Extend schedule from date established for commencement of the Work the Notice to proceed to date of Substantial Completion final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Commissioning Time: Include no fewer than 15 days for commissioning.
6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect’s and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use-of-premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Fabrication.
e. Sample testing.
f. Deliveries.
g. Installation.
h. Tests and inspections.
i. Adjusting.
j. Curing.
k. Startup and placement into final use and operation.

6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Temporary enclosure.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

1. Temporary enclosure.
2. Clinical Services Building
3. Node
4. Main Tunnel
5. Direct bury to Housing

G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012000 "Payment Procedures" for cost reporting and payment procedures.

H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

I. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

J. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

K. Distribution: Distribute copies of approved schedule to Architect Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.8 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for commencement of the Work Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first **90** days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.9 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the Work.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.10 CPM SCHEDULE REQUIREMENTS

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for commencement of the Work Outline significant construction activities for the first [90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for commencement of the Work.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.

g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and inspection.
j. Commissioning.
k. Punch list and final completion.
l. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, sustainable design documentation, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

    a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
    b. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediately preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

1.11 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Work Change Directives received and implemented.
17. Services connected and disconnected.

18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013300

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. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
5. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
6. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Engineer's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Engineer.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.

11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

B. Options: Identify options requiring selection by Engineer.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Engineer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2. Provide a space approximately **6 by 8 inches** on label or beside title block to record Contractor's review and approval markings and action taken by Engineer
3. Action Submittals: Submit **three** paper copies of each submittal unless otherwise indicated. Engineer will return **two** copies.
4. Informational Submittals: Submit **two** paper copies of each submittal unless otherwise indicated. Engineer will not return copies.
5. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using **CM/GC** transmittal form.

E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

F. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package and transmit to Engineer by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Engineer.

a. Engineer will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

2. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
3. Paper: Prepare submittals in paper form and deliver to Engineer.

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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. **Engineer reserves** the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on **Engineer'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 **10** days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. **Engineer** 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** days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Engineer's consultants, Owner, or other parties is indicated, allow [**21**] days for initial review of each submittal.

5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Engineer and to Engineer's consultants, allow [**15**] days for review of each submittal. Submittal will be returned to **Engineer** before being returned to Contractor.

    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Engineer

D. 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.
3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

1.7 SUBMITTAL REQUIREMENTS

A. 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 published data are unsuitable 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 catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.

B. 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

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional Engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches, but no larger than 30 by 42 inches.**

    a. **Two** opaque (bond) copies of each submittal. Engineer will return **one** copy.
    b. **Three** opaque copies of each submittal. Engineer will retain **two** copies; remainder will be returned.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
4. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

7. 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(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer**, will** return submittal with options selected.

8. 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 **three** sets of Samples. Engineer will retain **two** Sample sets; remainder will be returned. **Mark up and retain one returned Sample set as a project record Sample.**

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least **three** sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit **digitally signed PDF file and three** paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: 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 Engineer **and Construction Manager**.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with **a uniform approval stamp** Include 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.

1. Engineer will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ENGINEER'S REVIEW

A. Action Submittals: Engineer will review each submittal, indicate corrections or revisions required.

1. PDF Submittals: Engineer will indicate, via markup on each submittal, the appropriate action.

2. Paper Submittals: Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Engineer will **return without review** submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Engineer without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 014000

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. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection 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 quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

C. Related Requirements:

1. None

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.
3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. 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.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.

1.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction 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.

1.6 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups.

1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.

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

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including Subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address 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 inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. 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.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, 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.

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 product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. 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.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    f. When testing is complete, remove test specimens and test assemblies, and mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. 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 of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect or Construction Manager.

3. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's and Construction Manager's approval of mockups before starting corresponding work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

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

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.

1.11 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances, as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. 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.
2. Engage a qualified testing agency to perform quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

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

D. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. 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 Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Associated Contractor Services: Cooperate with agencies and representatives 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 inspection. 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 inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Engage a qualified testing agency special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

B. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

A. As approved by Owner

3.2 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's Construction Manager's reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.3 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, 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 or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

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 014000

SECTION 014100

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 General: The following requirements shall be incorporated in the contract Documents.

A. Permits:

1. Building Permits are not required on the University campus or for connection to University utilities.
2. Digging permits are required for any excavation, including utility installation, interruption, shut-off or outage, etc. they are obtained through FD&C and require a minimum of seven days notice during USU working hours.

1.2 Campus Restrictions: The following shall apply during construction:

1. Abide by all posted campus regulations in regard to traffic, parking, smoking etc.
2. All trash is to be hauled from campus to a legal disposal site. At no time shall on-site burning be allowed. Do not use University dumpsters for trash disposal.
3. Class schedules should be observed to avoid undue disturbances.
4. Parking permits are required from 7:30 a.m. to 2:00 p.m. Monday through Friday unless otherwise posted. Metered areas are enforced 7:00 a.m. to 5:00 p.m. Areas that are enforced twenty-four (24) hours a day include red curbs, roadways, driveways, fire hydrants, restricted areas, parking for persons with disabilities, and reserved spaces.
5. Contactor parking shall be within the contract staging limits. Any contractor or sub-contractor vehicles outside the staging will require a permit which can be obtained through Parking Services for a fee. Consultants may purchase an annual permit from Parking Services, which allows parking prior to the contract fences being installed.
6. Consultants and Contractors performing work for USU are subject to federal and state laws regarding affirmative action, equal employment opportunity, and sexual harassment.
7. During construction of the project the Contractor shall limit noise from the site as much as possible. Coordinate with Facilities Design and Construction for appropriate times to use loud equipment such as jackhammers or shot-nailers. Radios, tape players, and other devices will not be permitted on-site.

1.3 Temporary Utilities:

B. Electrical:

1. Where commercial power is not readily available, Utah State University may at their option provide electric power to a temporary service drip of single or three phase 120/208-208/120 up to 100 A. This may be to a pole provided and set by the Contactor located inside the contract limits or other termination as arranged for through the FD & C office. USU will provide the service drop meter base, meter and disconnect at the pole or other approved drop location. The Contractor shall provide his own services from the service drop disconnect. These services shall conform to

NEC requirements. The Contractor's representative shall observe meter readings at the time of meter installation. When permanent electric power is installed in the building and the building system has been inspected and approved as operational, the temporary service may be removed at the Contractor's request. Power system shall not be energized before the main switchboard is inspected by USU and the metering system is correctly installed.

2. The Contractor shall be billed for electrical power consumed on both the temporary and permanent power systems until final acceptance of the complete contract.

C. Culinary Water

1. The Contractor shall provide a source of culinary water on the site.
2. The site or building permanent culinary water may be used on the project after permanent connection and meter(s) is installed and the lines are tested, inspected and flushed. Fire service connections and lines shall not be used for site water.
3. The contactor will be billed for all culinary water used on site unless excepted at the beginning of the work by USU FD& C

D. Telephone

1. Outside the University telephone service area the entire service is to be by the local telephone company.
2. Within the University service area, service is to be ordered through the local telephone company and then arranged for service to the construction site through on campus cables through the USU Telecommunication department. The cost of the connection through USU cables will be through the local Telephone Company.

END OF SECTION 014100

SECTION 015639

TEMPORARY TREE AND PLANT PROTECTION

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. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
2. Section 311000 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape or the average of the smallest and largest diameters at a height 6 inches above the ground for trees up to and including 4-inch size at this height and as measured at a height of 12 inches above the ground for trees larger than 4-inch size.

B. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape or the average of the smallest and largest diameters at a height 54 inches above the ground line for trees with caliper of 8 inches or greater as measured at a height of 12 inches above the ground.

C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

a. Tree-service firm's personnel, and equipment needed to make progress and avoid delays.
b. Arborist's responsibilities.
c. Quality-control program.
d. Coordination of Work and equipment movement with the locations of protection zones.
e. Trenching by hand or with air spade within protection zones.
f. Field quality control.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
2. Detail fabrication and assembly of protection-zone fencing and signage.
3. Indicate extent of trenching by hand or with air spade within protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: 1-pint (0.5-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

D. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1. Species and size of tree.
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.
5. Description of maintenance following pruning.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

E. Quality-control program.

1.7 QUALITY ASSURANCE

A. Arborist Qualifications: Licensed arborist in jurisdiction where Project is located.

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.8 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Stockpiled soil from location shown on Drawings or stockpiled soil mixed with planting soil or planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of two parts stockpiled soil to one part planting soil.
2. Planting Soil: Planting soil as approved by owner.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood or ground or shredded bark or wood and bark chips.
2. Size Range: 3 inches maximum, 1/2 inch minimum.
3. Color: Natural.

C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements: Previously used materials may be used when approved by Engineer.

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch (50-mm) opening, 0.148-inch- (3.76-mm-) diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- (60-mm-) OD line posts, and 2-7/8-inch- (73-mm-) OD corner and pull posts with 1-5/8-inch- OD top rails with 0.177-inch- diameter top tension wire and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

    a. Height: 48 inches

2. Plywood Protection-Zone Fencing: Plywood framed with four 2-by-4-inch rails, with 4-by-4-inch preservative-treated wood posts spaced not more than 96 inches (2400 mm) apart.

    a. Height: 48 inches.
    b. Plywood and Lumber: Comply with requirements approved by owner

3. Wood Protection-Zone Fencing: Constructed of two 2-by-4-inch (50-by-100-mm) horizontal rails, with 4-by-4-inch preservative-treated wood posts spaced not more than 96 inches apart, and lower rail set halfway between top rail and ground.

    a. Height**:** 48 inches.
    b. Lumber: Comply with requirements approved by owner

4. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and

ultimate tensile strength of 2680 psi secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.

a. Height: 48 inches.
b. Color: High-visibility orange, nonfading.

5. Gates: Single- swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width as indicated.

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:

1. Size and Text: as shown on Drawings.
2. Lettering: 3-inch-high minimum, black characters on white background.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 2-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections

where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
3. Access Gates: Install where indicated; adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 50 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.

D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as shown on Drawings.

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Do not paint cut root ends.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."

B. Root Pruning at Edge of Protection Zone: Prune tree roots flush with the edge of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

    a. Type of Pruning: Cleaning, reducing and thinning where indicated.
    b. Specialty Pruning: Structural where indicated.

B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.

C. Cut branches with sharp pruning instruments; do not break or chop.

D. Do not paint or apply sealants to wounds.

E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.

F. Chip removed branches and stockpile in areas approved by Engineer or dispose of off-site.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.

1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Trees: Remove and replace trees indicated to remain that are more than 66 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 6 inches or smaller in caliper size.
2. Large Trees: Provide one new tree of 6-inch caliper size for each tree being replaced that measures more than 6 inches in caliper size.

a. Species: As selected by Engineer

3. Plant and maintain new trees as specified in Section 329300 "Plants."

C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a **4-inch** uniform thickness to remain.

D. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate **10 feet** beyond drip line and no closer than **36 inches** to tree trunk. Drill **2-inch**diameter holes a minimum of 12 inches (300 mm) deep at **24 inches** o.c. Backfill holes with an equal mix of augered soil and sand.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 01 5713 – TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section covers the work required for erosion control during construction. Any local or State Agency requirements will be considered part of these specifications.

B. Related Sections include the following:

1.	31 10 00	Site Clearing
2.	31 20 00	Earth Moving
4.	33 41 00	Storm Drainage

C. Obtain the National Pollution Discharge Elimination System (NPDES) Permit for storm water discharge associated with construction activity. Storm Water Pollution Prevention Plan may be required for this permit. It shall be the responsibility of the Contractor to prepare all necessary documents to obtain the required permitting

D. Obtain a UPDES Storm Water General Permit for Construction Activities (Permit #UTR100000) or an alternate individual permit. Applications are available online at www.waterquality.utah.gov/UPDES/stormwater. Storm Water Pollution Prevention Plan may be required for this permit. It shall be the responsibility of the Contractor to prepare all necessary documents to obtain the required permitting.

E. Coordinate all SWPPP requirements with USU.

PART 2 - PRODUCTS

2.1 SILT FENCE

A. Silt fence shall be a woven fabric that meets the following criteria:

Property	Unit	Test Method	Values
Grab Strength	lbs.	ASTMD-4632	90 min
Grab Elongation	%	ASTMD-4632	40 max
Water Flow Rate	gal/min/ft2	ASTMD-4491	15 min
Ultraviolet Stability	%	ASTMD-4355	70% min

PART 3 – EXECUTION

3.1 EXECUTION

A. Silt fence shall be placed at or near the project limit line or limit of impact line as shown

on the demolition plan. The placement of silt fence and/or bales shall consider drainage paths and intercept drainage prior to leaving the site or entering a storm sewer system. Removal of silt and replacement of silt fence and/or bales shall be on going through the duration of the project to maintain an effective silt removing barrier.

B. Temporary Sedimentation Basins and/or sinks shall be constructed as necessary for accumulated runoff to deposit sediment prior to leaving site. Contractor shall place basin where they deem necessary based upon construction sequencing/access, etc. The temporary sedimentation basin shall collect any runoff from the stabilized construction entrance/vehicle wash-down area. The basins and/or sinks shall be cleaned as required to maintain adequate size and depth.

C. Stabilized Construction Entrance & Vehicle Wash-down Area shall be provided at all construction entrances to the site. The stabilized construction entrance shall consist of a minimum 8" gravel & cobble pad large enough to accommodate the largest vehicles entering and exiting the site. The pad shall provide opportunity for dust to settle of the vehicle tires and shall be large enough that a vehicle may be parked and washed down with water to prevent tracking of dust and mud off-site.

D. All temporary grading of drainage channels, slopes or fills shall be in accordance with Section 31 20 00 Earth Moving

END OF SECTION

SECTION 016000

PRODUCT 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. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012300 "Alternates" for products selected under an alternate.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Engineers Action: If necessary, Engineer will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Form of Architect's Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

3. See individual identification sections in Divisions 22, 23, and 26 for additional identification requirements.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Engineer in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: …"

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

    a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.

    a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: …"

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

    a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.

    a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: …"

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or

indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.

B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300

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. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to submitting cutting and patching plan or commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for

ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

a. Contractor's superintendent.
b. Trade supervisor responsible for cutting operations.
c. Trade supervisor(s) responsible for patching of each type of substrate.
d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affecting by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Certified Surveys: Submit two copies signed by land surveyor or professional engineer.

F. Final Property Survey: Submit 5 copies showing the Work performed and record survey data.

1.6 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Plumbing piping systems.
    f. Mechanical systems piping and ducts.
    g. Control systems.
    h. Communication systems.
    i. Fire-detection and -alarm systems.
    j. Conveying systems.
    k. Electrical wiring systems.
    l. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.
    f. Piping, ductwork, vessels, and equipment.
    g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: 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, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. 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.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

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 Engineer and Construction Manager promptly.

B. General: Engage a land surveyor or professional engineer 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 limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Engineer and Construction Manager when deviations from required lines and levels exceed allowable tolerances.

7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer and Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

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.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

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.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

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

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

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

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

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

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

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

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. Remove liquid spills promptly.
2. 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. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

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

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 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.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017700

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. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at final completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by owner. Label with manufacturer's name and model number.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.

5. Submit testing, adjusting, and balancing records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.

10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of (10) days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer [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.

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

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit final completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. 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. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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

1. Organize list of spaces in sequential order.

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. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. Electronic file. Architect**,** through Construction Manager**,** will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within (15) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit by email to Architect.

E. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. Provide additional copies of each warranty to include in operation and maintenance manuals.

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.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

B. Cleaning: 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 designated 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 not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with local jurisdiction, Provide written report on completion of cleaning.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in local jurisdiction,

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

4. Replace burned-out bulbs, bulbs 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 017700

SECTION 017839

PROJECT RECORD DOCUMENTS

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. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:
1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit **one** set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:

1) Submit **one** paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and **one** of file prints.
3) Submit record digital data files and **one** set(s) of plots.
4) Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit **three** paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and **three** set(s) of prints.
3) Print each drawing, whether changes and additional information were recorded.

c. Final Submittal:

1) Submit **one** paper-copy set(s) of marked-up record prints.
2) Submit record digital data files and **thre**e set(s) of record digital data file plots.
3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit **one paper copy** or **annotated PDF electronic file** of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit **one paper copy** or **annotated PDF electronic files and directories** of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit **one paper copy or annotated PDF electronic files and directories**] of each submittal.

E. Reports: Submit written report **monthly** indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.

g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or **Construction C**hange Directive.
k. Changes made following Engineer's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: Annotated PDF electronic file
3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
4. Refer instances of uncertainty to Engineer for resolution.
5. Engineer will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

    a. See Section 013100 "Project Management and Coordination" for requirements related to use of Engineer's digital data files.
    b. Engineer will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."

d. Name of Engineer
e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Specifications as **annotated PDF electronic file** or **paper copy**

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.

C. Format: Submit record Product Data as **annotated PDF electronic file** or [**paper copy**

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as **PDF electronic file or paper copy**

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839

SECTION 024116

STRUCTURE DEMOLITION

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. Section Includes:

1. Demolition and removal of **and site improvements**.
2. **Abandoning in-place and removing** below-grade construction.
3. Disconnecting, capping or sealing, and **abandoning in-place** or **removing** site utilities.
4. Salvaging items for reuse by Owner.

B. Related Requirements:

1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
3. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and **deliver to Owner ready for reuse**. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

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

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at **Project site.**

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for **noise control and dust control**.
6. Review procedures for protection of adjacent buildings.
7. Review items to be salvaged and returned to Owner.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property**, for environmental protection, for dust control and, for noise control**. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain **including means of egress from those buildings**.

D. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping **or re-routing** of utility services.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by demolition operations.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than **72** hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before building demolition, Owner will remove the following items:

a. Trees as shown on Plans.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for materials that are known to be present in buildings and structures to be demolished because of building operations or processes performed there.

F. On-site storage or sale of removed items or materials is not permitted.

1.10 COORDINATION

A. Arrange demolition schedule so as not to interfere with **Owner's on-site operations or operations of adjacent occupied buildings**.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

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

2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 DEMOLITION CONTRACTOR

A. Demolition Contractor:

1. Contractor to provide the name of subcontractor to perform the work prior to commencing demolition to ensure subcontractor is qualified to complete the work.

3.2 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. **Perform** an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

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

3.3 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Salvaged Items: Comply with the following:

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

3.4 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

1. Owner will arrange to shut off utilities when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
4. Cut off pipe or conduit a minimum of **24 inches** below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
5. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.5 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

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

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.

2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

    a. Provide at least **72** hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.6 DEMOLITION, GENERAL

A. General: Demolish indicated **site improvements** completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

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

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage

adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.7 DEMOLITION BY EXPLOSIVES

A. Explosives: Perform explosive demolition according to governing regulations.

1. Obtain written permission from authorities having jurisdiction before bringing explosives to, or using explosives on, Project site.
2. Do not damage adjacent structures, property, or site improvements when using explosives.

B. Comply with recommendation in specialty explosives consultant's report.

3.8 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Salvage: Items to be removed and salvaged are indicated [**on Drawings.**

D. Below-Grade Construction: Abandon foundation walls and other below-grade construction. Cut below-grade construction flush with grade.

E. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending **5 feet** outside footprint indicated for new construction. Abandon below-grade construction outside this area.

1. Remove below-grade construction, including basements, foundation walls, and footings, **completely**.

F. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, **completely**.

G. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.

H. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within **5 feet** outside footprint indicated for new construction. Abandon utilities outside this area.

1. Fill abandoned utility structures with **satisfactory soil materials** to backfill requirements in Section 312000 "Earth Moving."

I. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.

J. Hydraulic Elevator Systems: Demolish and remove elevator system, including cylinder, plunger, well assembly, steel well casing and liner, oil supply lines, and tanks.

3.9 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with **satisfactory soil materials** according to backfill requirements in Section 312000 "Earth Moving."

C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.10 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.11 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site **and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.**

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.12 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

SECTION 024119

SELECTIVE DEMOLITION

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. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 017300 "Execution" for cutting and patching procedures.
4. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
5. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and **deliver to Owner ready for reuse** .

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

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

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at **Project site.**

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property**, for environmental protection, for dust control and, for noise control**. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's **building manager's and other tenants'** on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove the following items:

a. Trees as shown on plan. Coordinate with USU LOAM

C. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

F. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by **12 inches** or more.

G. Storage or sale of removed items or materials on-site is not permitted.

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

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

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. None

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. **Perform** an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of **preconstruction photographs or video.**

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

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

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

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

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

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

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least **2** hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

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

C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic. In historic spaces, areas, and rooms, or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 024296 "Historic Removal and Dismantling."

D. Removed and Salvaged Items:

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

E. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site **and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.**

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION 024119

SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Removing trees and other vegetation.
2. Clearing and grubbing.
3. Topsoil stripping.
4. Removing above-grade site improvements.
5. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections include the following:

1. Division 1 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
2. Division 31 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIALS OWNERSHIP

A. Materials indicated to be stockpiled or to remain are the Owner's property. Cleared materials shall become Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

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

B. Record drawings according to Division 1 Section "Closeout Procedures."

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing indicated removal and/or access on property adjoining Owner's property will be obtained by Owner before award of Contract.

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

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

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

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

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.

B. Do not excavate within drip line of trees, unless otherwise indicated.

C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

1. Cover exposed roots with burlap and water regularly.
2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
3. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange to shut off indicated utilities with utility companies.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, asphalt & concrete paving, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
4. Use only hand methods for grubbing within drip line of remaining trees.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod, grass, asphalt and concrete paving before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within drip line of remaining trees.
3. Dispose of excess topsoil as specified for waste material disposal.
4. Stockpile surplus topsoil and allow for re-spreading deeper topsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.7 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 311000

SECTION 312000

EARTH MOVING

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. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete pavements.
5. Subbase course and base course for asphalt paving.
6. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:

1. Section 013200 "Construction Progress Documentation" for recording pre-excavation and earth moving progress.
2. Section 015000 "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
   Section 3213143000 "USU Exterior Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
4. Section 142400 "Hydraulic Elevators" for excavating well hole to accommodate elevator-cylinder assembly.
5. Section 311000 "Site Clearing" for site stripping, grubbing, stripping topsoil, and removal of above- and below-grade improvements and utilities.
6. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
7. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices for earth moving specified in Section 012200 "Unit Prices."

B. Quantity allowances for earth moving are included in Section 012100 "Allowances."

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

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

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

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

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

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

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

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

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

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 QUALITY ASSURANCE

A. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

B. Preexcavation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 015000 "Temporary Facilities and Controls, and "Section 311000 "Site Clearing," are in place.

E. Do not commence earth moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

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

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

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

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

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches outside of concrete forms other than at footings.
b. 6 inches beneath bottom of concrete slabs-on-grade.
c. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1-inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work. Excavation to be approved according to Section 3.7 prior to placing footing or foundation elements.

2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

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

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

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

1. Clearance: As indicated.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.7 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with pneumatic-tired heavy equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

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

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

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.

7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

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

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, standing water, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill voids with satisfactory soil while removing shoring and bracing.

D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Place and compact final backfill of satisfactory soil to final subgrade elevation.

3.12 SOIL FILL

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

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, standing water, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

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

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

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

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

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.15 GRADING

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

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

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

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, standing water, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Place base course material over subbase course under hot-mix asphalt pavement.

2. Shape subbase course and base course to required crown elevations and cross-slope grades.
3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
4. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, standing water, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course 6 inches or less in compacted thickness in a single layer.
2. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1557, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

3.19 PROTECTION

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

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

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and re-compact.

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

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

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 32 1216

ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cold milling of existing asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt overlay.
5. Asphalt curbs.
6. Asphalt traffic-calming devices.
7. Asphalt surface treatments.

B. Related Requirements:

Related Sections include the following:

1. 31 1000 Site Clearing
2. 32 1216 Asphalt Paving
3. 32 8423 Underground Sprinklers
4. 32 9001 Common Planting
5. 32 9113 Soil Preparation
6. 32 9120 Topsoil Placement & Grading
7. 32 9223 Sodding
8. 32 9300 Plants
10. 33 4100 Storm Drainage

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at project location.

B. Review the following agenda items at the pre-installation conference

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.

b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.
2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
3. Job-Mix Designs: For each job mix proposed for the Work.

B. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer & testing agency.

B. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

C. Material Test Reports: For each paving material, by a qualified testing agency.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by Utah State University

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Utah State University for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.

4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242/D 242M, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320, PG 58-28

B. Asphalt Cement: ASTM D 3381/D 3381M for viscosity-graded material or ASTM D 946/D 946M for penetration-graded material.

C. Cutback Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-70 & MC-250.

D. Emulsified Asphalt Prime Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

F. Fog Seal: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

G. Water: Potable.

H. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires, asphalt shingles or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

B. Sand: AASHTO M 29, Grade No. 2 or No. 3.

C. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

D. Joint Sealant: AASHTO M 324, Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

A. Recycled Content of Hot-Mix Asphalt: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [40] percent or more than [50] percent by weight.

1. Surface Course Limit: Recycled content no more than [50] percent by weight.

B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes [approved by authorities having jurisdiction] [; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types";] and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: See Details
3. Surface Course: See Details

C. Emulsified-Asphalt Slurry: ASTM D 3910, Type 2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction]. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll sub-grade material with roller.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING & ASPHALT TIE-INS

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

C. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 PAVING GEOTEXTILE INSTALLATION

A. Apply asphalt binder uniformly to existing pavement surfaces at a rate of 0.20 to 0.30 gal./sq. yd. (0.8 to 1.2 L/sq. m).

B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm).

C. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.6 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.

2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.7 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints [using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."].
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.8 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent or greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.9 ASPHALT CURBS

A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at a minimum temperature of 250 deg F (121 deg C).

1. Asphalt Mix: Same as pavement surface-course mix.

B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.10 ASPHALT TRAFFIC-CALMING DEVICES

A. Construct hot-mix asphalt speed bumps over compacted pavement surfaces. Apply a tack coat unless pavement surface is still tacky and free from dust. Spread mix at a minimum temperature of 250 deg F (121 deg C).

1. Tack Coat Application: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m.)
2. Asphalt Mix: Same as pavement surface-course mix.
3. Before installation, mill pavement that will be in contact with bottom of traffic-calming device. Mill to a depth of 1 inch (25 mm) from top of pavement to a clean, rough profile.

B. Place and compact hot-mix asphalt to cross section indicated, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.11 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm)
2. Surface Course: 1/8 inch (3 mm)
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

C. Asphalt Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch (3 mm) of height indicated above pavement surface.

3.12 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. Asphalt Traffic-Calming Devices: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.

E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Replace and compact hot-mix asphalt where core tests were taken.

G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.14 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan.

END OF SECTION 321216

SECTION 321314

USU CAST-IN-PLACE EXTERIOR CONCRETE

PART 1 – GENERAL

1) GENERAL:

   a. Exterior concrete shall be defined as all concrete flatwork (sidewalks, curb, gutter, driveways, paving, landings, aprons, stairs, etc.) that is exposed to exterior freeze/thaw conditions and deicer use.

2) PRE-INSTALLATION CONFERENCE:

   a. General Contractor, Sub-Contractor(s), and Ready Mix supplier shall participate in a pre-installation conference with USU FPD&C to coordinate with users and review the installation schedule. The following items shall also be reviewed:

      i. Mix design requirements, including admixtures

      ii. Requirements for preparation of subgrade

      iii. Placement, finishing and curing of concrete

      iv. Hot and cold weather requirements

      v. Jointing requirements and joint layout

      vi. Safety issues

3) CONCRETE WORK DEFINITIONS AND APPLICATIONS:

   a. Exposed exterior flatwork shall be defined as the following:

      i. Sidewalks, curb, gutter, driveways, paving, landings, aprons, stairs, etc., and which are exposed to exterior freeze/thaw conditions, heavy deicer use and heavy snow removal equipment.
      ii. Use Concrete Mix Type 1 or 2 for these applications.

   b. Unexposed exterior flatwork shall be defined as the following:

      i. Flatwork exposed to ice and snow but not exposed to heavy deicer use or heavy snow removal equipment.
      ii. Use Concrete Mix Type 1, omitting waterproofing admixture, OR use Type 2 for these applications

   c. Suspended slabs shall be defined as follows:

i. All suspended concrete slabs or slabs on metal deck exposed to rain, snow, and ice, exterior freeze/thaw conditions, and/or deicer use, such as parking terraces, stairways, landings, bridges, etc.
ii. Use Concrete Mix Type 1 for these applications. At contractor's option, fiber reinforcing may be omitted.

d. Buried tunnel section work shall be defined as follows:

i. All cast-in-place buried tunnel sections, which shall include floor slabs, walls, and top slabs.
ii. Use Concrete Mix Type 1 for these applications. At contractor's option, fiber reinforcing may be omitted.

4) SUBMITTALS:

a. Contractor shall submit concrete mix design(s), certifications and all other required product spec sheets to engineer for review prior to any construction. Allow one (1) week for engineering review.

b. No concrete shall be poured without prior written approval of all submittals.

5) MOCKUPS:

a. Contractor to provide two mockups of colors selected by the Owner and Engineer. Mockup to coordinate with the mockup of Section 321400 Unit Paving.

b. Mockup to be at least 10' x 10' outside dimension.

6) AGGREGATE:

a. General:

i. Aggregates for all concrete shall come from a quarry that is DOT approved and meets or exceeds durability Class I aggregate. The quarry shall submit a letter to USU FPD&C that certifies that all aggregate complies with DOT requirements for durability. Aggregate not meeting DOT durability requirements shall not be used.

b. Cleanliness:

i. The concrete supplier shall submit written certification by an independent testing agency demonstrating that aggregates supplied meet this requirement.

1. All fine aggregates shall have a Sand Equivalent (SE) value of not less than 80 according to ASTM D2419 and/or AASHTO T176.

2. All coarse aggregates shall have a Cleanliness Value (CV) of not less than 80 according to California Department of Transportation Test 227.

c. Coarse Aggregate:

i. 1" minus and well-graded crushed aggregate meeting ASTM C33. Aggregate shall be free of deleterious coatings and other materials and/or aggregate types causing popouts, discoloration, staining, alkaline reactions or other defects within the concrete. The concrete supplier shall submit written certification by and independent testing source of aggregate testing and soundness in accordance with ASTM C33 with all concrete mix designs.

d. Fine Aggregate:

i. Natural sand or blend of natural sand and crushed sand meeting ASTM C33. Crushed sand shall be less than 50% of the total sand by dry weight.

7) CEMENT:

a. Portland Type I or Type II (Do not use Type I-A or II-A).

8) POZZOLAN:

a. Fly Ash: Type F meeting ASTM C618

b. Silica Fume: Silica fume (or mocrosilica) meeting ASTM C1240 and/or AASHTO M307

9) CONCRETE WATERPROOFING ADMIXTURES:

a. Approved products:

i. Penetron Admix as manufactured by Penetron International, Ltd

ii. Xypex Admix C-500 as manufactured by Xypex Chemical Corporation.

b. Comply with all manufacturer's instructions and recommendations.

10) FIBER REINFORCING:

c. Approved products:

i. 'RSC15' polyvinyl alcohol (PVA) fibers as manufactured by Nycon at a dosage rate not less than two (2) lbs. per cubic yard.

ii. 'Fibermesh 300' polypropylene fibrillated fibers as manufactured by Fibermesh at a dosage rate not less than 1.5 lbs. per cubic yard.

iii. 'Econo-Net' polypropylene fibrillated fibers as manufactured by Forta Corporation at a dosage rate not less than 1.5 lbs. per cubic yard.

d. Comply with all manufacturere's instructions and recommendations.

11) COMPRESSIVE STRENGTH:

a. 4500 psi, minimum at twenty-eight (28) days, using a minimum 6.5-bag mix.

12) WATER/CEMENT RATIO:

A. As noted for each individual mix

B. No additional water shall be permitted either in transit or on site.

13) AIR ENTRAINMENT:

a. As noted for each individual mix.

b. Air-entraining admixtures shall conform to ASTM C260.

14) SLUMP:

a. As noted for each individual mix.

b. For high slump concrete, water reducing admixtures meeting ASTM C494 shall be used.

15) SURFACE PREPARATION:

a. Remove all water, debris, dirt clods, etc., from space where concrete is to be placed.

b. Unless noted otherwise, all exterior concrete flatwork shall be installed with six inches (6") minimum, of washed, crushed gravel beneath it (1" minus).

c. Gravel shall be well compacted and pre-wetted as per ACI standards prior to concrete installation.

16) SPECIAL TECHNIQUES:

a. Cold Weather Concreting Procedures:

i. General Requirements:

1. Although the schedules of building projects may necessitate it, the installation of exterior concrete flatwork is NOT recommended before April 1st or after October 1st, due to Cache Valley climate.

2. Materials and equipment required for heating and protection of concrete shall be approved and available at project site before beginning cold weather concreting.

3. Forms, reinforcement, metallic embedments, and fillers shall be free from snow, ice, and frost. Surfaces that will be in contact with newly placed concrete, including sub-grade materials, shall be 35 deg F (2 deg C) minimum at time of concrete placement.

4. Thaw sub-grade 6 inches (150 mm) deep minimum before beginning concrete placement. If necessary, re-compact all thawed material.

5. Use no frozen materials or materials containing ice.

6. Requirements When Average twenty four (24) Hour Temperature, midnight to midnight, Is Below 40 deg F (4 deg C):

a. Temperature of concrete as placed and maintained shall be 55 deg F (13 deg C) minimum and 75 deg F (27 deg C) maximum.

b. Heat concrete for seventy two (72) hours minimum after placing if regular cement is used; for 48 hours if high early strength

cement is used; or longer if determined necessary by USU FPD&C.

i. During this period, maintain concrete surface temperature between 55 and 75 deg F (13 and 27 deg C).

c. Vent flue gases from combustion heating units to outside of enclosure to prevent carbonation of concrete surface.

d. Prevent concrete from drying during heating period. Maintain housing, insulation, covering, and other protection twenty four (24) hours after heat is discontinued.

e. After heating period, if temperature falls below 32 deg F (0 deg C), protect concrete from freezing until strength of 2000 psi minimum is achieved.

i. Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of 3500 psi minimum is achieved.

7. Requirements When Average twenty four (24) Hour Temperature, midnight to midnight, Is Above 40 deg F (4 deg C), but when temperature falls below 32 deg F (0 deg C):

a. Protect concrete from freezing for seventy two (72) hours after placing, or until strength of 2000 psi is achieved, whichever is longer.

b. Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of 3500 psi minimum is achieved.

b. Hot Weather Concreting Procedures:

i. Maximum concrete temperature allowed is 90 deg F (32 deg C) in hot weather.

ii. Cool aggregate and subgrades by sprinkling with water.

iii. Avoid cement over 140 deg F (60 deg C).

iv. Use cold mixing water or ice.

v. Use fog spray or evaporation retardant to lessen rapid evaporation from concrete surface.

17) FINISHING OF EXTERIOR CONCRETE:

a. All concrete sidewalks and other flatwork shall have a cross-slope of not greater than 2% but not less than 0.5% toward the curb or street to provide positive drainage.

b. Use of steel floats/trowels, power screeds and vibrators for the finishing of exterior, air-entrained concrete is not permitted and shall be cause for rejection of any or all work.

c. Bull floating and/or darbying shall follow promptly after initial screeding using magnesium tools only.

d. No finishing operations shall be performed with bleed water present on the surface of the concrete. Any dusting of cement powder onto the surface to absorb bleed water or the working of bleed water back into the surface of the concrete is not permitted.

e. All concrete slabs shall be edged according to current ACI standards.

f. Sprinkling of water on the surface of the concrete to re-temper it during any finishing process is not permitted.

g. Trowelling of concrete shall be limited to a single, light pass before final finish using a magnesium trowel only.

h. All concrete shall have slip resistant finishes. The standard finish, unless noted otherwise, shall be a coarse broomed finish. Finishes shall be applied to the surface before the concrete has thoroughly hardened but yet sufficiently hardened to retain the scoring impressions.

18) CONCRETE CURING:

a. Curing procedures shall begin immediately after the final finishing process is complete and the surface sheen is gone.

b. Contractor shall provide proper curing of concrete by employing initial and final curing methods as indicated in ACI 308R-01.

c. Final curing shall be achieved by providing and/or installing the following:

   i. Moist curing methods that maintain a continuously wet surface such as ponding, sprinkling, plastic sheeting, or wet burlap sheets for a minimum period of 7 days. Moist curing is the curing method of choice for all exterior concrete on USU campus.

   ii. As an alternate, liquid membrane-forming curing compound(s) conforming to ASTM C-309 or ASTM C-1315, applied according to manufacturer's recommendations and with the following additional requirements:

      1. Curing agent shall be applied in two (2) applications at right angles to each other to ensure uniform and complete coverage.

      2. Curing agent shall contain a fugitive dye or white pigmentation which allows an inspector to see that the agent has been adequately applied.

      3. Contractor shall provide evidence of the amount of curing agent used for the project.

      4. The use of sprayed curing compounds is NOT recommended before April 1st or after October 1st due to Cache Valley climate.

d. Contractor shall make every effort to allow concrete to air dry for at least 30 days after the curing process is complete before exposing it to freeze/thaw conditions.

19) JOINTS:

a. All exterior concrete shall have expansion and control joints installed according to current ACI standards.

b. Expansion Joints:

   i. Joint material shall be Re-Flex rubber expansion joint material as manufactured by the J.D. Russell Company or approved equal. See manufacturer's website www.jdrussellco.com/reflex.html for more information.

   ii. Joints shall be sealed using a self-leveling sealer installed as per manufacturer's recommendations. Approved sealers are: Sonolastic SL1, Novalink SL or approved equal.

c. Control Joints:

   i. Joints shall be installed using one of two methods:

      1. Saw cutting using a beveled blade that provides a 3/8" beveled profile. Straight, unbeveled saw cuts are not allowed. Contractors are encouraged to use this method. See www.cardinalsaws.com for further information.

      2. Tooled joints that provide a maximum 3/8" radius (rounded) profile.

20) COLORED CONCRETE:

a. Colored concrete shall have an integrated color (color throughout) within the concrete and shall not be surface applied.

21) FIELD TESTS AND INSPECTIONS:

a. Testing Agency shall provide testing and inspection for concrete as per ASTM C1077.

b. Testing Agency will sample and test for quality control during placement of concrete as directed by USU FPD&C.

c. Testing and inspections, if performed, will include the following:

   i. Periodic inspection verifying use of required design mix.

   ii. Inspection at time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine temperature of concrete.

   iii. Inspection of concrete placement for proper application techniques.

   iv. Periodic inspection of curing materials and techniques.

   v. Periodic inspection of formwork for configuration, location, and dimensions of concrete member being formed.

vi. Slope of concrete members.

d. Testing Agency will sample and test during placement of concrete as directed by USU FPD&C and may include the following:

i. Sampling Fresh Concrete: ASTM C172, except as modified for slump to comply with ASTM C94:

1. Slump: ASTM C143. Test each time a set of compressive test specimens are made.

2. Air Content: ASTM C173. Volumetric method for normal weight concrete each time a set of compression test specimens is made.

3. Concrete Temperature: Test each time a set of compressive test specimens is made.

4. Unit Weight: ASTM C567. Test each time a set of compressive test specimens is made.

ii. Compression Test Specimens: ASTM C31. One (1) set of four (4) standard cylinders for each compressive strength test, unless otherwise directed.

iii. Compressive Strength Tests: ASTM C39. :

1. Obtain one (1) composite sample for each day's pour of each concrete mixture exceeding 5 cu. Yd., but less than 50 cu. Yd., plus one (1) set for each additional 50 cu. Yd. or fraction thereof.

2. One (1) specimen tested at seven (7) days, two (2) specimens tested at twenty eight (28) days, and one (1) specimen retained in reserve for later testing if required.

3. If strength of field-cured cylinders is less than eighty-five (85) percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.

4. Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

22) PROTECTION:

a. Protect concrete that has not received its initial set from pedestrian traffic and from precipitation to avoid excess water in the mix and an unsatisfactory surface finish.

b. Do not allow materials resulting from construction activities, which will affect concrete, to come in contact with concrete slabs.

23) WARRANTY:

a. Contractor shall provide a two-year written guarantee of concrete materials and workmanship commencing on the date of substantial completion to promptly remove and/or repair all defective concrete (i.e., pitting, scaling, flaking, cracking, honeycombing, etc.).

24) CONCRETE MIX TYPES

a. Type 1:
   i. 611 lb. / cu. yd. total cementitious material, min.
   ii. Water/Cementitious Ratio. 0.43
   iii. Slump: 3" – 6" using water reducing admixture
   iv. Waterproofing admixture: Penetron or Xypex
   v. Fiber reinforced
   vi. Air Entrainment 6.5%, +/-1.5%
   vii. Pozzolan: Fly ash – Zero to 15% maximum

b. Type 2:
   i. 611 lb. / cy. yd. total cementitious material, min.
   ii. Water/Cementitious Ratio: 0.40
   iii. Slump: 8" – 9" using mid and high range water reducing admixtures
   iv. Waterproofing admixture: None
   v. Fiber Reinforced
   vi. Air Entrainment: 6.5%, +/-1.5%
   vii. Pozzolans: Fly ash – 15% maximum, and Silica Fume – 4% min., 6% max.

END OF SECTION 321314

SECTION 32 14 13.14 – INTERLOCKING CONCRETE UNIT PAVING ON **CONCRETE** BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Work consists of furnishing and installing an Interlocking Concrete Pavement System in accordance with these specifications and in general conformance with the lines, grades, design, and dimensions shown on the plans.
   2. Installation work includes:
      a. Verifying the [**concrete**] base and edge restraints are installed in general conformance with the lines, grades, and site conditions depicted in the construction documents;
      b. Furnishing and installing geotextile (where required), base course, bedding course, edge restraint, concrete pavers, and joint filling sand as shown on the construction drawings.

B. Related Requirements:
   1. Section 31 20 00 Earth Moving
   2. Section 32 16 13 Curbs and Gutters

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO)
   1. GDPS-4-M Guide for Design of Pavement Structures
   2. AASHTO M81 Standard Specification for Cutback Asphalt (Rapid-Curing Type)

B. American Society of Civil Engineers (ASCE)
   1. ASCE 58-16 Structural Design of Interlocking Concrete Pavement for Municipal Streets and Roadways

C. American Society for Testing and Materials (ASTM)
   1. ASTM C33 Standard Specification for Concrete Aggregates
   2. ASTM C94 Standard Specification for Ready-Mixed Concrete
   3. ASTM C131 Resistance to Degradation of Small-Sized Course Aggregate by Abrasion and Impact in the Los Angeles Machine
   4. ASTM C136 Sieve Analysis of Fine and Coarse-Grained Aggregates
   5. ASTM C140 Sampling and Testing Concrete Masonry Units and Related Units
   6. ASTM C144 Aggregate for Masonry Mortar
   7. ASTM C920 Standard Specification for Elastomeric Joint Sealants
   8. ASTM C936 Solid Concrete Interlocking Paving Units
   9. ASTM C979 Pigments for Integrally Colored Concrete
   10. ASTM C1645 Freeze-thaw and De-icing Salt Durability of Solid Interlocking Paving Units
   11. ASTM D698 Laboratory Compaction Characteristics of Soil Using Standard Effort
   12. ASTM D2488 Description and Identification of Soils (Visual-Manual Procedure)

13. ASTM D2940 Graded Aggregate Material for Bases or Subbases for Highways or Airports
14. ASTM D4873 Identification, Storage, and Handling of Geosynthetic Rolls and Samples
15. ASTM D6373 Performance Graded Asphalt Binder

D. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO M288 Geotextile Specification for Highway Applications

E. Interlocking Concrete Pavement Institute (ICPI)
   1. Tech Specs and Technical Bulletins.

1.3 SUBMITTALS

A. Contractor shall submit to the owner for approval a minimum of four full-size samples of each concrete paver type/size/thickness/color/finish specified. The samples shall represent the range of shape, texture, and color permitted for the respective type. Color(s) will be selected by Architect/Engineer/Landscape Architect/Owner from Manufacturer's standard colors.

B. Prior to delivery of the associated material to the site, the Contractor shall submit the following product-specific documentation for approval:
   1. Aggregates
      a. Sieve analysis per ASTM C136 for bedding and joint fill materials
      b. Minimum 3 lb. sample of each material for independent testing.
   2. Concrete Pavers:
      a. Test results from an independent testing laboratory for compliance with ASTM C936.
      b. Manufacturer's catalog product data.
      c. Safety Data Sheets (SDS).
   3. Geotextile
      a. One 18-inch x 18-inch panel of each type of geotextile to be used for inspection and testing. The sample panels shall be uniformly rolled and shall be wrapped in plastic to protect the material from moisture and damage during shipment. Samples shall be externally tagged for easy identification. External identification shall include the name of the manufacturer; product type; product grade; lot number; and physical dimensions.
      b. Current National Transportation Product Evaluation Program (NTPEP) evaluation report.
      c. Safety Data Sheets (SDS).

1.4 QUALITY ASSURANCE

A. Contractor Qualifications:
   1. Contractor shall submit a list of five (5) previously constructed projects of similar size and magnitude prior to the bid date to be qualified. Contact names, telephone numbers, and date of completion shall be listed for each project.
   2. The Contractor's site foreman shall hold a Certified Concrete Paver Installer Designation from the Interlocking Concrete Pavement Institute (ICPI). The site foreman shall be onsite for the entire installation.
   3. Contractor shall conform to all local, state/provincial licensing and bonding requirements.

B. Mockups: Build mockups to verify selections made under submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Install a 10 ft x 10 ft paver area following the installation practices described in Article 3.2 to 3.4. This area shall be used to verify joint sizes; lines; laying pattern(s); stitching details (for mechanical installation); color(s); and, texture of the job.
   2. To provide a proper representation of color blend, blending during installation of sample mock-up will be pulled from a minimum of 3 cubes.
   3. This area shall be the standard by which the work will be judged.
   4. Subject to approval by the Owner, the mock-up may be retained as part of the finished work. If mock-up is not retained, remove and dispose of mock-up at the completion of the project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.

B. Contractor shall check all materials upon delivery to assure that the proper materials have been received and are in good condition before signing off on the manufacturer’s packing slip.

C. Contractor shall protect all materials from damage or contamination due to job site conditions and in accordance with manufacturer's recommendations. Damaged or contaminated materials shall not be incorporated into the work.

D. Concrete pavers shall be delivered to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by forklift or clamp lift. Unload and store concrete pavers at the job site in such a manner that no damage occurs to the product.

E. Contractor shall handle and transport aggregates to avoid segregation, contamination, and degradation and keep different materials sufficiently separated as to prevent mixing. The material shall not be dumped or stored one material on top of another unless it is part of the installation process. Materials shall be covered to prevent removal by wind.

F. Geotextile shall be delivered, stored and handled in accordance with ASTM D4873.

1.6 ENVIRONMENTAL CONDITIONS

A. Pavers shall not be installed during heavy rain, freezing conditions or snowfall.

B. Base course shall not be installed on frozen soil subgrade.

C. Pavers, bedding course sand, and joint filling sand shall not be installed on frozen aggregates.

1.7 MAINTENANCE MATERIALS

A. Provide [**100**] square feet additional paver material for use by Owner for maintenance and repair.

B. Store extra paver materials in Owner-designated location.

PART 2 - PRODUCTS

2.1 INTERLOCKING CONCRETE PAVERS

A. Interlocking Concrete Pavers Basis-of-Design:
   1. Paver Name: [**Holland Stone**]
      a. Thickness: [**3-1/8 inches (80 mm)**]
      b. Color: Selected by Owner
      c. Finish: Selected by Owner
      d. Contact Person:
      e. Substitutions: No substitutions permitted.

B. Pavers shall meet the minimum material and physical properties set forth in ASTM C 936:
   1. Measured length or width of test specimens shall not differ by more than +/- 0.063 in, while measured thickness shall not differ by more than +/- 0.125 in.
   2. Average compressive strength of not less than 8,000 psi (55 MPa) with no individual unit under 7,200 psi (50 MPa) when tested in accordance with ASTM C140.
   3. Average absorption of 5% or less with no unit greater than 7% when tested in accordance with ASTM C140.
   4. **Freeze-thaw durable as tested in accordance with ASTM C1645. The average mass loss of all specimens tested shall not be greater than (A) 225 g/m2 when subject to 28 freeze-thaw cycles, or (b) 500 g/m2 when subject to 49 freeze-thaw cycles. Testing shall be conducted using a 3% saline solution.**
   5. Efflorescence shall not be a cause for rejection.
   6. Pigment in Concrete Pavers shall conform to ASTM C979.

2.2 BEDDING SAND

A. Bedding sand shall be clean, non-plastic sand, free from deleterious or foreign matter, and manufactured from crushed rock.

B. Screenings or stone dust shall not be utilized.

C. [**Micro Deval Degradation shall be less than 8% as per ASTM D7428.**

D. Percent combined of sub-angular and sub-rounded shall be greater than 60% as per ASTM D2488.

E. LA Abrasion <40 as per ASTM C131]

F. Verify gradation conforms to ASTM C33 requirements for concrete sand (listed in Table 1) as tested in accordance with ASTM C136.

Table 1
Gradation Requirements for Bedding Sand

Sieve Size	Percent Passing
3/8 inch (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100

No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	5 to 30
No. 100 (0.150 mm)	0 to 10
No. 200 (0.075 mm)	0 to 1

2.3 JOINT FILLING SAND

A. Joint sand aggregate shall be clean, non-plastic sand, free from deleterious or foreign matter, and manufactured from crushed rock.

B. Screenings or stone dust shall not be utilized.

C. [**Micro Deval Degradation shall be less than 8% as per ASTM D7428.**

D. Percent combined of sub-angular and sub-rounded shall be greater than 60% as per ASTM D2488.

E. LA Abrasion <40 as per ASTM C131]

F. Verify gradation conforms to ASTM C144 requirements for concrete sand (listed in Table 2) as tested in accordance with ASTM C136.

Table 2
Gradation Requirements for Joint Filling Sand

Sieve Size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	95 to 100
No. 16 (1.18 mm)	70 to 100
No. 30 (0.600 mm)	40 to 100
No. 50 (0.300 mm)	10 to 35
No. 100 (0.150 mm)	2 to 15
No. 200 (0.075 mm)	0 to 5

2.4 EDGE RESTRAINTS

A. Edge restraints shall be cast in place concrete curbs constructed at a minimum to the dimensions of the municipal standards.

2.5 GEOTEXTILES

A. Geotextile materials shall be selected by the Design Engineer based on the intended use in accordance with AASHTO M288.

B. Only geotextiles with a current NTPEP evaluation will be accepted.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prior to commencement of any work, the Contractor shall conduct a pre-construction meeting with the Owner, Designer, and affected sub-trades. The pre-construction meeting should establish contractor responsibilities and at a minimum verify:
   1. The location of the mock-up, and whether it will be part of the final construction or need to be removed.
   2. The site layout is in general conformance with the construction documents.
   3. The [**concrete**] base and edge restraints are in general conformance with the lines, grades, and locations shown in the construction documents. The surface of the base shall have a minimum slope of 1/4 inch per foot (2 percent grade) and be within a tolerance of 3/8 inch over a 10-foot straight edge. Surface to be free of dust, oil, grease, paint, wax, curing compounds, primer, sealer, form release agents, cracks over 3/16 inch, or any deleterious substances and debris.
   4. [**Concrete shall be fully cured and free of hydrostatic pressure, control joints are located at the specified interval, and the moisture content is less than 5 percent.**]
   5. The location and spacing of weep holes and that weep holes are filled with pea gravel and covered with a 12-inch by 12-inch geotextile.
   6. The subgrade lines and elevations are in general conformance with the construction documents. The subgrade elevations shall be within +/- 0.1 ft of the specified grades.
   7. Subgrade soil conditions and grades meet the requirements in the construction documents.
   8. The details of the site's erosion and sediment control plan.

B. Contractor shall verify compaction of the subgrade and base is in general conformance with the construction documents prior to commencing work.

C. Once the Contractor has confirmed the base conditions are in general conformance with the requirements in the construction documents, the Contractor shall begin installing the bedding sand material. By initiating installation of the bedding sand, the Contractor acknowledges acceptance of the base.

3.2 INSTALLATION OF EDGE RESTRAINTS

A. Adequate edge restraint shall be provided along the perimeter of all paving as specified. The face of the edge restraint, where it abuts pavers, shall be vertical.

B. All concrete edge restraints shall be constructed to dimensions and grades in general conformance with the construction documents and shall be supported on a compacted base not less than 6 inches thick. Concrete curbs shall meet local requirements or the requirements of Section 32 16 13 - Curbs and Gutters whichever is more restrictive. All concrete shall be in accordance with ASTM C94 requirements.

3.3 INSTALLATION OF BEDDING COURSE, PAVERS, AND JOINT FILLING MATERIAL

A. Install 12 inch strip of geotextile and turn up against curb to contain bedding course.

B. Spread the bedding course evenly over the base course and screed to a nominal 1-inch (25 mm) thickness. Sand shall be lightly screeded in a loose condition to the proper depth only slightly ahead of the paving units and shall be protected against incidental compaction. Any incidental compaction or screeded sand left overnight, or exposed to rain, shall be loosened prior to placing paving units. The Contractor shall screed the bedding course using either an approved mechanical spreader (e.g.: an asphalt paver) or by the use of screed rails and boards. The screeded sand should not be disturbed. Place sufficient sand to stay ahead of the laid pavers. Do not use the bedding sand to fill depressions in the base course surface.

C. Ensure that concrete pavers are free of foreign material before installation. Concrete pavers shall be inspected for color distribution and all chipped, damaged or discolored concrete pavers shall be replaced. Initiation of concrete paver placement shall be deemed to represent acceptance of the pavers.

D. Lay the concrete pavers in the pattern(s) as shown on the drawings and in general conformance with the approved mock-up. Maintain straight pattern lines.

E. Paving units shall be installed from a minimum of 3 bundles by hand, and 6 bundles during mechanical installation, simultaneously to ensure color blending.

F. Joints between the individual concrete pavers, and between concrete pavers and the edge restraints, buildings, collars, or other protrusions/edging, on average shall be between 1 /16 inch and 3 /16 inch (2 mm to 5 mm) wide.

G. Joint (bond) lines shall not deviate more than ±1/2 in. (±15 mm) over 50 ft. (15 m) from string lines.

H. Fill gaps at the edges of the paved area with cut pavers or edge units. Do not install cut pavers smaller than one-third of a whole paver along edges subject to vehicular traffic – trim two pavers to fit.

I. Cut all pavers using a double-bladed splitter or masonry saw. Upon completion of cutting, the area must be swept clean of all debris to facilitate inspection and to ensure the concrete pavers are not damaged during compaction.

J. Using a low amplitude plate compactor capable of at least 5,000 lbs. (22 kN) compaction at a frequency of 75 Hz –100 Hz, compact the concrete pavers into the bedding course.

K. The pavers shall be compacted to achieve consolidation of the bedding sand and brought to level and profile by not less than three passes. Initial compaction should proceed as closely as possible following the installation of the paving units and prior to the acceptance of any traffic or application of joint filling sand.

L. Any units that are structurally damaged during compaction shall be immediately removed and replaced.

M. Sweep dry joint filling sand into the joints and vibrate until they are full. This will require two or three passes with the compactor. Do not compact within 3 feet (1 m) of the unrestrained edges of the paving units.

N. All work to within 3 feet (1 m) of the laying face must be left fully compacted with sand-filled joints at the end of each day.

O. Sweep off excess sand when the job is complete.

P. The surface elevation of pavers shall be 1/8 to 1/4 inch (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.

3.4 AS-BUILT CONSTRUCTION TOLERANCES

A. Final inspection shall be conducted to verify conformance to the drawings after removal of excess joint sand. All pavements shall be finished to lines and levels to ensure positive drainage at all drainage outlets and channels.

B. The final surface elevations shall not deviate more than 3/8 (10 mm) inch under a 10-foot long (3 M) straightedge.

C. Lippage: No greater than 1/8 in. (3 mm) difference in height between adjacent pavers.

END OF SECTION 32 14 13.14

SECTION 321726

TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Tactile and detectable warning systems for pedestrian walking surfaces.

1.2 RELATED REQUIREMENTS

A. Section 32 1314 - USU Cast-In-Place Exterior Concrete.

B. Section 32 1723 - Painted Pavement Markings: Crosswalk and curb markings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Tactile and Detectable Warning Surface Systems:

1. Access Tile, a brand of Access Products, Inc: www.accesstile.com.
2. ADA Solutions, Inc: www.adatile.com.
3. Armor-Tile, a brand of Engineered Plastics, Inc: www.armortiletransit.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Cast Iron Detectable Warning Plates:

1. Neenah Foundry, a division of Neenah Enterprises, Inc: www.nfco.com.
2. Duralast Detectable Warning Plates: www.ejco.com
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 TACTILE AND DETECTABLE WARNING DEVICES

A. Tactile and Detectable Warning Systems: ADA Standards compliant, glass fiber and carbon fiber reinforced, exterior grade, matte finish polyester sheet with truncated dome pattern, solid color throughout, internal reinforcing of sheet and of truncated domes, integral radius cut lines on back face of tile; with factory applied removable protective sheeting.

1. Material Properties:
   a. Water Absorption: 0.20 percent, maximum, when tested in accordance with ASTM D570.

b. Slip Resistance: 0.80 minimum combined wet/dry static coefficient of friction, when tested in accordance with ASTM C1028.
c. Compressive Strength: 25,000 pounds per square inch (172 MPa), minimum, when tested in accordance with ASTM D695.
d. Tensile Strength: 10,000 pounds per square inch (69 MPa), minimum, when tested in accordance with ASTM D638.
e. Flexural Strength: 25,000 pounds per square inch (172 MPa) minimum, when tested in accordance with ASTM D790.
f. Chemical Stain Resistance: No reaction to 1 percent hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, or antifreeze, when tested in accordance with ASTM D543.
g. Abrasion Resistance: 300, minimum, when tested in accordance with ASTM C501.
h. Flame Spread Index: 25, maximum, when tested in accordance with ASTM E84.
i. Accelerated Weathering: Delta-E of less than 5.0 at 2,000 hours exposure, when tested in accordance with ASTM G155.
j. Adhesion: No delamination of tile prior to board failure in a temperature range of 20 to 180 degrees F (minus 7 to 82 degrees C), when tested in accordance with ASTM C903.
k. Loading: No damage when tested according to AASHTO LRFD test method HS20.
l. Salt and Spray Performance: No deterioration or other defect after 200 hours of exposure, when tested in accordance with ASTM B117.

2. Installation Method: Cast in place.
3. Shape: Rectangular.
4. Dimensions: 24 inches by 48 inches (610 mm by 1220 mm).
5. Pattern: In-line pattern of truncated domes complying with ADA Standards.
6. Edge: Square.
7. Joint: Butt.
8. Color: As selected by Architect from manufacturer's standard range – see drawings for color selection
9. Products:

a. ADA Solutions, Inc; Cast in Place (Wet-Set): www.adatile.com.
b. ADA Solutions, Inc; Transit Use - Staggered Dome Cast in Place Tactile: www.adatile.com.
c. ADA Solutions, Inc; Transit Use - In-Line Dome Surface Applied System: www.adatile.com.
d. Armor-Tile – Herculite Series
e. Armor-Tile – Modular Paver
d. Substitutions: See Section 01 6000 - Product Requirements.

B. Cast Iron Detectable Warning Plates:

1. Material: Cast gray iron; ASTM A48/A48M, Class 30 A (minimum).
2. Installation Method: Cast in place.
3. Shape: Rectangular and Radius.
4. Square Dimensions: 24 inches square (610 mm square).
5. Radius Dimensions: 24 inches (610 mm) wide, 9 feet, 5 inch (2.87 m) radius.
6. Pattern: ADA compliant truncated cones.

7. Joint: Manufacturer standard, bolted connection.
8. Finish: Natural unpainted cast iron – factory finish.
9. Color: As selected by Architect from manufacturer's standard range – see drawings for color selection
10. Products:

    a. Neenah Foundry, a division of Neenah Enterprises, Inc: www.nfco.com.
    b. Duralast Detectable Warnings
    b. Substitutions: See Section 01 6000 - Product Requirements.

2.3 ACCESSORIES

A. Fasteners: ASTM A666, Type 304 stainless steel

1. Type: Countersunk, color matched composite sleeve anchors
2. Size: 1/4 inch (6.35 mm) diameter and 1-1/2 inches (38 mm) long.

B. Adhesive: Type recommended and approved by surfacing tile manufacturer.

C. Sealant: Elastomeric sealant of color to match adjacent surfaces; approved by surfacing tile manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's written instructions.

1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.
2. Do not install when ambient or substrate temperature has been below 40 degrees F (4 degrees C) during the preceding 8 daylight hours.

B. Field Adjustment:

1. Cut units to size and configuration shown on drawings.
2. Locate relative to curb line in compliance with PROWAG, Sections 304 and 305.
3. Orient so dome pattern is aligned with the direction of ramp.

C. Install units fully seated to substrate, square to straight edges and flat to required slope.

END OF SECTION 321726

SECTION 32 3300 - SITE FURNISHINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ash Receptacles – Identified herein, Owner to select, provide & install

B. Benches – Identified herein, see drawings for details. Contractor to provide & install

B. Bicycle racks – Identified herein, see drawings for details. Contractor to provide & install.

E. Trash Receptacles – Identified herein, see drawings for details. Contractor to provide & install.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Owner Provided and Installed Products: Ash receptacles

B. Section 32 13 14 - USU Cast-in-Place Concrete: Mounting surface for benches, bicycle racks. Coordination required for bollard installation.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.

C. Shop Drawings: Indicate plans for each unit or groups of units, elevations with model number, overall dimensions; construction, and anchorage details.

D. Samples: Submit two sets of manufacturer's available colors for concrete finishes, plastics and metal furnishings.

1.04 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty against defects in materials or workmanship for ductile iron castings for a period of 10 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ASH RECEPTACLES

A. Ash Receptacles: Owner to provide.
   1. Shape: TBD
   2. Ashtray: TBD
   3. Color or Finish: Owner to Select
   4. Mounting: Owner to Install

2.02 BENCHES

A. Bench Type A: Tournisol – Plaza Series – 8’ Standard – 6’ Where indicated on plan.
   1. Finish: Bronze Powder Coat
   2. Mounting: Manufacturers surface mount system – Installed by Contractor – use only stainless steel hardware

B. Equal as approved by Owner & Landscape Architect

2.03 BICYCLE RACKS

A. Exterior Bicycle Racks: Madrax “U” Rack - Device allows user provided lock to simultaneously secure one wheel and part of the frame on each bicycle parked or racked – Contractor to provide and install
   1. Finish: Galvanized finish or match salvaged racks
   2. Mounting: Manufacturers surface mount system – Installed by Contractor –use only stainless steel mounting hardware
   3. Produce Number: U238-SF

B. Equal as approved by Owner & Landscape Architect

2.06 TRASH RECEPTACLES

A. Trash Receptacles: Landscape Forms – Presidio – Side Opening with Ash
   1. Shape: Presidio
   2. Ashtray: Yes
   3. Color or Finish: Bronze Powder coat or Owner to Select
   4. Mounting: Contractor to install per manufacturers instructions – use only stainless steel mounting hardware

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that mounting surfaces, preinstalled anchor bolts, or other mounting devices are properly installed; and ready to receive site furnishing items.

B. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

A. Install site furnishings in accordance with approved shop drawings, and manufacturer’s installation instructions.

END OF SECTION

SECTION 328423

UNDERGROUND SPRINKLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install planting irrigation system as described in Contract Documents complete with accessories necessary for proper function.

B. Related Requirements:

Related Sections include the following:
   1. 32 8423 Underground Sprinklers
   2. 32 9001 Common Planting
   3. 32 9113 Soil Preparation
   4. 32 9120 Topsoil Placement & Grading
   5. 32 9223 Sodding
   6. 32 9300 Plants

1.2 REFERENCES

A. Definitions:
   1. Dielectric Fittings: Special type of fitting used between dissimilar metals to prevent galvanic action from causing corrosion failure.
   2. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
   3. Non-Pressure Lateral Line: Downstream from electric control valves to pop-up spray heads and drip valve assemblies to emitters. Piping or tubing is under pressure during flow. In areas where potable or secondary water are used, pressure supply line shall be white. In areas where non-potable or reclaimed water are used, pressure supply line shall be purple.
   4. Peak Flow: Maximum required flow for given month based on six (6) day week, nine (9) hour day watering window to be used for irrigation system design and to be used in hydraulic analysis.
   5. Point of Connection: Location where new irrigation joins with existing irrigation system.
   6. Pressure Supply Line: Downstream from point of connection to electric control valves. Piping is under water-distribution-system pressure when activated by master valve or hydrometer. In areas where potable or secondary water are used, pressure supply line shall be white. In areas where non-potable or reclaimed water are used, pressure supply line shall be purple.
   7. Static Water Pressure: Pressure at point of connection when system is not operable.
   8. Working Pressure: Pressure at point of connection when system is operable.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Provide Coordination for required tests and inspections as described under Field Quality Control in Part 3 EXECUTION for the following:
      a. Manufacturer's Field Service: Provide necessary manufacturer's field service.
      b. Pressure Test: In the presence of Landscape Architect provide a pressure test.
      c. Walk Through for Substantial Completion: In the presence of Landscape Architect, plan and provide walk through for Substantial Completion after Contractor has completed all Work.
      d. Final Walk Through: In the presence of the Landscape Architect, plan and provide final walk through after Contractor has completed all work listed on substantial completion walk through punch list provided by Landscape Architect.

B. Pre-Installation Conference:
   1. Schedule pre-installation conference before irrigation system installation begins.
   2. Review the following as specific agenda items during the pre-installation conference:
      a. Landscape architect or designated landscape consultant shall demonstrate or describe method to be used to maintain head spacing from concrete and to stabilize heads.
      b. Within the field yard, provide one installed example of each type of irrigation detail for review and approval by the Landscape Architect and owner prior to beginning work in the field.

C. Sequencing:
   1. Install sleeves before installation of cast-in-place concrete site elements and paving.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Manufacturer's cut sheets for each element of system.
      b. Parts list for operating elements of system.

B. Informational Submittals:
   1. Certificates:
      a. Acceptance certificate of irrigation system.
         1) Upon acceptance of irrigation system, reviewer will provide signed acceptance certificate.
         2) Certificate will include name and signature of reviewer, reviewer's company, date of review, and reviewer's telephone number.
   2. Test And Evaluation Reports:
      a. Results of mainline service pressure test before beginning work on system should be submitted as a report following the testing and before burial of the mainline.
      b. Provide the following from Main Line Irrigation test and observation:
         1) Record and submit documentation of Irrigation Main Line tests, issues, and measure taking to correct problems.
   3. Manufacturer Instructions:
      a. Manufacturer's printed literature on operation and maintenance of operating elements of system.

b. Instruction Manual:
    1) Includes complete directions for system operation and maintenance, including winterizing, controller program worksheet and annual service and scheduling calendar based on local site specific conditions.

4. Qualification Submittals:
    a. Irrigation Installer:
        1) Provide documentation of the following:
            a) Firm experience in irrigation projects (minimum of five years)
            b) Financial stability.
            c) Comply with specifications and contract documents.

C. Closeout Submittals:
1. Substantial Completion Walkthrough:
    a. Punch List items complete
    b. 2 copies of irrigation as-built drawings
    c. Operations And Maintenance Data – one copy of each to be provided to Owner:
        1) Instruction Manual.
        2) Manufacturer's printed literature.
        3) Manufacturer's cut sheets for each element of system.
        4) Manufacturer's parts list.
        5) Main Line Irrigation observation report.
        6) Freezing prevention instructions.
        7) Controller Program Schedule

    d. Record Documentation:
        1) Certificates:
            a) Acceptance certificate of irrigation system.
        2) Testing and Inspection Reports:
            a) Mainline Pressure Test.
            b) Main Line Irrigation test and observation.
        3) Record drawings: As installation occurs, prepare accurate record drawing to be submitted before final inspection, including:
            a) Detail and dimension changes made during construction.
            b) Significant details and dimensions not shown in original Contract Documents.
            c) Field dimensioned locations of valve boxes, manual drains, quick-coupler valves, control wire runs not in mainline ditch, soil moisture sensors (if soil moisture sensor technology is selected for the site) and both ends of sleeves.
            d) Take dimensions from permanent constructed surfaces or edges located at or above finish grade.
            e) Take and record dimensions at time of installation.
            f) Reduced copy of record drawings to 11 by 17 inches (275 by 425 mm), with color key circuits and laminated both sides with 5 mil thick or heavier plastic. Mount on 12 x 18 inch (300 by 450 mm) hard board drilled with (2) two 1/2 inch (13 mm) holes at top of board and hang on hooks in Custodial Room or location designated by Owner's Representative.
            g) Two (2) additional reduced copies of record drawings to 11 by 17 inches (275 by 425 mm), with color key circuits, unlamented, and unmounted to be given to Owner's Representative.

2. Final payment for system will not be authorized until Closeout Submittals are received and accepted by Landscape Architect and Owner.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Work and materials shall be in accordance with latest rules and regulations, and other applicable state or local laws.
   2. Nothing in Contract Documents is to be construed to permit work not conforming to these codes.

B. Qualifications:
   1. Installer Qualifications:
      a. General:
         1) Perform installation under direction of foreman or supervisor with five (5) years minimum experience in sprinkling system installations.

C. Mockups:
   1. Provide Mock-Ups of each detail within a valve box at the staging area for review by Landscape Architect prior to installation of the irrigation system.
   2. These mock-ups may be installed without solvent weld cement so that they can later be used in the field.
   3. Mock-ups shall include a complete installation included gravel sump, equipment assembly, valve box placement and branding in conformance with these specifications.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage And Handling Requirements:
   1. Storage and handling during installation, protect materials from damage and prolonged exposure to sunlight.

1.7 WARRANTY

A. Manufacturer Warranty:
   1. Standard one year guarantee shall include:
      a. Filling and repairing depressions and replacing plantings due to settlement of irrigation system trenches.
      b. Adjusting system to supply proper coverage of areas to receive water.
      c. Ensuring system can be adequately drained.
   2. Automatic SMART Controller:
      a. Provide Manufacturer's extended warranty for five (5) years to be free of design, materials and workmanship defects.

PART 2 - PRODUCTS

2.1 SYSTEM

A. Manufacturers:
1. Manufacturer Contact List (for reference only):
a. 3M, Austin, TX www.3m.com/elpd.
b. Action Machining Inc, Bountiful, UT www.actionfilters.com.
c. Carson Industries LLC, Glendora, CA www.carsonind.com.
d. King Innovation, St Charles, MO www.kinginovation.com.
e. Netafim, Inc. www.netafimusa.com.
f. Nibco Inc., Elkhart, IN www.nibco.com.
g. Rain Bird Sprinkler Manufacturing Corp, Glendora, CA www.rainbird.com.
h. Weathermatic Irrigation Products, Garland, TX www.weathermatic.com.

B. Distributors:
1. Category Four Approved Distributors.
2. Hydro Point Data Systems, Inc. (makers of Weather TRAK) Petaluma, CA www.hydropoint.com.
a. Preferred Distributor:
1) Utah:
a) Sprinkler Supply - West Jordan, UT, Contact: Joe Jackson (801) 404-1371 (801) 566-8172 joe@sprinklersupplyco.com.

C. Materials:
1. Rock-Free Soil:
a. Backfill soil around PVC pipe.
b. Soil having rocks no larger than 1/2 inch (13 mm) in any dimension.
2. Pea Gravel:
a. For use around drains, valves, and quick couplers.
b. 1/2 inch (13 mm) maximum dimension, washed rock.
3. Sand: Fine granular material naturally produced by rock disintegration and free from organic material, mica, loam, clay, and other deleterious substances.
4. Native Material: Soil native to project site free of wood and other deleterious materials and rocks over 1-1/2 inches (38 mm).
5. Topsoil: Remove rocks, roots, sticks, clods, debris, and other foreign matter over 1-1/2 inches (38 mm) longest dimension encountered during trenching.
6. Pipe, Pipe Fittings, And Connections:
a. Pipe shall be continuously and permanently marked with Manufacturer's name, size, schedule, type, and working pressure.
b. Pipe sizes shown on Drawings are minimum. Larger sizes may be substituted if at no additional cost to Owner.
c. Northern Climate Zone Pipe:
1) Pressure Lines: Schedule 40 PVC or SIDR 15 HDPE 3408 100 lb Polyethelene
2) Lateral Lines: Schedule 40 PVC.
3) Quick Coupler Piping: Galvanized steel.
d. Fittings: Insert fittings with clamps (double clamp @ valves).
e. Sleeves:
1) Under Parking Area and Driveway Paving: Class 200 PVC Pipe.
2) All Other: Class 200 PVC Pipe.

3) Sleeve diameter shall be two times larger than pipe installed in sleeve.

7. Sprinkler Heads:
   a. Each type of head shall be product of single manufacturer.
   b. Shrub Head Bubblers:
      1) Category Four Approved Products.
         a) Rainbird
   c. Spray Heads in Shrub and Ground Cover Areas:
      1) Category Four Approved Products.
         a) Rainbird 1800 – PRS pop up with match precipitation rate nozzles
         b) Pop-up height shall be 6” or greater in shrub beds
         c) Design for 30 psi at each head
   d. Spray Heads in Lawn Areas:
      1) Category Four Approved Products.
         a) Rainbird 1800 – PRS pop up with match precipitation rate nozzles
         b) Pop-up height shall be 4” or greater in turf areas
         c) Design for 30 psi at each head
8. Sprinkler Risers:
   a. All stationary spray heads shall have Rain Bird model SA125050; Blu-lock model BLJ-050-SS-12 pre-manufactured swing assemblies or equal as approved by Landscape Architect before installation. Swing assembly shall be 1/2" x 1/2" x 12" (13 mm x 13 mm x 300 mm) NPT/Bullock.
   b. Pop-up rotor sprinkler heads shall have adjustable riser assembly, three ell swing joint assembly, unless detailed otherwise on Drawings. These swing joint fittings shall be of schedule 40 PVC plastic and nipples schedule 80 gray PVC unless otherwise designated on Drawings. Horizontal nipple parallel to side of lateral line shall be 8 inches (200 mm) long minimum. All other nipples on swing joint riser shall be of length required for proper installation of sprinkler heads.
   c. Pop-up sprinkler heads, shrub spray heads, bubbler heads, and stationary spray sprinkler heads shall have risers made up one of the following ways:
      1) Three schedule 40 street ells or Marlex street ells connected to lateral tee to form an adjustable riser or pop-up riser as detailed.
      2) Risers for sprinkler heads 14 inches (355 mm) long minimum and 24 inches (610 mm) maximum.
9. Automatic Irrigation Control Wiring And Controller:
   a. Control wire shall be UF-UL listed, color coded PE insulated copper conductor direct burial size 14. Wire runs to turf and shrub areas shall be different colors.
   b. Turf area hot wires shall be red in color with one (1) spare each, hot & ground wire, run to the most distant valve. Use 18 ga. Multi-strand irrigation wire with enough wires for 2 spares to farthest valve.
   c. Shrub area hot wires shall be green in color with one (1) spare each, hot & ground wire, run to the most distant valve. Use 18 ga. Multi-strand irrigation wire with enough wires for 2 spares to farthest valve.
   d. Ground wires shall be white in color with blue spare.
   e. All wire connections shall be soldered and be sealed water tight.
   f. All connection shall be located in valve boxes with 18” coil for each wire.
10. Valves:
   a. Manual Drain Valves:
      1) Approved Products.
         a) Mueller Orseal – ¾” Standard
         b) Provide 2” class 200 PVC sleeve to valve and cap with 6” round valve box.

b. Automatic Valves:
    1) Approved Products.
        a) Rainbird: PESB-(PRS-D if required)
        b) Size range from 1" to 2" as required
        c) Install two valves per jumbo box if 1" in size
        d) Install one valve per jumbo box if 1.5" or greater in size
c. Isolation Valves:
    1) Nibco T-113 non-rising stem gate valve, size to match pipe size
    2) Class Two Quality Standards.
        a) Rainbird: BV Series.
        b) Salco
d. Backflow Preventer: (NOT APPLICABLE)
e. Secondary Water Filter: (NOT APPLICABLE)
f. Valve Boxes And Extensions:
        a) Lid Colors:
            (1) Green: Lawn areas (potable and secondary water).
            (2) Brown: Bare soil and rock areas (potable and secondary water).
            (3) Purple: Reclaimed water.
        b) Valve Box:
            (1) Model 1730 Valve Box by Carson Industries.
g. Hydrometer:
    1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
        a) Netafim:
            (1) Acclima: LHM15TG1-MEL, LHM2TG1-MEL.
h. Pressure Reducing Valve: Make and model shown on Drawings or as required by local code and approved by Owner.
i. Quick Coupling Valves and Keys:
    1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
        a) Rainbird: 5-NP

11. Valve Accessories:
    a. Valve manifolds:
        1) Type Two Acceptable Products.
            a) Action: 1800 Series, Models 18001, and 18002, 1, 1-1/2, and 2 inch (25, 38, and 50 mm) sizes.
            b) Hydro-Rain: HRM Series.
            c) Rainbird: MS Series.
            d) Equals as approved by Landscape Architect before use.
    b. Valve Boxes And Extensions:
        1) Lid Colors:
            a) Green: Lawn areas (potable and secondary water).
            b) Brown: Bare soil and rock areas (potable and secondary water).
            c) Purple: Reclaimed water.
        2) Type Two Acceptable Products:
            a) Rainbird: VB-STD, VB-JMB, VB-STDT or VB-JMT Series, VB-STDP or VB-JMBP Series, VB-MAX series.
            b) Orbit: 53983, 53993, 53753, 53985, 53755, 53995 (with extension boxes).
            c) Carson Industries: Model 1419-12, Model 1419-18, Model 1730-18 Jumbo.
            d) Equal as approved by Landscape Architect before use.

c. Valve ID tags:
1) Type Two Acceptable Products:
a) Rainbird: VID1Y24, VID24Y48, VID1P24, VID24P48.
b) Equal as approved by Landscape Architect before use.
c) Valve Box Supports: Standard size fired clay paving bricks without holes or compacted gravel base.

12. Drip System: (NOT APPLICABLE)
13. Irrigation Controller
a. Accetable Products:
1) 24 Station Weather TRAK PRO-3 (WT-WTPRO3-C-24-CWM)
a) Weather TRAK 10 YR additional Central Service (WT-C1M010YA)
b) 5yr Additional Hardware Warranty (WT-WAR-10Y)
c) Onsite Consultation (WT-SITECONSULT)
14. Other Components:
a. Recommended by Manufacturer and subject to Landscape Architect's review and acceptance before installation.
b. Provide components necessary to complete system and make operational.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Approved irrigation system installers shall be pre-approved by Owner.

3.2 EXAMINATION

A. Verification Of Conditions:
1. Identify main line tie in locations.
2. Locate and route existing zones as necessary for continued operation during and post construction.
3. Coordinate with USU LOAM for final zone configuration – controller location, etc.

3.3 PREPARATION

A. Protection:
1. Protection Of In-Place Conditions:
a. Repair or replace work damaged during course of the Work at no additional cost to Owner. If damaged work is new, installer of original work shall perform repair or replacement.
b. Do not cut existing tree roots measuring over 2 inches (50 mm) in diameter in order to install irrigation lines.

B. Surface Preparation:
1. Layout of Irrigation Heads:
a. Location of heads and piping shown on Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.

b. During layout, consult with Landscape Architect to verify proper placement and make recommendations, where revisions are advisable.
c. Minor adjustments in system layout will be permitted to avoid existing fixed obstructions.
d. Make certain changes from Contract Documents are shown on record drawings.

3.4 INSTALLATION

A. Trenching And Backfilling:
1. Pulling of pipe is not permitted.
2. Excavate trenches to specified depth. Remove rocks larger than 1-1/2 inch (38 mm) in any direction from bottom of trench. Separate out rocks larger than 1-1/2 inch (38 mm) in any direction uncovered in trenching operation from excavated material and remove from areas to receive landscaping.
3. Cover pipe both top and sides with 2 inches (50 mm) of rock-free soil as specified under PART 2 PRODUCTS. Remainder of backfill to within 5 inches (125 mm) of finish grade shall be as specified in Section 31 2323. Top 5 inches (125 mm) of backfill shall be topsoil as specified in Section 32 9113.
4. Do not cover pressure main, irrigation pipe, or fittings until Landscape Architect has inspected and approved system.

B. Sleeving:
1. Sleeve water lines and control wires under walks and paving. Extend sleeves 6 inches (150 mm) minimum beyond walk or pavement edge. Cover sleeve ends until pipes and wires are installed to keep sleeve clean and free of dirt and debris.
2. Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.

C. Grades And Draining:
1. In localities where winterization is required, grade piping so system can be completely drained or blown out with compressed air. If system is not designed to be blown out with compressed air:
   a. Slope pipe to drain to control valve box where possible.
   b. Where this is not possible, slope pipe to a minimum number of low points. At these low points, install:
      1) 3/4 inch (19 mm) brass ball valve for manual drain. Do not use automatic drain valves.
      2) Install 2 inch (50 mm) Class 200 PVC pipe over top of drain and cut at finish grade.
      3) Provide rubber valve cap marker.
      4) Provide one cu ft (0.03 cu m) pea gravel sump at outlet of each drain.
   c. Slope pipes under parking areas or driveways to drain outside these areas.
   d. Provide and install quick-coupling valve or valves in location for easy blowout of entire system. Install quick coupler valves with 4 lineal feet (1.20 m) minimum of Schedule 80 PVC pipe between valve and main line.

D. Installation of Pipe:
1. Install pipe in manner to provide for expansion and contraction as recommended by Manufacturer.

2. Unless otherwise indicated on Drawings, install main lines and lateral lines connecting pop-up rotor and impact sprinklers with minimum cover of 18 inches (450 mm) based on finished grade. Install remaining lateral lines, including those connecting drip tubing, with minimum of 12 inches (300 mm) of cover based on finish grade.
3. Main line and lateral line piping may not be placed in the same trench. See Drawings.
4. Install pipe and wires under driveways or parking areas in specified sleeves 18 inches (450 mm) below finish grade or as shown on Drawings.
5. Locate no sprinkler head closer than 12 inches (300 mm) from building foundation. Heads immediately adjacent to mow strips, walks, or curbs shall be one inch (25 mm) below top of mow strip, walk, or curb and have 3 inches 75 mm clearance between head and mow strip, walk, or curb.
6. Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.
7. Make solvent weld joints as follows:
    a. Do not make solvent weld joints if ambient temperature is below 35 deg F (2 deg C).
    b. Clean mating pipe and fitting with clean, dry cloth and apply one coat of P-70 primer to each.
    c. Apply uniform coat of 711 solvent to outside of pipe.
    d. Apply solvent to fitting in similar manner.
    e. Give pipe or fitting a quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
    f. Allow joints to set at least 24 hours before applying pressure to PVC pipe.
8. Tape threaded connections with Teflon tape.
9. If pipe is larger than 3 inches (75 mm), install concrete thrust blocks wherever change of direction occurs on PVC main pressure lines.

E. Control Valves And Controller:
1. Install valves in plastic boxes with reinforced heavy duty plastic covers. Locate valve boxes within 12 inches (300 mm) of sidewalks and shrub bed edges with tops at finish grade. Do not install more than two valves in single box.
2. Place 3 inches (75 mm) minimum of pea gravel below bricks supporting valve boxes to drain box. Set valve boxes over valve so all parts of valve can be reached for service. Set cover of valve box even with finish grade. Valve box cavity shall be reasonably free from dirt and debris.
3. Wiring:
    a. Tape control wire to side of main line every 10 feet (3.050 m). Where control wire leaves main or lateral line, enclose it in gray conduit.
    b. Use waterproof wire connectors consisting of properly-sized wire nut and grease cap at splices and locate all splices within valve boxes.
    c. Use white or gray color for common wire and other colors for all other wire. Each common wire may serve only one controller.
    d. Run two spare control wires from panel continuously from valve to valve throughout system similar to common wire for use as a replacement if a wire fails. Spare wires shall be different colors than other wires, and included in multi-strand cable. Mark spare control wire in control box as an unconnected wire. Extend spare control wires 24 inches (600 mm) and leave coiled in each valve box.

F. Backflow Preventer: (NOT APPLICABLE)

G. Sprinkler Heads:
1. Set sprinkler heads and quick-coupling valves perpendicular to finish grade.

2. Do not install sprinklers using side inlets. Install using base inlets only.
3. Set sprinkler heads at a consistent distance from existing walks, curbs, and other paved areas and to grade by using specified components or other method demonstrated in Pre-Construction Conference.

H. Drip Assembly: (NOT APPLICABLE)

I. Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments.

3.5 FIELD QUALITY CONTROL

A. Field Tests:
1. Main Line:
a. Before backfilling main line, test pressure at 120 psi (~~690 kPA~~) minimum for two (2) hours minimum and make certain there are no leaks.
1) A report of the test results along with photographs of the testing process are to be provided by the landscape Architect or his authorized representative at completion of testing.
2) This report shall be included along with the acceptance certificate at the end of the project to the Owner.
3) Notify Landscape Architect two (2) working days minimum before conducting test.
b. Test report:
1) Report of test results along with photographs of testing process are to be provided by Landscape Architect or his authorized representative at completion of testing.
2) This report shall be included in Operations and Maintenance Manual along with acceptance certificate at end of Project.
c. Notify Landscape Architect two (2) working days minimum before conducting test.

B. Field Inspections:
1. Landscape Architect's irrigation design consultant, or certified water auditor recommended by consultant and approved in writing by Landscape Architect, will review irrigation system before substantial completion.
2. Installations completed after water source has been turned off for season, as determined by Landscape Architect, will be accepted following spring, after system can be checked for proper operation.
3. Upon acceptance of irrigation system, reviewer will provide signed acceptance certificate.

C. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Automatic SMART Controller:
a. Correct or replace any work found defective or not complying with contract document requirements at no additional cost to the Owner.

3.6 ADJUSTING

A. Adjust sprinkler heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering and raising of sprinkler heads shall be part of original contract with no additional cost to Owner.

B. Adjust sprinkler heads for proper distribution and trim so spray does not fall on building.

C. Adjust watering time of valves to provide proper amounts of water to plants.

3.7 MAINTENANCE

A. Contractor shall assist USU personnel with first year winterization of system and with second year start up of the system.

END OF SECTION

SECTION 329001

COMMON PLANTING REQUIREMENTS

PART 1 - GENERAL

SUMMARY

Includes But Not Limited To:

1. Common procedures and requirements for landscaping work.
2. Provide maintenance for new landscaping as described in Contract Documents.

Related Requirements: Related Sections include the following:

1. 32 8423 Underground Sprinklers
2. 32 9001 Common Planting
3. 32 9113 Soil Preparation
4. 32 9120 Topsoil Placement & Grading
5. 32 9223 Sodding
6. 32 9300 Plants

ADMINISTRATIVE REQUIREMENTS

Pre-Installation Conference:

1. Schedule pre-installation conference is required prior to starting planting.
2. Schedule planting pre-installation conference after completion of Fine Grading, but before beginning landscape work.
3. During the meeting specific agenda items shall be established to review the following:
   a. Establish responsibility for maintenance of new landscaping during all phases of construction period.
   b. Prepare two typical landscape planting excavations and conduct percolation test to verify that water drains away within two hours. Discuss results of percolation tests with Landscape Architect and Owner's representative.

SUBMITTALS

A. Closeout Submittals:
   1. Include following:
      a. Conduct Substantial Completion walkthrough with Landscape Architect & Owner:
         1) Landscape Architect to generate punch list of items to complete during substantial completion walkthrough.
         2) At completion of all punch list items, Contractor shall submit two copies of typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work and plantings.

QUALITY ASSURANCE

Qualifications:

2. Installer:
    a. Use trained personnel familiar with required planting procedures and with Contract Documents.
    b. Planting shall be performed under direction of foreman or supervisor with minimum five years' experience in landscape installations.

DELIVERY, STORAGE, AND HANDLING

Storage and Handling Requirements:

1. Deliver packaged materials in containers showing weight, analysis, and name of Manufacturer.
2. Deliver sod, plants, trees, and shrubs in healthy and vigorous condition.
3. Protect materials from deterioration during delivery.

Storage and Handling Requirements:

4. Store in location on site where they will not be endangered and where they can be adequately watered and kept in healthy and vigorous condition.
5. Protect materials from deterioration while stored at site.

PART 2 - PRODUCTS

PART 3 - EXECUTION

INSTALLERS

General Contractor to determine qualifications of landscape installer. It is recommended that any installer have a minimum of five (5) years' experience in landscape installation.

EXAMINATION

Verification of Conditions:

1. Inspect site and Contract Documents to become thoroughly acquainted with locations of irrigation, ground lighting, and utilities.
2. Repair damage to irrigation, ground lighting, and utilities and other items adjacent to landscaping caused by work of this Section or replace at no additional cost to Owner.

PREPARATION

Before proceeding with work, verify dimensions and quantities. Report variations between Drawings and site to Landscape Architect before proceeding with landscape work.

1. Plant totals are for convenience of Contractor only and are not guaranteed. Verify amounts shown on Drawings.
2. All planting indicated by symbols on Drawings is required unless indicated otherwise.

Protection:

1. Take care in performing landscaping work to avoid conditions that will create hazards. Post signs or barriers as required.
2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
3. Keep site well drained and landscape excavations dry.
4. Verify with Landscape Architect that the irrigation system is fully functional before beginning planting.

INSTALLATION

Interface with Other Work:

1. Do not plant trees and shrubs until major construction operations are completed. Do not commence landscaping work until work of Section 31 2216 and Section 32 8423 has been completed and approved.

Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

Hand excavate as required.

Maintain grade stakes until parties concerned mutually agree upon removal.

When conditions detrimental to plant growth are encountered, such as rubble fill or adverse drainage conditions, notify Landscape Architect before planting.

FIELD QUALITY CONTROL

Field Inspection:

1. Landscape Architect will inspect landscaping installation approximately two weeks before Substantial Completion.
2. Replace landscaping that is dead or appears dead as directed by Landscape Architect within 10 days of notification and before Substantial Completion.

CLEANING

Waste Management:

1. Immediately clean up soil or debris spilled onto pavement and dispose of deleterious materials.

CLOSEOUT ACTIVITIES

Instruction of Owner:

1. Replace damaged plantings at no additional cost to Owner.

PROTECTION

Protect planted areas against traffic or other use immediately after planting is completed by placing adequate warning signs and barricades.

Provide adequate protection of planted areas against trespassing, erosion, and damage of any kind. Remove this protection after Landscape Architect has accepted planted areas.

MAINTENANCE DURING CONSTRUCTION

General:

1. Plants shall be in at least as sound, healthy, vigorous, and in approved condition as when delivered to site, unless accepted by Landscape Architect in writing at final landscape inspection.
2. Maintain existing and newly installed landscaping from beginning to completion of landscape installation until 7 days after Substantial Completion Meeting or until all punch list items are complete, whichever is longer.
3. Areas sodded or seeded after November 1st will be accepted the following spring, approximately one month after start of growing season, May 1st or as determined by Landscape Architect, if specified conditions have been met.
4. Replace landscaping that is dead or appears unhealthy or non-vigorous as directed by Landscape Architect at the Substantial Completion Meeting. Make replacements within 10 days of notification.
5. Lawn that does not live and has to be replaced shall be guaranteed 30 days from date of installation or replacement.

Seeded Lawn:

1. N/A

Sodded Lawn:

1. Maintain sodded lawn areas until lawn complies with specified requirements and throughout landscape installation period.
2. Water sodded areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist 3 to 4 inches (75 to 100 mm) deep.
3. Cut grass first time when it reaches 3 inches (75 mm) high.

Trees, Shrubs, and Plants:

1. Maintain by pruning, cultivating, and weeding as required for healthy growth.
2. Restore planting basins.
3. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical positions as required.
4. Spray as required to keep trees and shrubs free of insects and disease.
5. Provide supplemental water by hand as needed in addition to water from sprinkling system.

END OF SECTION

SECTION 329113

SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform soil preparation work as described in Contract Documents.
   2. Furnish and apply soil additives as described in Contract Documents.

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM 1557-02, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.'

Related Sections include the following:
   1. 32 8423 Underground Sprinklers
   2. 32 9001 Common Planting
   3. 32 9113 Soil Preparation
   4. 32 9120 Topsoil Placement & Grading
   5. 32 9223 Sodding
   6. 32 9300 Plants

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Schedule pre-installation conference.
   2. Specific agenda items for pre-installation conference:
      a. Review on-site and import topsoil test results & recommendations
      b. Review soil amendments and fertilizer requirements.

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Product literature and chemical / nutrient analysis of soil amendments and fertilizers.
   2. Samples:
      a. Sample of soil conditioner for approval before delivery to site. Include product analysis list.

B. Informational Submittals:
   1. Installer Reports:
      a. Delivery slips indicating amount of soil conditioner delivered to Project site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Incorporate following soil amendments into topsoil used for Project. Do not apply additional fertilizer if GroPower Plus soil conditioner is used.
   1. Acceptable Soil Amendments, Soil Conditioners, and Application Rates. (Choose one):
      a. Soil Pep and Utelite Soil Conditioner:
         1) Lawn Areas
            a) Contractor to provide minimum depth of 12" amended soil consisting of 10% "Soil Pep", 10% Utelite Soil Conditioner and 80% excavated topsoil from site. 12" depth of soil shall take into account a compaction/soil settling factor of 15%.
         2) Planter Areas
            a) Contractor to provide minimum depth of 18" amended soil consisting of 20% "Soil Pep", 20% Utelite Soil Conditioner and 60% excavated topsoil from site. 18" depth of soil shall take into account a compaction/soil settling factor of 15%.
      b. Equals as approved by Landscape Architect before use.

   2. Acceptable Fertilizers And Application Rates:
      a. GroPower Plus soil conditioner by GroPower Inc., Chino, CA www.gropower.com. Apply as directed on package.
      b. Equal as approved by Landscape Architect before installation.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Add soil amendments recommended in topsoil test report at specified rates to lawn areas. Roto-till or otherwise mix amendments evenly into top 4 inches (100 mm) of topsoil. Incorporate and leach soil amendments which require leaching, such as gypsum, within such time limits that soil is sufficiently dry to allow proper application of fertilizer and soil conditioners.

END OF SECTION

SECTION 329120

TOPSOIL PLACEMENT AND GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Perform topsoil placement and grading work required to prepare site for installation of landscaping as described in Contract Documents.
   2. Furnish and apply soil additives as described in Contract Documents.

Related Sections include the following:
   1. 32 8423 Underground Sprinklers
   2. 32 9001 Common Planting
   3. 32 9113 Soil Preparation
   4. 32 9120 Topsoil Placement & Grading
   5. 32 9223 Sodding
   6. 32 9300 Plants

1.2 REFERENCES

A. Reference Standards:
   1. ASTM International:
      a. ASTM D1557-07, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).'

1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:
   1. Participate in pre-installation conference...

1.4 SUBMITTALS

A. Action Submittals:
   1. Product Data:
      a. Product literature and chemical / nutrient analysis of soil amendments and fertilizers.
   2. Samples:
      a. Sample of soil conditioner for approval before delivery to site. Include product analysis list.

B. Informational Submittals:
   1. Field Quality Control Submittals:

a. Submit tests on imported and site topsoil by licensed laboratory before use, submit results to Landscape Architect.
    1) Before use, topsoil shall meet minimum specified requirements and be approved by Landscape Architect.
    2) If necessary, submit proposed amendments and application rates necessary to bring topsoil up to minimum specified requirements.
b. Submit report stating location of source of imported topsoil and account of recent use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
1. Topsoil used in landscaped areas, whether imported or from site, shall be fertile, loose, friable soil meeting following criteria:
    a. Chemical Characteristics:
        1) Acidity / alkalinity range: pH 5.5 to 8.0.
        2) Soluble Salts: less than 3.0 mmhos/cm.
        3) Sodium Absorption Ratio (SAR): less than 6.0.
        4) Organic Matter: greater than one percent.
    b. Physical Characteristics:
        1) Gradation as defined by USDA triangle of physical characteristics as measured by hydrometer.
            a) Sand: 15 to 60 percent.
            b) Silt: 10 to 60 percent.
            c) Clay: 5 to 30 percent.
        2) Clean and free from toxic minerals and chemicals, noxious weeds, rocks larger than 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.
        3) Soil shall not contain more than 2 percent by volume of rocks measuring over 3/32 inch (2 mm) in largest size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
1. Contractor to conduct topsoil test of existing site topsoil by licensed laboratory. Contractor to provide testing results to Landscape Architect.

3.2 PREPARATION

A. Protection Of In-Place Conditions:
1. Protect utilities and site elements from damage.

B. Surface Preparation:

1. Disk, till, or aerate with approved agricultural aerator to depth of 6 inches (150 mm).
2. Seven days maximum before beginning seeding and planting:
    a. Loosen area 4 inches (100 mm) deep, dampen thoroughly, and cultivate to properly break up clods and lumps.
    b. Rake area to remove clods, rocks, weeds, roots, and debris.
    c. Grade and shape landscape area to bring surface to true uniform planes free from irregularities and to provide drainage and proper slope to catch basins.
3. Limit use of heavy equipment to areas no closer than 6 feet (1.80 m) from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer than 6 feet (1.80 m).

3.3 PERFORMANCE

A. Tolerances:
    1. Total topsoil depth of 12 inches (125 mm) minimum in lawn and groundcover planting areas.
    2. Total topsoil depth of 18 inches minimum in shrub and tree planting areas.
    3. Finish grade of planting areas before planting and after addition of soil additives shall be specified distances below top of adjacent pavement of any kind:
        a. Sodded Areas: 2 inches (50 mm) below.
        b. Ground Cover Areas: 2 inches (100 mm) below.

B. Do not expose or damage existing shrub or tree roots for all trees that are to remain.

C. Redistribute approved existing topsoil stored on site as a result of work of Section 31 1000.
    1. Remove organic material, rocks and clods greater than 1-1/2 inch (38 mm) in any dimension, and other objectionable materials.
    2. Provide additional approved imported topsoil required to bring surface to specified elevation relative to concrete site elements.
    3. Do not place topsoil whose moisture content makes it prone to compaction during placement process.

D. Slope grade away from building for 12 feet (3.60 m) minimum from walls at slope of 1/2 inch in 12 inches (13 mm in 300 mm) minimum unless otherwise noted.
    1. High point of finish grade at building foundations shall be 6 inches (150 mm) minimum below finish floor level.
    2. Direct surface drainage in manner indicated on Drawings by molding surface to facilitate natural run-off of water.
    3. Fill low spots and pockets with topsoil and grade to drain properly.

E. After landscape areas have been prepared, take no heavy objects over them except lawn rollers.

F. Immediately before planting lawn and with topsoil in semi-dry condition, roll areas that are to receive lawn in two directions at approximately right angles with water ballast roller weighing 100 to 300 lbs. (45 to 135 kg), depending on soil type.
    1. Rake or scarify and cut or fill irregularities that develop as required until area is true and uniform, free from lumps, depressions, and irregularities.

END OF SECTION

SECTION 329223

SODDING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install sodded lawn as described in Contract Documents.

B. Related Requirements:

   Related Sections include the following:
   1. 32 8423 Underground Sprinklers
   2. 32 9001 Common Planting
   3. 32 9113 Soil Preparation
   4. 32 9120 Topsoil Placement & Grading
   5. 32 9223 Sodding
   6. 32 9300 Plants

C. Definitions:
   1. Crop Coefficients and Hydro-Zones: Crop coefficients (Kc) are used with ETO to estimate specific plant evapotranspiration rates. The crop coefficient is a dimensionless number (between 0 and 1.2) that is multiplied by the ETO value to arrive at a plant ET (Etc.) estimate. Plants grouped by water needs, organized into one irrigation zone.
   2. Reference Evapotranspiration (ETO): The total water lost from the soil (evaporation) and from the plant surface (transpiration) over some period.

1.2 SUBMITTALS

A. Informational Submittals:
   1. Source Quality Control Submittals:
      a. Written certification confirming lawn seed quality and mix.

B. Closeout Submittals:
   1. Participate in Substantial Completion Walkthrough
   2. Complete Punch List items

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Harvest, deliver, store, and handle sod in accordance with requirements of Turf grass Producers International (TPI) (formally American Sod Producers Association) Specifications for Turf grass Sod Materials and Transplanting / Installing.

2. Schedule deliveries to coincide with topsoil operations and laying. Keep storage at job site to minimum without causing delays.
    a. Deliver, unload, and store sod on pallets within 24 hours of being lifted.
    b. Do not deliver small, irregular, or broken pieces of sod.

B. Storage And Handling Requirements:
1. Cut sod in pieces approximately 3/4 to one inch (19 to 25 mm) thick. Roll or fold sod so it may be lifted and handled without breaking or tearing and without loss of soil.
2. During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.
3. During dry weather, protect sod from drying before installation. Water as necessary to insure vitality and to prevent excess loss of soil in handling. Sod that dries out before installation will be rejected.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Description:
1. Superior sod grown from certified, high quality, seed of known origin or from plantings of certified grass seedlings or stolon's:
    a. Assure satisfactory genetic identity and purity.
    b. Assure over-all high quality and freedom from noxious weeds or an excessive amount of other crop and weedy plants at time of harvest.
2. Sod shall be composed of five (5) or more varieties minimum of bluegrass. Mix varieties shall consist of those with proven success in full sun, partial shade or full shade.
    a. Seed mix from sod farm shall be submitted for approval prior to purchase and delivery of sod.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interface With Other Work:
1. Do not commence work of this Section until work of Sections 32 9113 and 32 9300 has been completed and approved.

B. Tolerances:
1. Final grade of soil after sodding of lawn areas is complete shall be one inch below top of adjacent pavement of any kind.

C. Laying of Sod:
1. Lay sod during growing season and within 48 hours of being lifted.
2. Lay sod while top 6 inches (150 mm) of soil is damp, but not muddy. Sodding during freezing temperatures or over frozen soil is not acceptable.

3. Lay sod in rows perpendicular to slope with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.
4. Lay sod flush with adjoining existing sodded surfaces.
5. Do not sod slopes steeper than 3:1. Consult with Landscape Architect for alternate treatment.

D. After Laying of Sod Is Complete:
1. Roll horizontal surface areas in two directions perpendicular to each other.
2. Repair and re-roll areas with depressions, lumps, or other irregularities. Heavy rolling to correct irregularities in grade will not be permitted.
3. Water sodded areas immediately after laying sod to obtain moisture penetration through sod into top 6 inches (150 mm) of topsoil.

3.2 FIELD QUALITY CONTROL

A. Field Inspection:
1. Sodded areas will be accepted at Project closeout if:
a. Sodded areas are properly established.
b. Sod is free of bare and dead spots and is without weeds.
c. No surface soil is visible when grass has been cut to height of 2 inches (50 mm).
2. Sodded areas have been mowed a minimum of twice.

END OF SECTION

SECTION 329300

PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install landscaping plants as described in Contract Documents.

B. Related Requirements:

   Related Sections include the following:
   1. 32 8423 Underground Sprinklers
   2. 32 9001 Common Planting
   3. 32 9113 Soil Preparation
   4. 32 9120 Topsoil Placement & Grading
   5. 32 9223 Sodding
   6. 32 9300 Plants

C. Definitions:
   1. Reference Evapotranspiration (ETo): The total water lost from the soil (evaporation) and from the plant surface (transpiration) over some period.

D. Reference Standards:
   1. American Nursery & Landscape Association / American National Standards Institute:
      a. ANLA / ANSI Z60.1-2004, 'American Standard for Nursery Stock.'

1.2 SUBMITTALS

A. Action Submittals:
   1. Samples:
      a. Organic Top Dressing Mulch – Only fine ground bark mulch with no material size exceeding 3/8” and free of foreign matter.
      b. Top dressing mulch must be submitted to USU Facilities LOAM for approval before delivery to site.

B. Closeout Submittals:
   1. Include following:
      a. Operations And Maintenance Data:
         1) Installer Instructions:
            a) Provide written instructions covering maintenance requirements by Owner.
      b. Warranty Documentation:
         1) Include final, executed copy of warranty.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:
   1. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately.
   2. Do not prune before delivery, except as approved by Landscape Architect.
   3. Protect bark, branches, and root systems from sun scald, drying, whipping, and other handling and tying damage.
   4. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape.
   5. Provide protective covering during delivery.

B. Storage And Handling Requirements;
   1. Handle balled stock by root ball or container. Do not drop trees and shrubs during delivery.
   2. If planting is delayed more than six hours after delivery, set planting materials in shade and protect from weather and mechanical damage.
   3. Set balled stock on ground and cover ball with soil, saw dust, or other acceptable material approved by Landscape Architect. Do not place on pavement.
   4. Do not remove container-grown stock from containers before time of planting.
   5. Water root systems of trees and shrubs stored on site with fine spray. Water as often as necessary to maintain root systems in moist condition. Do not allow plant foliage to dry out.

1.4 WARRANTY

A. Special Warranty:
   1. Provide written warranties as follows:
      a. Guarantee shrubs, ground covers, and vines to live and remain in strong, vigorous, and healthy condition for one (1) year or one complete growing season, whichever is longer, after date landscape installation is accepted as complete.
      b. Guarantee trees to live and remain in strong, vigorous, and healthy condition for one (1) year or one complete growing season, whichever is longer, from date landscape installation is accepted as complete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plants:
   1. Conform to requirements of Plant List and Key on Drawings and to ANLA / ANSI Z60.1.
   2. Nomenclature:
      a. Plant names used in Plant List conform to 'Standardized Plant Names' by American Joint Committee on Horticultural Nomenclature except in cases not covered. In these instances, follow custom of nursery trade. Plants shall bear a tag showing the genus, species, and variety of at least 10 percent of each species delivered to site.
   3. Quality:

a. Plants shall be sound, healthy, and vigorous, free from plant disease, insect pests or their eggs, noxious weeds, and have healthy, normal root systems. Container stock shall be well established and free of excessive root-bound conditions.
b. Do not prune plants or top trees prior to delivery.
c. Plant materials shall be subject to approval by Landscape Architect as to size, health, quality, and character.
d. Bare root trees are not acceptable.
e. Provide plant materials from licensed nursery or grower.

4. Measurements:
   a. Measure height and spread of specimen plant materials with branches in their normal position as indicated on Drawings or Plant List.
   b. Measurement should be average of plant, not greatest diameter. For example, plant measuring 15 inches (375 mm) in widest direction and 9 inches (225 mm) in narrowest would be classified as 12 inch (300 mm) stock.
   c. Plants properly trimmed and transplanted should measure same in every direction.
   d. Measure caliper of trees 6 inches (150 mm) above surface of ground.
   e. Where caliper or other dimensions of plant materials are omitted from Plant List, plant materials shall be normal stock for type listed.
   f. Plant materials larger than those specified may be supplied, with prior written approval of Landscape Architect, and:
      1) If complying with Contract Document requirements in all other respects.
      2) If at no additional cost to Owner.
      3) If sizes of roots or balls are increased proportionately.
5. Shape and Form:
   a. Plant materials shall be symmetrical or typical for variety and species and conform to measurements specified in Plant List.
   b. Well grown material will generally have height equal to or greater than spread. However, spread shall not be less than 2/3's of height.

2.2 ACCESSORIES

A. Planting Mix:
   1. Mixture of three parts topsoil mix as specified in Section 32 9113 and one part well-rotted composted manure, or approved commercial mix.

B. Planting Tablets: (NOT APPLICABLE)

C. Tree Stakes:
   1. Type Two Acceptable Products:
      a. 2 inch (50 mm) diameter Lodgepole Pine.
      b. Equal as approved by Landscape Architect before installation.

D. Tree Staking Ties:
   1. Type Two Acceptable Products:
      a. 32 inch (800 mm) Cinch-Tie tree ties by V.I.T. Products Inc., Escondido, CA www.vitproducts.com.
      b. Flex strap Tree Ties by Aquarius Brands Inc., Ontario, CA www.aquariusbrands.com.
      c. Equal as approved by Landscape Architect before installation.

E. Tree Guys:
   1. Type Two Acceptable Products:
      a. Duckbill Model 68DTS guying kit.
      b. Equal as approved by Landscape Architect before installation.

F. Pre-Emergent Herbicide:
   1. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
      a. Chipco Dimension Granular by the Andersons Inc., Maumee, IL www.andersonsinc.com.
      b. Elanco XL2G granular by Crop Data Management Systems, Marysville, CA www.cdms.net.
      c. Ronstar G granular by Bayer Crop Science, Monheim, Germany www.bayercropscience.com.
      d. Surflan AS liquid by United Phosphorous Inc., Trenton, NJ www.upi-usa.com.
      e. Oryzalin 4 A.S. liquid by Farm Saver, Seattle, WA www.farmsaver.com.

G. Weed Barrier: (NOT APPLICABLE)

H. Bark Or Wood Top Dressing Mulch:
   1. One Acceptable Product:
      a. Fine Bark Mulch 3/8”
      b. Soil Pep
      c. Equal as approved by Landscape Architect before installation.

I. Rock Mulch:
   1. Type Two Acceptable Products:
      a. 1.5” SOUTH TOWNE LANDSCAPE COBBLE – SOURCE: NEPHI SANDSTONE
         1) Size – ¾” min. to 2” max. multicolored round
      b. Equal as approved by Landscape Architect before installation.

J. Boulders:
   1. Type Two Acceptable Products:
      a. CHAMPLAIN BOULDERS – SOURCE: NEPHI SANDSTONE
         1) Small – no less than 2’ minimum dimension on any side
         2) Large – no less than 3’ minimum dimension on any side
      b. Equal as approved by Landscape Architect before installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Evaluation And Assessment:
   1. Before proceeding with work, check and verify dimensions and quantities. Report variations between Drawings and site to Landscape Architect before proceeding with work of this Section.
   2. Plant totals are for convenience only and are not guaranteed. Verify amounts shown on Drawings. All planting indicated on Drawings is required unless indicated otherwise.

3.2 PREPARATION

A. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas. Secure Landscape Architect's acceptance before planting. Make minor adjustments as may be requested.

3.3 INSTALLATION

A. Interface With Other Work:
   1. Do not commence work of this Section until work of Sections 32 9113 and 32-8423 have been completed and approved.

B. Excavation:
   1. If underground construction work or obstructions are encountered in excavation of planting holes, Landscape Architect will select alternate locations.
   2. Plant Excavation Size:
      a. Diameter: Twice diameter of root ball or container minimum.
      b. Depth: Equal to container or rootball depth.
   3. Unless excavated material meets topsoil requirements as specified in Section 32 9113, remove from landscape areas and do not use for landscaping purposes.
   4. Roughen sides and bottoms of excavations.
   5. With approval of Landscape Architect, select five typical planting excavations throughout site for drainage testing.
      a. Fill selected excavations with water and verify that water drains away at rate of 3 inches (75 mm) per hour minimum. Inform Landscape Architect in writing of excavations where water does not drain properly.
      b. Select three excavations approximately 5 feet (1 500 mm) away from each non-draining excavation and repeat tests. Continue testing process until non-draining areas have been identified.
      c. In excavations located in identified non-draining areas, auger 6 inch (150 mm) diameter hole 4 feet (1 200 mm) deep in low point of each excavation and fill with tamped planting mix.
      d. Do not plant trees or shrubs in holes that do not properly drain.

C. Planting:
   1. Removing Binders And Containers:
      a. All of the wire basket and burlap shall be removed after the plant is placed in the excavation.
      b. Remove plastic and twine binders from around root ball and tree trunk.
      c. Remove wood boxes from around root ball. Remove box bottoms before positioning plant in hole. After plant is partially planted, remove remainder of box without injuring root ball.
   2. Plant immediately after removing binding material and containers. Place tree and shrub rootballs on undisturbed soil. After watering and settling, top of tree root balls shall be approximately two inches (50 mm) higher than finished grade and trunk flare is visible. Shrub root balls shall be approximately one inch (25 mm) higher than finished grade
   3. Properly cut off broken or frayed roots.
   4. Center plant in hole, remove remaining wire basket, and backfill with specified planting mix. Except in heavy clay soils, make ring of mounded soil around hole perimeter to form watering basin.

5. Add planting tablets in plant pit as follows. Place tablets in relation to root ball as recommended by Manufacturer.
    a. One Gallon (4.5 L) Shrub: 1 tablet.
    b. 5 Gallon (23 L) Shrub / Tree: 3 tablets.
    c. 15 Gallon (68 L) Tree: 4 tablets.
    d. 24 inch600 mm) Box Tree: 6 Tablets.
6. Fill landscape excavations tamped planting mix. Settle by firming and watering to ensure top of ball one inch higher than surrounding soil.
7. Do not use muddy soil for backfilling.
8. Make adjustments in positions of plants as directed by Landscape Architect.
9. Thoroughly water trees and shrubs immediately after planting.
10. At base of each tree, leave 36 inch (900 mm) diameter circle free of any grass.

D. Supports for New Trees:
1. Provide new supports for trees noted on Drawings to be staked and/or approved by the Landscape Architect.
    a. Remove nursery stakes delivered with and attached to trees.
    b. Support shall consist of at least two tree stakes driven into hole base before backfill so roots are not damaged. Place stakes vertically and run parallel to tree trunk. Install stakes so 3 feet (900 mm) of stake length is below finish grade.
    c. Place tree ties 6 to 12 inches (150 to 300 mm) below crotch of main tree canopy. Second set of tree ties may be required 18 to 24 inches (450 to 600 mm) above finish grade, if directed by Landscape Architect.
    d. Remove tops of tree stakes so top of stake is 6 inches (150 mm) below main tree canopy to prevent damage to tree branches and canopy growth.
2. Provide root guying kits to support 24 inch (600 mm) box, 3 inch (75 mm) caliper and larger trees.
3. Equal as approved by Owner – shop drawing and product submittal required

E. Vines:
1. Remove from stakes, untie, and securely fasten to wall or fence next to which they are planted.

F. Ground Covers:
1. Container-grown unless otherwise specified on Drawings. Space evenly to produce a uniform effect, staggered in rows and intervals shown.

G. Post Planting Weed Control:
1. Apply specified pre-emergent herbicide to shrub and ground cover planting areas and grass-free areas at tree bases after completion of planting.
2. Areas shall be free of existing weed growth before application of herbicide.

H. Weed Barrier Fabric: (NOT APPLICABLE)

I. Mulching:
1. After application of herbicide, mulch shrub and ground cover planting areas with 1-2 inches (75 mm) deep layer of specified top dressing.
2. Cover grass-free area at tree bases with weed barrier and 1-2 inches (75 mm) of top dressing mulch.
3. In areas where rock mulch is specified – 3” minimum depth of mulch is required
4. Place mulch to uniform depth and rake to neat finished appearance.

END OF SECTION