



DIVISION ONE SPECIFICATIONS

OCTOBER 2021

Version 0

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SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Project information.
 - 2. Work covered by the Contract Documents.
 - 3. Phased construction.
 - 4. Work by Owner.
 - 5. Work under separate contracts.
 - 6. Future work.
 - 7. Purchase contracts.
 - 8. Owner-furnished products.
 - 9. Contractor-furnished, Owner-installed products.
 - 10. Access to site.
 - 11. Coordination with occupants.
 - 12. Work restrictions.
 - 13. Specification and drawing conventions.
 - 14. Miscellaneous provisions.

1.2 PROJECT INFORMATION

- A. Project Identification:
 - 1. Project Location: California Institute of Technology locations.
- B. Owner: California Institute of Technology (CIT).
 - 1. Owner's Representative: Caltech Project Manager.
 - 2. The terms "Owner " and "CIT" are synonymous.
- C. Architect: Design Team
 - 1. Architect: Design Team. Design Team may be under contract with Design Builder, for Architectural services as defined under California license regulations and laws. Where used, "Architect" includes Architect of Record (AOR) and Engineer (s) of Record (EOR)
 - 2. Design Team engaged directly by Caltech or Design-Builder has been engaged for this Project to provide architectural and engineering services and to serve as Project's constructor. The terms "Design-Builder" and "Contractor" are synonymous.
 - 3. Trade Partner: First Tier subcontractor under contract to the Design-Builder.
 - 4. Trade Partner Design Professional: Design Professional registered in the State in which the Project is located and engaged by Contractors Trade Partner, subcontractor, or supplier to provide drawings, computations, and specifications, including Delegated Design components and systems.
- D. Project Web Site: Unless otherwise directed by CIT, a project management software platform administered by Contractor will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination." for requirements for establishing, administering, and using the Project Management Software platform.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work is defined by each projects contract documents.
- B. Type of Contract:
 1. As established by each project.

1.4 PHASED CONSTRUCTION

- A. The Work may be conducted in phases as indicated on Contract Drawings Phasing Plan.
- B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement, and completion dates, and for all phases of the Work.

1.5 PROCEDURES INVOLVING OWNERS' PROPERTY INSURANCE PROVIDER

- A. General: Cooperate fully with Owner and Owners FM Global insurance provider regarding the Work.
- B. FM Global Requirements:
 1. Construction shall meet FM Global requirements as defined by applicable FM Global Data Sheets, including exterior envelope, fire resistance, and fire protection systems.
 2. Coordinate with Owner for preconstruction meetings, submittal review and site inspection requirements as established by FM Engineer.
 3. FM Engineer review and approval of applicable submittals is required. Review process and duration periods shall be included in the project submittal schedule.
 4. Comply with FM Global checklist as referenced in Caltech Design Guidelines.

1.6 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.

1.7 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.

1.8 OWNER-FURNISHED PRODUCTS

- A. Owner-Furnished Contractor-Installed (O.F.C.I.): The Work includes providing administrative services, structural support systems to receive Owner's equipment and all building system connections within Contractor's scope.

1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
 2. Owner will arrange for delivery of Owner-furnished items in coordination with Contractor's Construction Schedule.
 3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
 4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement. Based on inspection with Owner, Contractor shall notify Owner with 48 hours of missing items or damage affecting proper installation or connection of equipment.
 5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
 6. Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
 7. Design Team and Owners designated representative shall review Shop Drawings, Product Data, and Samples and return them to Contractor noting discrepancies or anticipated problems in use of product.
 8. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site or other location as directed by CIT.
 9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
 10. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
 11. Contractor shall install and otherwise incorporate Owner-furnished items identified into the project at no additional cost to the Owner.
- B. Owner-Furnished Owner-Installed (O.F.O.I.) Products: The Owner is responsible for such products, including delivery, handling, inspection, and installation. The Owner and Contractor(s) will coordinate product roughing requirements to assure proper services and support facilities are provided under the Work of the Contract.

1.9 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations, including use of Project site, 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.
1. Driveways, Walkways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises and adjacent buildings clear and available to Owner, Owner's employees, students, and emergency vehicles at all times. Do not use these areas for parking or 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.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight and clean condition throughout construction period. Repair damage caused by construction operations.
- C. 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 and return to original condition.

- D. Do not load structure(s) with weight that will endanger structure.
- E. Contractor is responsible for protection and safe keeping of all materials, products, and equipment stored on the premises or incorporated into the Work until complete and acceptable to the Owner.
- F. Contractor will move any stored materials, products, or equipment that interferes with the operations of Owner or others.
- G. Special Owner Requirements:
 - 1. Construction employees shall not use any facilities within existing buildings unless they are instructed to do so as part of construction or alteration work or unless otherwise indicated within the Contract Documents. This includes but is not limited to such areas as rest rooms, cafeteria, and waiting areas.
 - 2. Service of electrical power, light, heat, water, gas, steam, compressed air, oxygen, suction, telephone, etc., must be maintained, except temporary shutdowns may be made after arrangements have been made with the Owner. Note that some temporary service shutdowns may require scheduling of work outside of normal working hours, but with Owners prior approval.
 - 3. All activities required on the site for completion of the work shall be accomplished within the Contract Limit Lines as indicated on the Drawings, except where extensive work is required within existing buildings, such as in floors above or below area of Work, for service connections, which are not shown as being within Contract Limit Lines.
 - 4. The Owner is not aware of existing hazardous materials. If during the performance of the Work suspected hazardous materials are encountered, notify Owner immediately. The Owner will negotiate a separate contract for the containment or removal of such materials.

1.10 COORDINATION WITH OCCUPANTS

- A. 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 partial occupancy shall not constitute acceptance of the Work.
 - 1. Contractor shall prepare a Certificate of Substantial Completion using AIA form as defined in Owner-Contractor Contract 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, HVAC 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.
 - 5. Contractor shall provide an Owner approved on-line warranty management system for Owner's use in filing warranty claims, including filing initial claim, status, and close-out.

1.11 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 during normal business working hours as permitted by City of Pasadena ordinance and approvals, Monday through Friday, except otherwise indicated.
 - 1. Weekend Hours: As permitted by City of Pasadena ordinance and approvals, except otherwise indicated.
 - 2. Early Morning Hours: No noise generating activities prior to 7:00 AM or as permitted by City of Pasadena ordinance and approvals, whichever is most restrictive.
 - 3. Hours for Core Drilling, pile driving, cut off saw work, and similar extraordinary noisy construction activities: No noise generating activities prior to 7:00 AM or as permitted by City of Pasadena ordinance and approvals, whichever is most restrictive.
 - 4. Contractor shall notify CIT 3 working days prior to any activity that generates noise or increases vehicular traffic.

- 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 arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner's Design and Construction Facilities Department not less than 5 working days in advance of proposed utility interruptions.
 - 2. Notify CIT Facilities Electrical Shop in advance of electrical shutdowns.
 - a. Provide not less than 7 days in advance of proposed minor electrical shutdowns, such as electrical panel work.
 - b. Provide not less than 14 days in advance of proposed complex electrical system shutdowns, such as buildings.
 - c. Provide shutdown/interruption on Request on Owners Form.
 - 3. Do not proceed with utility interruptions without Owner's written permission.
 - 4. Maintain a log of work, including preparation, work events, re-established service procedures, and final completion.

- 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 Owner not less than 5 working days in advance of proposed disruptive operations.
 - 2. Comply with City of Pasadena ordinance and approvals, except otherwise indicated.
 - 3. Obtain Owner's written permission before proceeding with disruptive operations.

- E. Nonsmoking Building: Comply with all provisions of City of Pasadena Municipal Ordinance and CIT regulating smoking on campus.
 - 1. Provide "No Smoking" signs, size, mounting and location as directed by Owner and in compliance with applicable regulations.

- F. Restricted Substances: Use of controlled substances on Project site is not permitted.

- G. Employee Identification:

1. Provide hard hats with name and means to display compliance with safety training requirements for all Contractor personnel. Require personnel to use specified hard hats at all times.
 2. Contractor shall require all sub-contractors, vendors and suppliers working on Project site to comply with specified hard hat criteria.
 3. Provide safety type vests.
- H. Facility Key Control
1. Card keys shall be issued to Contractor to access only the project site through the CIT Security Office. The Contractor shall go to the CIT Project Manager and make the request for card keys.
 2. The Contractor is solely responsible for obtaining access to all restricted areas, including access for warranty work following occupancy by Owner.
 3. Time required to obtain card keys will not be accepted as the basis for extension of contract time or claim for delay.
 4. Contractor shall be responsible for obtaining verification of the correct card key for a specific lock well in advance of need. Facilities Management staff will not unlock doors for Contractor, subcontractors or vendors.
 5. Contractor is responsible for the safekeeping of CSU access devices. Do not loan access devices to others or use access devices to enter areas that are not part of the Work.
 6. Immediately report lost or missing keys and access devices to CIT Security Office.
 7. Contractors and vendors may be financially responsible for replacement of lost or missing access devices.
 8. Contractors and vendors shall be financially responsible for the cost of changing locks due to the loss of access devices resulting in compromised security.
 9. Contractors shall return all card keys at the end of a project to the CIT Security Office. Delay may impact release of Final Payment.
 10. Contractor shall not prop any doors open at any time. Doors that need to be open for access, material loading, and delivery shall be manned at all times.
- I. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
1. Maintain list of approved screened personnel with Owner's representative.
 2. Contractor shall comply with Owner's project safety protocols, including provisions for Covid - 19 construction staff screening and operational procedures. Contractor is advised such safety protocols are not within Design Team's scope of work, and Design Team is not responsible for the Contractors implementation of, or adherence, to such protocols and procedures.
 - a. Provide site specific Covid 19 protocol for Owner review and approval prior to beginning work.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "Master Format" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available

- Section numbers are not used. Consult the Table of Contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. 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 01 1000**

SECTION 01 1119 – CAD & BIM DELIVERABLES

PART 1 - GENERAL

1.1 COMPUTER AIDED DESIGN (CAD) & BUILDING INFORMATION MODELING (BIM) DELIVERABLE STANDARD

- A. These guidelines will ensure that work produced for the Owner will integrate into existing Virtual Design Construction (VDC) files.
- B. At the start of the project, a CAD and BIM Deliverable coordination meeting will be held between Caltech PM, Space Management, and those producing CAD files to review these guidelines and identify any specific concerns. **This includes determination of BIM versus 2D requirements, room numbering process, and equipment asset tagging and inventory.** The expected authorized use of the BIM model and software versions should also be discussed.
- C. CAD files (building plans and base maps) are available for use from the Owner Disclaimer: All CAD files provided by the Owner are the “Best Available” at the time of transfer and are for information only. Field verify data as necessary prior to the commencement of any work to ensure accuracy. Floor plan access is intended only for the use by the individual or entity to which it is provided. Any dissemination, distribution, or copying is strictly prohibited without prior written consent from Caltech Facilities, Design and Construction.

1.2 ELECTRONIC DELIVERABLES

- A. 2D/3D CAD & BIM MODEL TRANSMISSION: When a large amount of files are to be submitted, use Caltech SharePoint project folder to upload and share files. Caltech PM will share link to SharePoint project folder. Files may not be compressed using ZIP format.
- B. PDF: Deliver all drawing sheets in Portable Document Format (.pdf). Submit one PDF file for each drawing sheet. The PDF document size is to be the same as the full size drawing sheet size. PDFs should be produced from the native program of origin wherever possible.
- C. EXCEL: A drawing index will be supplied in Microsoft Excel Format (.xls). The Excel document will contain separate columns with document attributes as follows: drawing title, revision date, sheet number and discipline. This document will contain all drawings in the “record” set.
- D. MEDIA: Caltech SharePoint project folder to upload and share files. Files may not be compressed using ZIP format.

1.3 PDF DELIVERABLES

- A. Deliver conformed set of as-built drawing files in Portable Document Format (.pdf). File titles should conform to AIA Page Naming Standards. Page titles should not include any blank spaces.
- B. 2D CAD DELIVERABLES FORMAT: Deliver conformed set of as built drawing files in Autodesk’s AutoCAD native drawing (.dwg) format. Caltech will accept drawings up to two versions older than the current release version of AutoCAD. Each sheet in the drawing set must be saved as an individual file. File titles should begin with the building number,

hyphen, building name, hyphen, floor number, hyphen, discipline, hyphen, followed by other distinguishing information. Drawing titles should not include any blank spaces.

- C. **SUPPORT FILES:** Deliver all CAD Support files necessary to recreate output that matches hard copy submittals. Support files include, but are not limited to, the following: External References (XRefs), Plot configurations (.ctb, .pc3), blocks, write blocks, images (logos), shapes (.shx) and fonts. Deliver files to the Owner free of any copyrighted or other material whose distribution is prohibited.
- D. **SUPPORT DOCUMENTATION:** Provide support documentation in PDF (.pdf) or Word (.doc) format. Support documentation includes, but is not limited to, the following: List of all layers, layer descriptions, an index matching each CAD file name to the corresponding drawing sheet, and any other special circumstances that warrant further clarification.
- E. **LAYERING:** Follow Caltech's standard AutoCAD Drawing Layer Information (attached) and AIA CAD Layer Guidelines (for anything not mentioned in the Caltech standards). The ability to isolate any set of similar entities must be maintained. Define all entities by layer and not by entity type (e.g. Color and Linetype will be defined as "ByLayer"). Save all drawing files in a 'plot ready state'.
- F. **EXTERNAL REFERENCE FILES (XRefs):** Each XRef file will have an insertion point of 0, 0, 0; Scale factor of 1; Rotation angle of 0; and reside on a separate layer within the dependent file. In addition, XRef files must be included with each submittal and be located in the same directory as the dependent file.
- G. **PAPER SPACE/MODEL SPACE-TABS & PLOTTING LAYOUTS:** Each sheet of the drawing set will have one corresponding DWG file. The geometry contained in a file will be in Model Space at full scale. Use Paper Space primarily for setting up the appropriate output size, appearance, border, and title block information. Model Space entities will not be dimensioned or labeled in Paper Space.
- H. **MAPPING:** Mapping files must align with Caltech campus map provided by Wayne Bottomley and Space Management.

1.4 BIM EXECUTION PLAN

- A. As part of their respective proposals/bid submittals, the architect and the general contract must submit a BIM Execution Plan (BEP) describing processes and procedures in place within their organizations used to coordinate and deliver the BIM's and associated data according to the most recent version of the Caltech Design Guidelines.

1.5 3D BIM/CAD DELIVERABLES

- A. **FORMAT:** Deliver all drawing files in Autodesk Revit (native. rvt) drawing formats. Caltech will accept drawings two versions older than the current release version of Autodesk Revit. This is in accordance with Autodesk's software retirement program. The version of Autodesk Revit, defined by the design team, used from the start of the project must remain a constant throughout the life of the project.
- B. Fully coordinated architectural, structural, civil and MEP 3D models of existing conditions with Schematic Design (30% set).
- C. Fully coordinated architectural, structural, civil and MEP 3D models in Revit at 100% CD by the Design Team.

- D. Fully coordinated as-built architectural, structural, civil and MEP 3D models in Revit at project close-out.
- E. All equipment schedules must be generated from the parameter embedded in the Revit model objects and tied into Asset Management naming conventions.
- F. SUPPORT FILES: Deliver all assets necessary to recreate output that matches hard copy submittals. Support files include, but are not limited to, the following: AutoCAD native drawing files (.dwg), Images (.jpg) and External Links. Deliver files to the Owner free of any copyrighted or other material whose distribution is prohibited.
- G. LEVEL OF DEVELOPMENT (LOD): Final model deliverables are to be LOD 400 for Mechanical, Electrical, Plumbing and Fire Alarm plans, per AIA Document G202 (r2021). All other model deliverables are to be LOD 300, per AIA Document G202 (r2021).

1.6 GENERAL FILE STANDARDS

- A. COMPONENTS: All models & component families must follow logical grouping and naming conventions.
- B. MODEL VIEWS: Model views must be sorted by floor, prefixed with the corresponding floor level and description, as to display and sort in logical order.
- C. SHEET VIEWS: All sheet views must be prefixed with the corresponding sheet number, logically ordered in a plot-ready state.

1.7 ROOM TAGS

- A. Design team is mandated to work with Caltech Design & Construction's Planning and Space Information Manager Wayne Bottomley to assign official Caltech room numbers. For projects where there are changes to existing room layouts, Design team must consult with Planning and Space Information for any reassignment of room numbers.
- B. Submit floor plans (CAD, pdf or hard copy) for numbering no later than the end of schematic design so the appropriate Caltech room numbers can be included on all design and construction documents.
- C. All room tags are to be correlated to most current Caltech Asset and Equipment Naming Standards: <https://facilitiesoperations.caltech.edu/assetmanagement/namingstandards>

1.8 EQUIPMENT TAGS

- A. All equipment tags are to be correlated to most current Caltech Asset and Equipment Naming Standards: <https://facilitiesoperations.caltech.edu/assetmanagement/namingstandards>

1.9 GENERAL DRAWING REQUIREMENTS

- A. SHEET REQUIREMENTS: Drawing sets will have consistent sheet sizes Standard Sheet Size: Minimum Paper Size: ARCH D (ARCH 4) – 24"x36" Maximum Paper Size (preferred): ARCH E (ARCH 5) – 36"x48"
- B. TITLE BLOCK: The title block will include, but not be limited to, the following information:

1. Title – Includes building name, building number, floor and room numbers as applicable
2. Owner's project name
3. Sheet number
4. Drawing file name
5. Revision history – revision number and date
Drawing Phase – BID, CONSTRUCTION, AS-BUILT, etc.
6. Architect, engineer, consultant, contractor, and/or sub-consultant

1.10 ACCEPTANCE OF ELECTRONIC DELIVERABLES

- A. Caltech will review electronic file deliverables for compliance with these guidelines prior to acceptance. Files that do not meet these guidelines will require resubmittal.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 01 1119

SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Contract Document modification procedures, including contract change orders.

1.2 CHANGE PROCEDURES

A. General

1. Contractor shall establish measures as needed to assure familiarity of the Contractor's staff and employees with procedures for processing changes to the Contract Documents.
2. The Contractor shall maintain and coordinate a Register of RFIs, ASIs, Contractor Change Order Requests, CCDs and Change Orders at the job site, accurately reflecting current status of all pertinent data as submitted by the Contractor and submit to CIT during project closeout.

- B. Architect's Supplemental Instructions (ASI): The Contractor may submit minor changes in the Work that do not involve an adjustment to Contract Price or Contract Time to the Architect and Owner. Subject to Owners approval, the Architect will issue Architects Supplemental Instructions on AIA Form G710 or other Owner approved issued document.

C. Change Order Request (COR):

1. Contractor may submit a COR to the Owner, for changes in conditions, Owner changes, or other direction from the Architect, jurisdictional authority or Owner's inspector. Architect's review is limited to identification of any impact on AOR role.
2. The Contractor shall document the proposed change and its complete impact, including its effect on the cost and schedule of the work.
3. Present total cost and schedule impacts in documentation, including all mark-ups permitted by Owner-Contractor Contract. Provide detailed back-up as required by Owner, including supplier costs, sub-contractor labor time and rates, and all other data deemed reasonably necessary by Owner for review of COR.
4. Following final review by Owner of original and supplemental information, and if COR is accepted by Owner, no additional cost or schedule adjustments will be included.
5. Following Owner review, and based on Owner direction, Contractor will prepare a Change Order.
6. Where Change Order is based on a Not-To-Exceed amount or time extension, Contractor shall provide Owner with detailed final costs and schedule impact to reconcile in final Change Order.

- D. Change Order (CO): Change Orders will be issued by the Contractor in accordance with procedures established in this Specification Section and Owner-Contractor Contract.

1. Change Order Forms: Per AIA G701 Change Order Form or other equivalent form approved by Owner.
2. Execution of Change Orders: Contractor will issue Change Orders for signatures of Owner, Architect, and Contractor.

- E. Construction Change Directives (CCD): CCD will be issued by Owner in those cases where contract cost or time for the modification is in dispute.
1. Construction Change Directive Forms: AIA G714 Construction Change Directive Form, current edition, or other form as approved by Owner.
 2. Execution of Construction Change Directive: Owner will issue CCD. Contractor shall proceed with work as defined by CCD.
 3. Unless otherwise agreed, maintain detailed records of work done under the direction of a CCD on Time and Material basis. Provide full information required to substantiate costs for changes in the Work.
 4. Following agreement on cost of the work, a Change Order will be prepared.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 2600

SECTION 01 2900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

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

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule, list of subcontractors, and submittal log.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Owner at earliest possible date but no later than fifteen days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Sub-schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
 - 4. Sub-schedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide sub-schedules showing values coordinated with each element.
- B. Format and Content: Use the 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 Architect.
 - c. Architect's and Owner's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange Schedule of Values consistent with format of standard form designated by Owner.
 - 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.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum and subcontract amount.
 - a. Include separate line items under Contractor and principal subcontracts for LEED documentation and other Project closeout requirements in a percentage as directed by Owner of the Contract Sum and subcontract amount.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. 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. If specified, include evidence of insurance or bonded warehousing.
 7. Where applicable, provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 8. 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.
 9. 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.
 10. Overhead Costs: Include total cost of general overhead and profit.
 11. Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
 12. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in a percentage as directed by the Owner of the Contract Sum and subcontract amount.
 13. Each item in the Schedule of Values and Applications for Payment shall be complete.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
 14. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment 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.
- C. Substantiation of Values: Upon Owner's request, submit sufficient data to substantiate the values stated in the Schedule of Values.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Submit Application for Payment to Owner to coincide with the monthly project schedule update.
- C. Application for Payment Process: Unless otherwise directed by Owner, submit Application for Payment on-line using Owners electronic payment application software and process.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor.
 - 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. Unless otherwise approved by Owner, 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.
- E. 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 onsite 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.
 - 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.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from first tier subcontractors for construction period covered by the previous application. Owner may require waivers from lower tier subcontracts and vendors.
 - 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.
- G. Initial Application for Payment: Administrative actions and submittals that must coincide with initial Application for Payment include the following unless directed otherwise by CIT:
1. Schedule of Values.
 2. Contractor's Construction Schedule (preliminary if not final).
 3. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 4. Submittals Schedule (preliminary if not final).
 5. Data needed to acquire Owner's insurance.
 6. Initial settlement survey and damage report if required.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment 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 Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: 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, "Contractor's Affidavit of Payment of Debts and Claims." 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 5. Evidence that claims have been settled.
 6. 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.
 7. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION (Not Used)****END OF SECTION 01 2900**

SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Digital project management procedures.
 - 5. Project meetings.

1.2 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request from Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Coordination: Contractor shall coordinate with Owner and coordinate its construction operations with those of Owners other Contractors and entities to ensure efficient and orderly installation of each part of the Work.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other Contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
 4. Evaluate and make provisions for installation of oversize equipment and elements.
- C. Priority of Construction Space:
1. Coordinate installation of different components to ensure performance and accessibility for required maintenance, service, and repair of all components.
- D. Condition of Contract Drawings for all Building Systems, including but not limited to, Mechanical, Plumbing, Fire Protection, Communication and Data, and Electrical Work.
1. Drawings contain diagrammatic layouts and indicate general arrangement of systems, piping conduit, etc.
 2. Prior to installation of material and equipment, review and coordinate Work with Architectural and Structural Drawings for exact space conditions; where not readily discernable, request information from Architect before proceeding.
 3. Check Drawings of all other trades to verify extent of material and equipment to be installed in spaces available and consider layout alternatives so that all requirements can be accommodated.
 4. Maintain maximum headroom at all locations without finished ceilings.
 5. Maintain finished ceiling heights as indicated.
 6. Coordinate installations with other trades to prevent conflict with Work of other trades and cooperate in making reasonable modifications in layout as needed.
 7. Where conflicts occur with placement of mechanical and electrical materials as they relate to placement of other building materials, coordinate resolution with Architect.
 8. Coordinate and control organization of all building systems so that a consistent and organized visual appearance is provided.
 9. Provide BIM coordination documentation as specified in Section 01 1119.
 10. The Contract drawings shall reflect all applicable criteria in the Caltech Design Guidelines as referenced in GMP Contract.
- E. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, list of attendees at meetings, and get approval from Project Manager before issuance.
- F. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Procedures for preparing RFI's
 4. Procedures for preparing substitution requests
 5. Installation and removal of temporary facilities and controls.

6. Delivery and processing of submittals.
 7. Progress meetings.
 8. Preinstallation conferences.
 9. Project closeout activities.
 10. Startup and adjustment of systems.
- G. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare Coordination Drawings as specified in this Section, according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity. Coordination Drawings prepared by Contractor are for Contractor's use in identifying and resolving coordination issues under the Work of this Contract.
1. Contractor is solely responsible to coordinate the Work, including conditions where specific dimensions are not indicated, or the work is represented schematically or diagrammatically.
 2. Evaluate and make provisions for installation of oversize equipment and elements.
 3. Coordinate with Section 01 1119 requirements. Use of BIM documentation may be used to satisfy requirements of this Section.
 4. Prepare Coordination Drawings to maximize utilization of space for efficient installation of different components, visually organized and pleasing appearance, and where coordination is required for installation of products and materials fabricated by separate entities.
 5. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Prepare original drawings and documents as required to avoid copyright violation of source documents. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of Coordination Drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the Coordination Drawings by multiple Contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Follow routing shown on Contract Drawings for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.
 - d. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - e. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - f. Show location and size of access doors required for access to concealed

- dampers, valves, and other controls.
- g. Indicate required installation sequences.
- h. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts.
- i. Show locations for all access doors and panels required for the Project.
- j. Refer to individual Sections for additional requirements for Coordination Drawings specific to that Section.

1.6 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents and it is not possible to request information at Project meetings, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return RFIs directly submitted to Architect by entities other than the Contractor with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 - 3. Architect will return RFI to Contractor. Contractor shall obtain final disposition of Architects and /or Engineers response prior to transmittal to Owner for review.

- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date submitted
 - 4. Date response requested, including Architect, Engineer and Owner.
 - 5. Name of Contractor.
 - 6. Name of Architect of Record and Engineer of Record.
 - 7. RFI number, numbered sequentially.
 - 8. RFI subject.
 - 9. Specification Section number and title and related paragraphs, as appropriate.
 - 10. Drawing number and detail references, as appropriate.
 - 11. Field dimensions and conditions, as appropriate.
 - 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 13. Contractor's electronic signature.
 - 14. Provide designated space on RFI form for Architect, Engineer, and Owner stamp indicating action.
 - 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, Coordination Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

- C. RFI Forms: Software-generated form with substantially the same content as indicated above, submitted by electronic mail (e-mail) in accordance this Section.
 - 1. Identify each page of attachments with the RFI number and sequential page number.
 - 2. Provide attachments for software-generated forms in Adobe Acrobat PDF format.
 - 3. Provide photographs for software-generated forms in JPG format.

- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI, with an additional 7 days for Owner response. RFIs received by Architect and Owner after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of requested additional information.
 3. Owner's final disposition action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Order Request according to the Owner-Contractor Contract.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly to Owner. Use software log that is part of web-based Project software. Owner shall have full access to the web-based project management software RFI Log.
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted to Architect and date response received by Contractor.
 7. Date the RFI was submitted to Owner and date Owners response was received by Contractor.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Web-Based Project Software: Provide, administer, and use web-based Project software for purposes of hosting and managing project communication and documentation until Final Completion. Software shall be approved by Owner. If acceptable to Owner, Contractors current web-based software complying with specified criteria may be used.
1. Web-based Project software site includes, at a minimum, the following features:

- a. Compilation of Project data, including Contractor, Subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including but not limited to, RFIs, submittals, minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.
 - j. Document management for Drawings, Specifications, and Coordination Drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
2. Provide access to web-based software for Owners use. Provide software with integrated training modules and free access to software developers helpline staff for web-based Project software users.
 3. At completion of Project, provide Owner with digital archive in format that is readable by common desktop software applications in format acceptable to Owner. Organize file using file naming and structure as directed by Owner. Provide data in locked format to prevent further changes.
- B. PDF Document Preparation: Where PDFs are required to be submitted to Architect and Owner, prepare as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

- A. General: Contractor shall schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
 4. Decisions and interpretations given by the Owner shall be conclusive on each Contractor affected.
- B. Preconstruction Conference: Contractor shall schedule and conduct a preconstruction conferences before starting construction of project phases, at a time and date convenient to Owner and Architect, at the Project site or another location convenient to the Owner.
1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Owners insurance representative; Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Introductions
 - b. Scope of Work Overview
 - c. Responsibilities and personnel assignments.
 - d. Mobilization
 - e. Tentative construction schedule.
 - f. Phasing and advance work planning
 - g. Critical work sequencing and long-lead items.
 - h. Designation of key personnel and their duties, including Owners insurance representative.
 - i. Lines of communications.
 - j. Use of web-based Project software.
 - k. Procedures for processing field decisions and Change Orders.
 - l. Procedures for RFIs.
 - m. Procedures for testing and inspecting.
 - n. Procedures for processing Applications for Payment.
 - o. Distribution of the Contract Documents.
 - p. Submittal procedures.
 - q. LEED requirements.
 - r. Preparation of record documents.
 - s. Use of the premises and existing building, including reports by Owners insurance representative.
 - t. Work restrictions.
 - u. Working hours.
 - v. Owner's occupancy requirements, including inspection procedures.
 - w. Responsibility for temporary facilities and controls.
 - x. Procedures for moisture and mold control.
 - y. Procedures for disruptions and shutdowns.
 - z. Construction waste management and recycling.
 - aa. Parking availability.
 - bb. Office, work, and storage areas.
 - cc. Equipment deliveries and priorities.
 - dd. First aid, safety, confined space, trenching, fall protection
 - ee. Emergency Contacts (nearest care facility)
 - ff. Security.
 - gg. Progress cleaning.
 3. Minutes: Record and distribute meeting minutes.

- C. LEED Coordination Conference: Contractor shall schedule and conduct a LEED coordination conference before starting construction, at a time convenient to Owner and Architect, and Commissioning Agent.
1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Owners insurance representative; Architect, and their consultants; Contractor and its superintendent and LEED coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect meeting requirements for LEED certification, including the following:
 - a. LEED Project Checklist.
 - b. General requirements for LEED-related procurement and documentation.
 - c. Project closeout requirements and LEED certification procedures.
 - d. Role of LEED coordinator.
 - e. Construction waste management.
 - f. Construction operations and LEED requirements and restrictions.
 3. Minutes: Record and distribute meeting minutes.
- D. Preinstallation Conferences: Conduct a preinstallation conference at Project site when required by other sections and when required for coordination with other construction.
1. Scheduling: When appropriate, schedule preinstallation conferences on same day as progress meetings attended by Architect and Owner.
 2. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Owner, Owners insurance representative, and Owner's Commissioning Authority of scheduled meeting dates.
 3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. LEED requirements.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.

- v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 5. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- E. Project Closeout Conference: Contractor shall schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Owners insurance representative; Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing LEED documentation.
 - f. Requirements for preparing operations and maintenance data.
 - g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - i. Preparation of Contractor's punch list and procedure for reporting completion status.
 - j. Procedures related to obtaining final AHJ approvals.
 - k. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - l. Submittal procedures.
 - m. Coordination of separate contracts.
 - n. Owner's partial occupancy requirements.
 - o. Installation of Owner's furniture, fixtures, and equipment.
 - p. Responsibility for removing temporary facilities and controls.
 4. Minutes: Record and distribute meeting minutes.
- F. Progress Meetings: Contractor shall conduct Owner-Architect-Contractor (OAC) progress meetings at weekly intervals.

1. Attendees: In addition to representatives of Owner, ; Architect, Contractor, Contractor shall arrange for other entities as required for the current progress or involved in planning, coordination, or performance of future activities to be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Status of LEED documentation.
 - 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Access.
 - 9) Site use.
 - 10) Temporary facilities and controls, including safety protocols.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Status of RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
 - 21) Schedule of required utility and area shutdowns
3. Minutes: Record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION (Not Used)**

Attachments:

Request for Information (RFI) Form (SAMPLE)

END OF SECTION 01 3100

REQUEST FOR INFORMATION

Request No. [XXXXX]	Date	[Month 00, Year]
Project Name [Project Name]	To	Design Team
Project No. [XXXXXX.XX]		[Address]
Subject [Subject of RFI]		[City, State, Zip]
		[Name]
	Attention	[email]

Specification Section No. & Paragraph	[Section No. & paragraph]	Drawing & Details Affected	[Drawing & details affected]
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WHY IS THIS INFORMATION BEING REQUESTED? (select one)

- Information necessary to complete shop drawing submittal
- Information necessary to complete field coordination / erection
- Other [Explain]

REQUEST (attached referenced documents)
[Write Request Here; Include Cost And Schedule Impacts Of RFI]

RESPONSE: [Provide Response By Date]

Attachments [Your Attachments Here]

Distribution [Your Distribution Here]

CONTRACTOR'S / BIDDER'S REPRESENTATION
Undersigned warrants that Contractor has thoroughly researched the documents, and the information requested does not exist or cannot be ascertained from the information given in the documents.

Subcontractor's signature and date

Contractor's / CM's signature and date

ARCHITECT RESPONSE:

DATE:

OWNERS RESPONSE:

DATE:

SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION**PART 1 – GENERAL****1.1 SUMMARY**

- A. This 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. Special reports.

1.2 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 activities are activities on the critical path. They 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. 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.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. 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.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file.
- B. Startup construction schedule.

- C. Contractor's Construction Schedule: Submit initial schedule, large enough to show entire schedule for entire construction period.
 - 1. Submit working electronic copy of schedule, labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. Constraints Schedule: List of key project constraints
- E. Daily Construction Reports: Submit at monthly intervals.
- F. Material Location Reports: Submit at monthly intervals.
- G. Site Condition Reports: Submit at time of discovery of differing conditions.
- H. Unusual Event Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

- A. Scheduling staff Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the list of subcontracts, Submittals Schedule, progress reports, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 – PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of 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.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal 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 Owner.
 - 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.

- a. Curtainwall, including mockup testing.
 3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 3300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include not less than 30 days for startup and testing.
 5. Commissioning Time: As required per project.
 6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Owners 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.
- C. 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 under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 1000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 1000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. 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.
 7. 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. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.

8. 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. Shoring
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.

- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

- E. 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 Contract Time.

- F. 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.

- G. 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, and equipment required to achieve compliance, and date by which recovery will be accomplished.

- H. Distribution: Distribute copies of approved schedule to Architect 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.

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

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

2.2 STARTUP CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work 1.

2.3 CPM SCHEDULE REQUIREMENTS

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, 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 the Notice to Proceed.
 - a. CPM shall reflect Gantt Chart activities developed for Start-Up schedule.
 - b. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 - 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. Include list of nonworking days and holidays incorporated into the schedule.
- C. 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 commissioning.
 - j. Commissioning.
 - k. Punch list and final completion.

- I. Activities occurring following final completion.
 - D. 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.
 - E. 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.
 - F. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - 1. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
 - G. 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.
 - H. 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.
 - I. 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.

2.4 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. Constraints to progress
 6. Material deliveries.
 7. High and low temperatures and general weather conditions including presence of rain.
 8. Testing and inspection, including non-conformance reports.
 9. Accidents.
 10. Meetings and significant decisions.
 11. Unusual events (refer to special reports).
 12. Stoppages, delays, shortages, and losses.
 13. Orders and requests of authorities having jurisdiction, including non-conformance reports.
 14. Services connected and disconnected.
 15. Equipment or system tests and startups.
- B. **Material Location Reports:** At monthly 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, including attic stock.
 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 Interpretation. 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, 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 of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 3 - EXECUTION (Not Used)**END OF SECTION 01 3200**

SECTION 01 3233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs.
 - 3. Final Completion construction photographs.
 - 4. Preconstruction video recordings.
 - 5. Periodic construction video recordings.
 - 6. Final completion construction video recordings.

1.2 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same label information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
 - 1. Submit photos on portable thumb/flash drive and DVD. Include copy of key plan indicating each photograph's location and direction.
 - 2. Digital Camera: Minimum sensor resolution of 10 megapixels.
 - 3. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
 - 4. Identification: Provide the following information with each image description in the file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier keyed to accompanying key plan.
- C. Video Recordings: Submit video recordings within seven days of recording.
 - 1. Submit video recordings on portable thumb/flash drive and DVD
 - 2. Identification: With each submittal, provide the following information in file metadata tag:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date video recording was recorded.
 - f. Description of vantage point, indicating location, direction (by compass point), and

- elevation or story of construction.
- g. Weather conditions at time of recording.

1.3 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has basic skills necessary to record digital photographs and video recordings with the exception of the final construction photos. The final construction photos and videos shall be taken by a professional photographer and videographer. Proof of experience may be requested for approval.
- B. Taking photographs or video recordings with students and schools staff included on the image is strictly prohibited; Adjust sequence and timing as required.

1.4 USAGE RIGHTS

- A. Contractor shall obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.
- B. Contractor and Architect may not use media without express written approval by Owner.

1.5 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 10 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.
- C. Metadata: Record accurate date and time from camera ad as specified in this Section.
- D. File Names: Name media files with date, Project area, map/view coordination numbering, and sequential numbering suffix as directed by Architect.

1.6 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Photographer shall be qualified to take construction photographs with reasonable detail and quality.
 - 1. Engage a professional photographer for final construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.
 2. Field Office Images: Maintain one set of images on flash drive and DVD in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.
- D. Preconstruction Photographs: Before commencement of excavation and demolition, take color Digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
1. Flag excavation areas construction limits before taking construction photographs.
 2. Take a minimum of 10 photographs to show existing conditions adjacent to property before starting the Work.
 3. Take minimum Of 10 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
 5. Include measurement device in documentation to indicate dimension of distress, damage, crack or displacement.
- E. Periodic Construction Photographs: Take a minimum of 10 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken. Coordinate with Owner if pre-selected vantage points are to be used.
1. Exterior progression shots: Taken from key perspectives along site perimeter and 360 degrees around building envelope, to be performed at monthly intervals.
 2. Interior progression shots: Broadly track the improvements from logical perspectives, to be performed at monthly intervals and coordinated with pace of erection.
 3. Pre-slab/Pre-Chase/Interior record shots: Underground or concealed utilities will be documented post inspection/pre-insulation and prior to pouring slabs, backfilling or closing chases/walls/ceilings
- F. Final Completion Construction Photographs: Take a minimum of 20 color photographs after date of Substantial Completion for submission as Project Record Documents. Coordinate with Owner and Architect for desired vantage points. Do not include date stamp on Final Completion Construction Photographs.
1. Final construction photographs shall be taken by a professional photographer.

1.7 CONSTRUCTION VIDEO RECORDINGS

- A. Videographer: Videographer shall be qualified to take construction videos with reasonable detail and quality.
1. Engage a professional videographer for final construction videos.
- B. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
- C. Narration: Describe scenes on video recording by audio narration by microphone while video is recorded. Edit narration as required to remove excessive pause, inaccurate comments, and excessive background noise where possible. Include description of items

being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.
 2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.
- D. Preconstruction Video Recording: Before starting excavation and demolition, record video of Project site and surrounding properties from different vantage points, as directed by Architect.
1. Flag excavation areas and construction limits before recording construction video.
 2. Show existing conditions adjacent to Project site before starting the Work.
 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of excavation and demolition.
 4. Include:
 - a. Off-site street and frontage improvements, including manholes, meters, and above ground utility structures, identifying all evidence of existing settlement, cracking, and other signs of damage, distress or failure.
 - b. Condition of adjacent properties, including fencing, retaining walls, pools, paving, and structures. Clearly identify all evidence of existing settlement, cracking, alignment and other signs of damage, distress or failure.
 - c. Condition of surfaces and construction at existing facilities or areas designated as partially demolished or renovated. Clearly identify all evidence of existing cracking, scuffs, paint wear, flooring damage door and hardware alignment and all other signs of damage, distress or failure.
 - d. Condition of landscaping, including canopy overhang, shrubbery and grass/groundcover. Clearly identify all evidence of existing trunk damage, grass compaction, crushed and broken shrubs and other signs of distress or failure.
 5. Include measurement device in documentation to indicate dimension of distress, damage, crack or displacement.
 6. Show protection of existing conditions and SWPPP efforts by Contractor.
 7. Obtain Architects certification that documents were prepared prior to beginning construction and deliver documentation to Owner prior start of construction.
- E. Periodic Construction Video Recordings: Record video monthly and submit with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 15 minutes and shall include narration of actual conditions and progress made since last recording.
- F. Final Construction Video Recordings: Provide a video of the project done by a professional videographer in a format usable by Caltech. Video shall be high resolution with professional lighting and other aspects such as audio enhancements.
- G. Owner's Training: Record video during the manufacturer's training session at substantial completion. Minimum recording time shall be 30 minutes per session. Deliver the recordings with the O&M Manual. See Section 01 7900.
- H. Submit videos in flash drive and DVD format.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3233

SECTION 01 3300 - SUBMITTAL PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
 - 1. Required Submittals: All required submittals are indicated in each specification section. Do not submit items unless they are required by Specification Section. Submittals which are not required may be discarded without review.
 - 2. Submittal Register Preparation and maintenance.
 - 3. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action and Owners approval. Action submittals are those submittals indicated in individual Specification Sections as "Action Submittals."
- B. Delegated Design/Deferred Approval: Professional design service or certification specifically required by the Contractor in Sections of the Project Manual. Delegated Design is also defined as "Deferred Approval" where indicated. Comply with Section 01 3573.
- C. Informational Submittals: Written and graphic information and physical samples that do not require Architect'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".
- D. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- E. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
- F. Submittal Register: Written register listing each submittal, tracked for status and action, and maintained on Contractor web-based project management system. Submittal Register shall comply with Owner standards and content as specified.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule 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 Architect 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 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 Architect's and Owners final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.
- B. Submittal Register: Submit a Submittal Register incorporating the categories identified below.
1. Coordinate submittal register with submittal schedule.
 2. Format: Submittal Register shall comply with Owner format, arranged in matrix form for each section. See format as attached at end of this Section. Example shown for a single section. Provide complete register for all Sections with applicable entries based on Specification requirements.
- C. Submittal Log: Contractor to maintain a submittal log listing all submittals and tracks all activity for each to include disposition of reviewers and dates of all activity. Log shall be available to Caltech at any time. Log shall be electronic and be administered in an agreed upon project management tool.
- D. Submittal Package: Assemble all Action Submittals for each specification section into a single package for delivery to Architect and Owner unless otherwise specified. Failure Contractor to assemble all Action Submittals in single package may result in Architect withholding action on submittal(s) until associated submittal(s) required by applicable specification section are received.
1. Closeout Submittals or Submittals for Work Performed by Separate Trades: Submit in separate package as applicable rather than in single Action Submittal package described above.
 2. Transmittal: Submit each Submittal Package with a transmittal for the package.
 - a. Transmittal shall include not less than the following Items:
 - 1) Project name.
 - 2) Date.
 - 3) Name and address of Architect.

- 4) General application or specific location of installation
 - 5) Name of Contractor.
 - 6) Names of subcontractor, manufacturer, and supplier.
 - 7) Related physical samples submitted directly.
 - 8) Indication of full or partial submittal.
 - 9) Other necessary identification.
- b. Include a completed Submittal Identification Form in all Submittal Packages in addition to any separate transmittal. Submittal Packages not including Submittal Identification Form will be returned as "Not Reviewed."
3. All submittals shall be reviewed and clearly marked with Architect's stamp and action prior to submittal to Owner. Submittal received without Architects action will be returned to Contractor.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data: See Section 01 1119 for BIM procedures.
- 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.
 - a. Prepare and track submittals on a Material Status Log, including long lead time schedule.
 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 different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as specified. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals. For samples and required physical submittals, review time begins when both physical submittal and electronic Submittal Identification Form have been received by Architect.
1. When a large volume of submittal materials is scheduled, such as structural steel or concrete shop drawings, or particularly complex submittals such as mechanical controls, additional review durations may be required. Similarly, a particular submittal may require review completion in less than the specified duration. Due to such variations in submittal volume and processing needs, specified review time is not intended to apply to extreme conditions.
 2. Contractor and Architect shall coordinate on acceptable review durations and indicate on project schedule.

3. Initial Review: Unless otherwise defined in project schedule, allow 15 days for initial review of each submittal. Allow additional 7 days if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 4. Resubmittal Review: Allow 10 days time for review of each resubmittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D. Sample Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Submittal Identification Form: All submittals shall be accompanied by a completed Submittal Identification Form attached to this Section. Submittals lacking Submittal Identification Form will not be reviewed.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete Submittal Package into a single indexed file incorporating submittal requirements of single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. Include in file name project identifier, Specification Section number, and item number, followed by "RVW" with number of review, then title. (e.g. "PI-05 5100-001 RVW 01 SD-Metal Stairs – Stair 01 & 02" for first metal stair shop drawing for stair 01 and 02 review 01).
 - b. Project Identifier: Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 3. Transmittal for Electronic Submittals: Comply with requirements specified in Submittal Package paragraph in Action Submittals article.
 - a. Submittals not including Submittals Identification Form will be returned as "Not Reviewed."
 4. Include the following information as keywords in the electronic submittal file naming or identification:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
 - e. Keynote or finish code.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations and Additional Information: On attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

1. Deviations: Encircle or otherwise specifically identify deviations from Contract Documents on submittals.
 2. Deviations shall not be approved by Architects action on submittals
 3. Changes shall not be made by Architect on submittals by annotation, comment, dimensional modifications. All changes shall be reflected on ASI or Change Orders and approved by Owner.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked "No Exceptions Taken" or "Make Corrections Noted," and initialed by Architect.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating "No Exceptions Taken" or "Make Corrections Noted," and initialed by Architect.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit Submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submittals shall be processed using Contractor's project management software as approved by Owner. Owner may elect to approve alternate submittal processes for small or interim phase projects.
 2. Submit notification that electronic submittals are available for review via email notification to Architect's Construction Administrator Coordinator (CAC), with CC to Owner and Architect. Include project name and Submittal Identification Number in subject line of email.
 - a. Architect will return annotated file to Contractor. Annotate and retain one copy of file as an electronic Project record document file.
 3. Action Submittals: Must be submitted electronically. Architect will return one annotated copy.
 4. Informational Submittals: Must be submitted electronically. Architect will not return copies.
 5. Certificates and Certifications Submittals: Provide 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.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable to Project.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications, including performance characteristics written to match specified terminology for ease of comparison.
 - c. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1) Preparation of substrates.
 - 2) Required substrate tolerances.
 - 3) Sequence of installation or erection.
 - 4) Required installation tolerances.
 - 5) Required adjustments.
 - 6) Recommendations for cleaning and protection.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring and controls.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Statement of compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 - o. Availability and delivery time information.
 - p. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - q. Additional information as required by Specifications.
 4. Submit Product Data before or concurrent with Samples.
 5. Submit Product Data as a PDF electronic file.
 6. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.
 - a. Architect will not review MSDS sheets and will remove/discard them from the submittal.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal of digital data drawing files are otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

- a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 - p. Additional information as required by Specifications.
 - q. Do not include the phrase "by others," except when relating to materials, products or equipment not included under the Work of the Contract.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets formatted at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
 - a. Submittals shall be clear and legible. The Architect reserves the right to reject in full any submittal due to illegibility, as determined solely by the Architect, without any impact to the allowed review time. All dimensions and text shall be a minimum of 10pt or 0.389 inches in height. Drawings not conforming to this requirement will be rejected without review.
3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
4. BIM Federation: Develop and incorporate Trade Shop/Fabrication BIMs into a federated construction BIM established for Project.
 - a. Prepare Trade Shop/Fabrication BIMs in the format as defined in Section 01 1119.
 - b. Refer to Division 01 Section "Project Management and Coordination" for requirements for coordination drawings.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.

- e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. 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.
 - c. Contractor shall assemble boards on site showing samples of related products, such as curtainwall and adjacent materials, toilet room tile and adjacent materials and the like.
 5. 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 two (2) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one (1) submittal set with options selected.
 6. 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 (3) sets of Samples. Architect will retain one. Owner will retain one. Sample sets: with remainder returned to Contractor. Maintain one set at job-site.
 - 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.
 7. Field Samples: Erect at project site at location(s) acceptable to Architect and Owner.
 - a. Construct each field sample complete; including work of all trades required to finish the Work.
 - b. When directed by Architect and Owner, demolish field sample and remove from Project Site, unless acceptable by Architect and Owner as part of the competed work.

- E. 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.
 5. Submit product schedule as a PDF electronic file.
- F. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use of CSI Form 1.5A is preferred, if not used, submission must include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Submit list electronically.
- H. LEED Submittals: Comply with requirements specified in Section 018113 "Sustainable Design Requirements"
- I. Material Safety Data Sheets (MSDSs) for LEED Certification: Submit information necessary to show compliance with LEED certification requirements, which will be the limit of the Architect's review.
1. Architect will not review non-LEED submittals that include MSDSs and will remove/discard them from the submittal.
- J. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- K. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- M. Certificates:
1. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
 2. Installer Certificates: Prepare 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: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

4. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
5. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

N. Reports:

1. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
2. Product Test Reports: Prepare written reports indicating 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.
3. Research/Evaluation Reports: Prepare 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.
4. Preconstruction Test Reports: Prepare 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. Compatibility Test Reports: Prepare 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.
6. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
7. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - a. Name, address, and telephone number of factory-authorized service representative making report.
 - b. Statement on condition of substrates and their acceptability for installation of product.
 - c. Statement that products at Project site comply with requirements.
 - d. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - e. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - f. Statement whether conditions, products, and installation will affect warranty.
 - g. Other required items indicated in individual Specification Sections.

- O. Where applicable, include Owners Commissioning Agent review form with submittal Reports.
- P. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- T. Construction Photographs and Videos: Comply with requirements specified in Division 01 Section "Photographic Documentation."
- U. Closeout submittals as defined in Section 01 7700.

2.2 DELEGATED DESIGN

- 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.
- B. Delegated Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file, 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. Where required by AHJ, provide signed and stamped paper submittals.
 - 1. Comply with Section 01 3573.
 - 2. 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.
 - 3. Where shop drawings are signed and sealed by a responsible design professional, ensure that design professional complies with the following requirements:
 - a. Performs periodic field review as construction progresses on site.
 - b. Submit report of periodic field review within three (3) days of field review.
 - c. Submit final letter certifying general conformance with signed and sealed shop drawings.
- C. BIM Federation: Incorporate delegated design Trade Shop/Fabrication BIMs into a federated construction BIM established for Project.

1. Prepare delegated design Trade Shop/Fabrication BIMs as specified in Section 01 1119.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action 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 Architect.
 1. Verify:
 - a. Field Measurements.
 - b. Field Construction Criteria.
 - c. Catalog Numbers and Similar Data.
 - d. Quantities.
 2. Contractor's responsibility regarding deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Architect gives written acceptance of specific deviations as approved by Owner.
 3. When work is directly related and involves more than one trade, coordinate submittal with other trades. Show related work in submittal to indicate coordination.
 4. After a submittal has been submitted for review, no changes may be made to that Submittal other than changes resulting from review notes made by the Architect unless such changes are clearly identified and circled before being resubmitted. The Architect's review will be invalidated if material changes are made and not identified.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 7700 "Closeout Procedures."
- C. Approval Stamp: Stamp each Submittal Identification Form with Contractor's stamp certifying that submittal has been reviewed and checked and stamped for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will indicate on Submittal Identification Form for each submittal to indicate action taken, as follows:
 1. "No Exceptions Taken":
 - a. No further review of submittal is required.
 2. "Make Corrections Noted":
 - a. If Contractor complies with noted corrections, fabrication may proceed and resubmission is not required, unless otherwise noted.
 - b. If for any reason the Contractor cannot comply with the noted corrections, fabrication shall not proceed and Contractor shall resubmit, following procedures

outlined hereinbefore.

3. "Revise and Resubmit":
 - a. Contractor shall revise and resubmit for review. Fabrication shall not proceed.
 4. "Rejected":
 - a. Submittal is not in compliance with the Contract Documents and is not acceptable. Provide new submittal.
 5. "For Record / Information Only":
 - a. Submittal has been received and will be retained for record keeping purposes.
 6. "Not Required For Review":
 - a. Submittal is not required by Contract Documents and has not been reviewed.
- C. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Unless approved in advance by Architect, partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded or returned without action.

3.3 DISTRIBUTION OF SUBMITTALS BY ORIGINAL SUBMITTER, AFTER ARCHITECT'S AND OWNER'S REVIEW

- A. Make and distribute copies of submittal which have been accepted by the Owner to the following:
1. Contractor.
 2. Related Contractor(s).
 3. Supplier.
 4. Fabricator.
 5. Owner.
 6. Job-site file (record copy).
- B. Produce and distribute additional copies as required.

3.4 SUBMITTAL REGISTER FORMAT

- A. Caltech Submittal Register format. Example shown for a single section. Provide complete register for all Sections with applicable entries based on Specification requirements.

SUBMITTAL REGISTER													Project CP No. XXXX								
PROJECT TITLE AND LOCATION: CALTECH PROJECT										Caltech 1200 East California Blvd. Pasadena, CA 91125			Design Guidelines Section 10 00 00 Specialties								
ACTIVITY NO.	TRANSMITTAL NO.	ITEM NO.	DESIGN GUIDE SECTION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION			OWNER ACTION		REMARKS	
					WARRANTY	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	MANUALS	OWNER ONLY	REVIEWED	SUBMITTAL	FILE ONLY IN PROJECT FOLDER		FILE IN MERIDIAN
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	z	aa	ab
			101100 Visual Display Surfaces	Product Data		X											X		X		
				Warranty	X														X	X	
				Shop Drawings			X										X		X		
				Product Schedule				X									X		X		
				Maintenance Data		X									X		X		X	X	
				Samples									X								

END OF SECTION 01 3300

SECTION 01 3573 – DELEGATED DESIGN PROCEDURES**PART 1 – GENERAL****1.1 SUMMARY**

- A. Section includes procedures for portions of Work under this Contract that are defined as Delegated Design components and systems in applicable Sections, including structural and non- structural components of the Work.

1.2 DEFINITIONS

- A. Delegated Design: Professional design service or certification specifically required of the Trade Partner in Sections of the Project Manual. Delegated Design also includes Deferred Submittals where AHJ approval is required.
- B. Design Builder: Licensed General Contractor under Contract to the Owner. Where used in this Section, "Contractor" shall mean "Design Builder".
- C. Architect of Record: Design Team for Architectural services as defined under California license regulations and laws. The terms "Architect of Record " and "Architect" as used in the specifications are synonymous.
- D. Engineer of Record: Design Team for Engineering services as defined under California license regulations and laws.
- E. Trade Partner: First Tier subcontractor under contract to the Design-Builder.
- F. Trade Partner's Design Professional: Design Professional registered in the State in which the Project is located and engaged by Trade Partner, subcontractor or supplier to provide drawings, computations and specifications required for Delegated Design components and systems.
- G. Deferred Submittal: Construction documents for those components of the Work that cannot be fully detailed on the approved construction documents because of variations in product design and manufacture and have been specifically approved by the AHJ for submittal review and approval after original permit approval.
- H. AHJ: Authorities Having Jurisdiction.
- I. Seal: Certification that drawings, computations and specifications were designed and prepared under direct supervision of the Architect or Professional Engineer whose name appears thereon.
- J. Delegated Design Component Review Stamp: Confirmation that Delegated Design drawings have been reviewed by Design Builder Architect of Record or Design Builder consultants only for coordination and compatibility with design intent of the Contract Documents.

1.3 RESPONSIBILITIES

- A. Trade Partner's Responsibilities: Provide services or certifications by Trade Partner's Design Professional, whose signature and seal appear on drawings, calculations, specifications, certifications, shop drawings and other submittals prepared by that design

professional. Ensure shop drawings and other submittals related to the Work designed or certified by that professional, if prepared by others, bears that design professional's written approval when submitted to the Design-Builder Architect of Record. The Design-Builder Architect of Record, Design Builder Engineer of Record, Owner, and Design Builder, shall rely on the completeness of the services, certifications and approvals performed or provided by that Trade Partner design professional.

1. Coordinate and assume or assign to Trade Partner subcontractors complete responsibility for design, documentation, calculations, submittals, permits, fabrication, transportation and installation of components requiring Delegated Design.
 2. Coordinate components requiring Delegated Design with adjacent or related systems whether designed by Design-Builder Architect of Record or are other Delegated Design components. Ensure complete, operational systems that perform their intended use are provided.
 3. Engineer components of the Work requiring Delegated Design. Include provisions for wind, gravity, lateral, and seismic loads and include design for life safety, sizing of supports, anchors, framing, connections, spans, and other characteristics required to meet or exceed requirements of applicable codes, standards, regulations, AHJ, and design requirements of the Contract Documents.
 - a. Refer to Structural Drawings or applicable Specification Sections for structural performance criteria.
 - b. For non-structural applications requiring Delegated Design, comply with performance criteria and AHJ requirements specified in applicable Section.
 4. Ensure Delegated Design executes design intent indicated in the Contract Documents.
 5. Coordinate and assume or assign to subcontractors and/or suppliers complete responsibility for design, calculations, submittals, permits if required, fabrication, delivery and installation of Delegated Design components.
 6. Where specified, submit Delegated Design documents to AHJ for review, as required, in a manner that will not adversely affect Project's construction schedule.
 7. Trade Partner shall indemnify and hold harmless Owner, Owner's Representative, and agents and employees of any of them from and against claims, damages and expenses resulting from breach or failure by Trade Partner to perform fully any of the forgoing obligations and specifically agrees to indemnify and hold Owner, Owner's Representative, harmless from any and all claims of the Trade Partner's employees, agents, subcontractors, suppliers or third parties and to make good any damages to the Work, and attorneys' fees and costs of additional work by Owner's Representative resulting from the inadequacies of the techniques or methods of construction of the Design-Build Work.
- B. Trade Partner's Design Professional: Design Professional registered in the State in which the Project is located and engaged by Trade Partner, subcontractor or supplier to provide drawings, computations and specifications required for Delegated Design components and systems, in accordance with criteria specified in Contract Documents; include documentation required by AHJ. Responsibilities of Trade Partner's Design Professional include, but are not limited to, the following:
1. Preparation of Delegated Design submittals.
 2. Periodic field review of Delegated Design work, including review of associated mock-ups where applicable, at locations where the Work is in progress, fabrication and installation of Delegated Design work, and submission of field review report after each visit to Design- Builder Architect of Record, AHJ as required, and in accordance with applicable building codes.

- a. Provide field reviews at intervals necessary and appropriate to progress of the Work to allow Trade Partner's Design Professional to be familiar with progress and quality of Work related to Delegated Design components and to determine if Work related to Delegated Design components is proceeding in general conformity with Contract Documents, including reviewed shop drawings and design calculations.
 - b. Include costs for all review services, in Contract Sum, including testing and inspection reports, shop drawings, field reviews and field review reports, and letters of general conformity.
3. Upon completion of Delegated Design components of the Work, prepare and submit to Design-Builder Architect of Record and AHJ as required a letter of general conformity for Delegated Design components of the Work, certifying that they have been supplied and installed in accordance with the requirements of the Contract Documents and AHJ.

1.4 SCHEDULING

- A. Schedule design process and submittals required for Delegated Design portions to comply with Project Construction Schedule.
 1. Allow sufficient time for Design-Builder Architect of Record's, Design Builder Engineer(s) of Record, and where applicable, AHJ, review of Delegated Design submittals. Include time estimate and coordination of schedule for review of Delegated Design submittals.
 2. If Design-Builder Architect of Record's and Design-Builder Engineer of Record action on submittal relating to Delegated Design components is required prior to application for permit, schedule and sequence Delegated Design submittal review prior to permit submittal. Comply with requirements specified in Division 1 Section "Submittal Procedures."
- B. Design Builder and Owner is not responsible to pay for any delays, additional products, additional hours of Work, or overtime, restocking or rework required due to failure by Trade Partner or Trade Partner subcontractor to coordinate their Work with Work of other trades on Project or to provide Delegated Design portion or component in a timely manner to meet project schedule.

1.5 SUBMITTAL PROCEDURES FOR DELEGATED DESIGN COMPONENTS

- A. Comply with requirements specified for submittals in Division 01 sections, including, but not limited to, form and procedures for delivering submittals.
 1. Before the Work proceeds, complete the following:
 - a. Submit complete legible documents for Delegated Design components.
 - b. Design-Builder Architect of Record, Design-Builder Engineer of Record and AHJ as appropriate, have accepted and reviewed, and where required by AHJ, approved, Delegated Design documents.
 2. Submit Delegated Design documents for approval prior to fabrication of components included in Delegated Design work.
 3. Design-Builder Architect of Record's and Design-Builder Engineer of Record review of Delegated Design submittals is for the limited purpose of checking for general conformance with information given and the design concept expressed in the Contract Documents. Design-Builder Architect of Record and Design-Builder Engineer of Record

will review, approve or take other appropriate action on submittals consistent with this limited purpose.

- a. Design-Builder Architect of Record's and Design-Builder Engineer of Record review does not lessen nor shift burden of responsibility from Trade Partner or Trade Partner subcontractor/ supplier / engineer to Owner Design Builder, Design-Builder Architect of Record, or Design-Builder Engineer of Record.
- B. In addition to other submittal requirements specified in other Sections of the Project Manual, include in submittals for Delegated Design components submittals the following:
1. Complete criteria.
 2. Design assumptions.
 3. Details.
 4. Calculations for required engineering, including but not limited to, structural, mechanical, plumbing, fire protection, and electrical work as applicable.
 5. Reactions to structure where applicable.
 6. Submittal stamped and signed by Trade Partner's Design Professional responsible for preparation of submittals.
 7. Instructions for fabrication, assembly, installation and interface with other trades.
- C. Trade Partner's Design Professional List: Submit list of Trade Partner's Design Professionals in accordance with requirements specified in Division 01 Section "Submittal Procedures" for Subcontract List.
1. Submit Trade Partner's Design Professional list to AHJ, when required.
- D. Preliminary Submittal: Submit preliminary drawings and product data prior to performing engineering calculations and shop drawings.
- E. Final Review: Submit final Delegated Design documents to Design-Builder Architect of Record and AHJ as required for review and approval based on submittal schedule defined in this Section.
1. Include design criteria, design assumptions, structural calculations where applicable, other required engineering calculations, fabrication and construction details, required clearances, and interface requirements in Final Review Delegated Design documents.
 - a. Delegated Design drawings are in addition to shop drawings.
 2. Comply with AHJ requirements.
 3. Affix Trade Partner's Design Professional's professional seal on submittals.
 4. Make corrections as noted by Design-Builder Architect of Record and Design-Builder Engineer of Record and comply with AHJ requirements.
 5. Execute corrections to Delegated Design Work at no additional cost to Owner and prior to Substantial Completion.
- F. Submit Delegated Design Professional's qualifications and, where specified, proof of insurance, identifying insurer, policy number, policy term and limit of liability, on duly signed letterhead or certificate of insurance.

1.6 QUALITY ASSURANCE

- A. In addition to requirements specified in this Article, comply with quality assurance requirements specified in other Sections with Delegated Design components.
- B. Quality assurance requirements specified in this Section and other Sections constitute minimum acceptable standards for this Project.
- C. Documentation: Comply with the following:
 - 1. Uniform Drawing System, NCS/UDS published by National Institute of Building Sciences.
 - 2. Minimum Text Size: 1/8 inch.
- D. Pre-Submittal Meeting: Meet with Design-Builder Architect of Record, Design-Builder Engineer of Record, subcontractors, and Trade Partner's Design Professional to discuss requirements of work, submittals, scheduling, and sequencing of Delegated Design components.
- E. Contractor's Trade Professional's Qualifications: In addition to qualification requirements specified in Sections containing Delegated Design components, ensure submittals for items required to be sealed by professional engineer are prepared, sealed, and signed under direct control and supervision of Contractor's Trade Professional who has professional liability insurance with minimum limit of liability as shown in contract with Design Builder in force.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Delegated Design Components: Refer to individual Project Manual Sections for work requiring Delegated Design, including specific Professional Liability insurance limits of liability.
- B. Delegated Design components and systems shown in Contract Documents are shown for design intent with the Trade Partner responsible for designing, providing, coordinating, and installing Delegated Design components including specified products.
 - 1. Design components requiring Delegated Design that are attached to structural frame or supplemental to structural frame for anticipated loads specified on structural drawings, inherent gravity loads supported by system and coordinated with Design Builder, or loads included in applicable building codes where Project is located.
 - a. Clearly define load reactions at interface between Delegated Design components and structural frame to allow for review by Design Builder Engineer of Record.
 - 2. Design all non-structural components in compliance with applicable regulations, performance criteria, and submittal requirements as specified in the respective sections.
 - 3. Coordinate Delegated Design components with appropriate subcontractors.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3573

SECTION 01 4000 – QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality- assurance and -control procedures that facilitate compliance with the Contract Document requirements or relieve the Contractor of the responsibility for compliance with the Contract Document requirements.
 - 3. Services of testing laboratories and Special Inspectors as specified are intended for the Owner's verification of the Contractor's compliance with the requirements of the Contract Documents and include requirements of authorities having jurisdiction (AHJ).
 - 4. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 5. The services and quantities of testing specified are approximate and may vary. Actual services and quantities of testing will be determined by the Owner, Architect, AHJ, and Commissioning Authority during the construction period.
 - 6. Specific test and inspection requirements are not specified in this Section.

1.2 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 Testing: 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. 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.

- E. 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.
- F. Source Quality Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. 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.
- I. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate 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.

1.3 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.

1.4 CONFLICTING REQUIREMENTS

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

1.5 ACTION SUBMITTALS

- A. 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.

1.6 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 sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- 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. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- 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.

1.7 CONTRACTOR'S QUALITY CONTROL PLAN

- A. Quality Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Owner. 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 full-time 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 shall not have other Project responsibilities.
 - 2. CQM-C certified or as approved by Owner.

- 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.
 - 2. Special inspections required by authorities having jurisdiction and indicated in Section 014523, specific Sections, or on Drawings.
 - 3. Owner-performed tests and inspections indicated in the Contract Documents including tests and inspections indicated to be performed by the 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. Process shall be approved by Owner and Architect.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect, testing and inspection agencies, Owner, or AHJ, 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.

1.8 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, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results, an interpretation of test results, and statement whether tested or inspected Work complies with the Contract Document requirements.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Name and signature of laboratory inspector.
 - 12. Recommendations for retesting and reinspection procedures of non-conforming work.
- 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, and telephone number 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, and telephone number 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.

1.9 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and possessing required licenses, specified certifications and manufacturers approvals.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications 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. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 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, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 - g. When requested by the Owner, Architect, testing agency, or Special Inspector, immediately provide copies of mill reports, cutting lists, material bills, shipping bills, time and place of shipment of materials to shop, and any relevant data on previous testing and investigations of materials.
 - 2. **Testing Agency Responsibilities:** Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, Owner, and Commissioning Authority 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.

1.10 QUALITY CONTROL

- A. Coordinate with Section 01 4523.
- B. **Owner Responsibilities:** Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency and/or Special Inspector 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 inspecting they are engaged to perform.
 - 2. Payment for these services will be made directly by Owner.
 - 3. Costs for retesting and reinspecting construction due to the following reasons will be charged to Contractor and the Contract Sum will be adjusted by Change Order:
 - a. Additional testing required after correction of defective materials or workmanship

- to verify compliance with Contract Documents.
 - b. Materials or practices not complying with the Contract Documents that could possibly result in defective work rendering it necessary or advisable to perform additional testing to determine if the work is acceptable.
 - c. Changes in source, quality or characteristics of materials.
 - d. Site-cured cylinders requested by the Contractor.
- C. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required of Contractor by authorities having jurisdiction, 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. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Provide testing agencies and inspectors, minimum 48 hours notice in advance of time when Work that requires testing or inspecting will be performed.
 - a. Provide Owners inspection staff, minimum 48 hours notice in advance of time when Work that requires testing or inspecting 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 inspecting 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.
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- 1. The Contractor shall bear all costs associated with retesting and reinspecting after the work has been corrected to further verify compliance with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Owner, Contractor, Architect, and Commissioning Authority in performance of duties. Provide qualified personnel to perform required tests and inspections.
- 1. Notify Owner, Contractor, Architect, and Commissioning Authority promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine from the Architect the location 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 any duties of Contractor.
- F. **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."
- G. **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.
- H. **Associated 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. Cooperation and access to the Work, including (but not limited to) cooperation with testing agency personnel and Special Inspectors by providing proper facilities for access including scaffolding, temporary work platforms, and hoisting facilities required for inspections in the shop or in the field.
 2. Incidental labor and facilities necessary to facilitate tests and inspections, including (but not limited to) providing access to the work to be inspected or tested, obtaining and handling samples at the Site, and facilitating inspections and tests.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
 8. A complete set of shop drawings for the items being tested and inspected.
 9. Contractor shall consult with Owner to identify Owners designated representative for quality control monitoring of specific work areas defined by Owner. Coordinate schedule with designated representative prior to starting work requiring Owner's review.
- I. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- J. **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 schedule concurrently with Contractor's construction schedule within 30 days of date established for the Notice to Proceed. Update as the Work progresses.

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

1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency 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, Commissioning Authority, 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, Owner, and Commissioning Authority 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, Owner, Commissioning Authority, 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, Owner, and Commissioning Authority 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. Submit list of firms proposed for testing for Owner approval.

3.2 TEST AND INSPECTION LOG

- A. Prepare a log to 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 modifications as they occur. Provide access to test and inspection log for Owners, Architect's, and Commissioning Authority's, reference during normal working hours.
1. Submit all Quality Assurance/Quality Control logs at Project closeout as part of Project Record Documents.

3.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes to the satisfaction of the Architect and Owner.
1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 2. Comply with the Contract Document requirements for Section 01 7329 "Cutting and Patching."
- 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. Contractor shall be responsible for all damages or incurred cost.

END OF SECTION 01 4000

SECTION 01 4200 – REFERENCES**PART 1 – GENERAL**

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- J. "Contract Limit": Space available for performing construction activities; the primary area of Work may be indicated by a Limit of Construction line on Drawings, but Work necessary to complete the Project can also occur beyond this limit. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- K. "Remove": Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- L. "Remove and Salvage": Detach items from existing construction and deliver them to Owner, ready for reuse, when specified.
- M. "Salvage": Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner, ready for reuse, when specified. Include fasteners or brackets needed for reattachment elsewhere.
- N. "Remove and Reinstall": Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

- O. "Existing to Remain": Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.
- P. "Demolish": Tearing down, destruction, breakup, razing or removal of the whole or part of a building or structure, or a free-standing machinery or equipment that is directly related to the function of the structure.
- Q. "Recycle": Recovery of demolition waste for subsequent processing in preparation for reuse.
- R. Permanent Enclosure: As determined by Architect and Owner, the condition at which roofing is insulated and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures equivalent in weather protection to permanent construction.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
 - 1. AABC - Associated Air Balance Council; www.aabc.com.
 - 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 - 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
 - 4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 - 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 - 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 - 7. ABMA - American Boiler Manufacturers Association; www.abma.com.
 - 8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
 - 9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 - 10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
 - 11. AF&PA - American Forest & Paper Association; www.afandpa.org.
 - 12. AGA - American Gas Association; www.aga.org.
 - 13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
 - 14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
 - 15. AI - Asphalt Institute; www.asphaltinstitute.org.

16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC- Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.

64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
83. FM Approvals - FM Approvals LLC; www.fmglobal.com.
84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarroof.com.
86. FSA - Fluid Sealing Association; www.fluidsealing.com.
87. FSC - Forest Stewardship Council U.S.; www.fscus.org.
88. GA - Gypsum Association; www.gypsum.org.
89. GANA - Glass Association of North America; www.glasswebsite.com.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
95. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
96. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
97. IAS - International Accreditation Service; www.iasonline.org.
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; www.iccsafe.org.
101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
104. IEC - International Electrotechnical Commission; <http://www.iec.ch>.
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
109. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
110. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.

111. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
116. ISO - International Organization for Standardization; www.iso.org.
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; www.itu.int/home.
119. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; www.lightning.org.
122. MBMA - Metal Building Manufacturers Association; www.mbma.com.
123. MCA - Metal Construction Association; www.metalconstruction.org.
124. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
125. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
126. MHIA - Material Handling Industry of America; www.mhia.org.
127. MIA - Marble Institute of America; www.marble-institute.com.
128. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
129. MPI - Master Painters Institute; www.paintinfo.com.
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
131. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
132. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
133. NADCA - National Air Duct Cleaners Association; www.nadca.com.
134. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
135. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
136. NBI - New Buildings Institute; www.newbuildings.org.
137. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
138. NCMA - National Concrete Masonry Association; www.ncma.org.
139. NEBB - National Environmental Balancing Bureau; www.nebb.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
141. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
142. NEMA - National Electrical Manufacturers Association; www.nema.org.
143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
145. NFPA - National Fire Protection Association; www.nfpa.org.
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; www.nfrc.org.
148. NHLA - National Hardwood Lumber Association; www.nhla.com.
149. NLGA - National Lumber Grades Authority; www.nlga.org.
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
152. NRCA - National Roofing Contractors Association; www.nrca.net.
153. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
154. NSF - NSF International; www.nsf.org.
155. NSPE - National Society of Professional Engineers; www.nspe.org.
156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
158. NWFA - National Wood Flooring Association; www.nwfa.org.

159. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
160. PDI - Plumbing & Drainage Institute; www.pdionline.org.
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
162. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
163. RFCI - Resilient Floor Covering Institute; www.rfci.com.
164. RIS - Redwood Inspection Service; www.redwoodinspection.com.
165. SAE - SAE International; www.sae.org.
166. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
167. SDI - Steel Deck Institute; www.sdi.org.
168. SDI - Steel Door Institute; www.steeldoor.org.
169. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; www.siaonline.org.
172. SJI - Steel Joist Institute; www.steeljoist.org.
173. SMA - Screen Manufacturers Association; www.smainfo.org.
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
175. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
176. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
177. SPIB - Southern Pine Inspection Bureau; www.spib.org.
178. SPRI - Single Ply Roofing Industry; www.spri.org.
179. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
180. SSINA - Specialty Steel Industry of North America; www.ssina.com.
181. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
182. STI - Steel Tank Institute; www.steeltank.com.
183. SWI - Steel Window Institute; www.steelwindows.com.
184. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
185. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
186. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
190. TMS - The Masonry Society; www.masonrysociety.org.
191. TPI - Truss Plate Institute; www.tpinst.org.
192. TPI - Turfgrass Producers International; www.turfgrasssod.org.
193. TRI - Tile Roofing Institute; www.tilerroofing.org.
194. UL - Underwriters Laboratories Inc.; www.ul.com.
195. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
196. USGBC - U.S. Green Building Council; www.usgbc.org.
197. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
198. WASTEC - Waste Equipment Technology Association; www.wastec.org.
199. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
200. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
201. WDMA - Window & Door Manufacturers Association; www.wdma.com.
202. WI - Woodwork Institute; www.wicnet.org.
203. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
204. WWPA - Western Wood Products Association; www.wwpa.org.

- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following

list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1. CBC – California Building Code (Title 24, Part 2, CCR)
2. CSFM – California State Fire Marshal
3. CalGreen – California Green Code, (Title 24, Part 11, CCR)
4. OSHPD - Office of Statewide Health Planning and Development (California)
5. DSA – Division of State Architect (California)
6. DIN - Deutsches Institut für Normung e.V.; www.din.de.
7. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
8. ICC - International Code Council; www.iccsafe.org.
9. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1. ADA – Americans with Disabilities Act
2. ADAS – Americans with Disabilities Act Standards
3. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.

4. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
 5. DSCC - Defense Supply Center Columbus; (See FS).
 6. FED-STD - Federal Standard; (See FS).
 7. FS-Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
 8. MILSPEC - Military Specification and Standards; (See DOD).
 9. USAB - United States Access Board; www.access-board.gov.
 10. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
 2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
 3. CDHS; California Department of Health Services; (See CDPH).
 4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
 5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
 6. LADBS; Los Angeles Department of Building and Safety; www.ladbs.org
 7. LADWP; Los Angeles Department of Public Works; www.ladwp.com.
 8. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
 9. US Forest Service; www.fs.usda.gov.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION (Not Used)****END OF SECTION 01 4200**

SECTION 01 4339 – INTEGRATED EXTERIOR WALL MOCK-UPS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Integrated exterior wall mock-ups.
 - a. Exterior Mock-up 1: As specified per the project.
 - 2. Structural engineering of mock-up as required to implement Mock-Ups.
 - 3. Design of mock-up, including shop drawings, showing configuration as specified and designated elements as shown on drawings.
 - 4. Disposal of mock-up.
 - 5. Testing payment as indicated.
- B. This Section does not represent, or limit application of mock-ups specified in individual Sections.
- C. Refer to applicable Sections in Division 02 through Division 33 for requirements for mock-ups specific to individual sections.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Fabrication / Pre-Installation Meetings: Prior to starting fabrication or installation of mock-ups, schedule meeting at mutually acceptable time with Owner, Owner's consultants, Architect, Contractor, affected Subcontractors and Installers, affected manufacturer's representatives, and other parties affected by mock-ups to review materials, methods, and procedures required for mock-ups.
- B. Obtain Owners approval of scope of mockup including testing.

1.3 SUBMITTALS

- A. Submittal Processing: In order to expedite ordering of components and materials required to construct mock-ups, provide submittals as required to obtain approvals of mock-up components and materials.
- B. Product Data: Prior to construction of mock-ups, provide material samples as specified in the respective specification sections that are included as part of the mock-up.
- C. Shop Drawings: Prior to mock-up fabrication, submit shop drawings for mock-up that integrate shop drawings specified in applicable Sections for each component and finish material required for mock-up.
 - 1. Clearly identify components and materials to be integrated into mock-up.
 - 2. Provide complete details of all materials, clearly showing sequence of installation, method of installation, and all components necessary to fully describe mock-up.
 - 3. Indicate manufacturer and model number of individual components.
 - 4. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

5. Prior to mock-up fabrication and construction, obtain Architect's and Owners acceptance of Shop Drawings in accordance with Section 013300 - Submittal Procedures.
- D. Samples: Submit samples specified in applicable Sections for components and materials included in mock-up.
- E. Certifications
 1. Related Contractor and Subcontractor Review and Acceptance Certification: Submit certification specified in Review and Acceptance paragraph in General - Mock-ups article in Part 2 of this Section.

1.4 QUALITY ASSURANCE

- A. General mock-up requirements
 1. Purpose of mock-up includes, but is not necessarily limited to, the review of appearance, quality of workmanship, range of aesthetic effects and workmanship, coordination, compatibility, and relationships with adjacent materials, to test air and water infiltration performance, and to provide Contractor with opportunity to coordinate Subcontractor Work.
 2. Maintain quality control over Work of various Sections of Specifications, manufacturers, products, services, workmanship, and site conditions to produce mock-ups in accordance with the Contract Documents.
 3. Performance requirements specified for each material shall apply to each Mock-up, including tolerances and material properties.
- B. Design, engineer, and construct mock-up, including required shoring, bracing, foundations, power, and related requirements.
 1. Comply with performance requirements specified in the individual Specification Sections.
 2. Maintain design concept, member profiles, and alignment of components.
- C. During Mock-up assembly, notify Architect and Owner of conditions that may violate material manufacturers warranty, installation procedures, or recommendations.
- D. Testing Agency Qualifications:
 1. Qualified according to ASTM E 329 and E 699 for testing indicated.
 2. Testing Agency shall be approved by Owner.
- E. Following acceptance, mock-ups shall serve as a performance standard of quality and appearance of the Work it represents, including the interface with adjacent materials and components as applicable.
 1. Contractor shall have subcontractors whose Work is affected by the Mock-up(s) review the Mock-up and agree to certify to meet the standards and quality shown. Submit signed certifications to Owner.
 2. Construction of the mock-up assemblies shall be under the supervision of the same personnel who will be employed for the subsequent work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate fabrication, delivery, assembly, and installation with related materials included in mock-ups.

1.6 FIELD/SITE CONDITIONS

- A. Maintain mock-ups in neat, clean condition until removal or final acceptance. Repair damage as required to maintain in condition suitable for review and approval.
 - 1. Protect mock-ups as required to permit installation during inclement weather and high winds. Provide protective coverings required to avoid damage to mock-up assembly until final acceptance, including all testing.

PART 2 – PRODUCTS

2.1 GENERAL – MOCKUPS

- A. Description of mock-ups: Full-size, physical assemblies, constructed on-site, to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review construction, coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances.
 - 1. Construct mock-up using materials complying with performance requirements specified in applicable section, including tolerances and material properties.
 - 2. Demonstrate proposed range of aesthetic effects and workmanship.
- B. Mock-up Construction/Fabrication: Before installing portions of construction requiring mock-ups, fabricate or construct mock-ups for each form of construction and finish required to comply with following requirements, using materials indicated for completed construction:
 - 1. Construct or fabricate mock-up with all components and materials indicated for related subsequent construction, including required shoring, bracing, foundations, power, and related requirements, unless otherwise shown on Drawings. Provide engineering services required for construction or fabrication of mock-up.
 - a. Construct mock-up in location and of size indicated on Drawings, described in this Section, described in individual Section, or if not indicated, as directed by Architect.
 - 2. Construct mock-ups complying with performance requirements specified in applicable individual Sections.
 - 3. Maintain design concept of mock-up assembly, including member profiles and alignment of components.
 - 4. Photograph mock-up assemblies at each review stage and distribute clear and well-defined photographs to establishing standard of workmanship and construction for observation of subsequent construction.
 - 5. Scheduling: Construct mock-ups in timely manner permitting review and modifications without delaying subsequent construction.
 - a. Do not proceed with ordering of components for subsequent construction or start subsequent construction until after all acceptances of mock-up assemblies have been obtained, including Architect and Owner's acceptance.
 - b. Notify Architect and Owner seven days in advance of dates and times when mock-ups will be constructed.
 - c. Include line item in Construction Schedule specified in Division 01 for each mock-up, showing submittals, construction, review, and acceptance periods.

- d. Allow sufficient time in schedule to accommodate failures of tests and required modification and retesting of mock-up assembly. Erect mock-up in sufficient time to allow final approval of texture and color of components of mock-up assembly.
- C. Modifications: Provide modifications required to achieve mock-ups acceptable to Architect and Owner, meeting testing requirements and demonstrating quality required by Contract Documents.
 - 1. Approval of mock-ups does not constitute approval of deviations in mock-ups from Contract Documents unless specifically approved in writing by Architect and Owner.
- D. Review and Acceptance: Obtain Architect and Owner's acceptance of mock-up assembly before starting fabrication or construction illustrated by mock-up assembly.
 - 1. Timing: Provide not less than 7 days for initial review of mock-up assembly and not less than 7 additional days for review of each revision to mock-up assembly.
 - 2. Architect and Owner's Review of Partial Mock-up: If requested by Contractor or Owner, review of partial mock-ups does not constitute acceptance of incomplete mock-up construction or mock-up construction not installed. Review of partial mock-ups applicable only for completed work as requested and not for adjacent construction.
 - 3. Related Contractor and Subcontractor Review: Arrange for review of mock-up by Contractors and Subcontractors whose construction is affected by construction illustrated by mock-up assembly.
 - a. Certification: Obtain written certification from related Contractors and Subcontractors that construction of mock-up assembly meets standard, and quality required for their construction.
 - 4. Accepted mock-ups: Following acceptance, mock-ups provide performance standard of quality and appearance for construction represented by mock-up, including interface with adjacent materials and components.
- E. Incorporation into Subsequent Construction: Do not incorporate mock-up assembly into subsequent construction. Maintain mock-up assembly through completion of building exterior to provide standard for workmanship. Demolish and remove mock-ups when directed, unless otherwise indicated.

2.2 INTEGRATED PLASTER WALL / METAL WALL PANEL / CURTAINWALL MOCKUP – MOCK- UP

- A. Mock-up 1 Assembly Description: Mock-up of exterior plaster, aluminum plate panel and curtainwall assembly erected separately from building but on Project site. Construct mock-up as shown on Drawings, according to accepted Shop Drawings and as specified:
 - 1. Comply with requirements specified in individual Sections in Divisions 01 through 13 applicable to mock-up including related supporting components.
- B. Provide design, engineering and construction of freestanding exterior MOCK-UP 1 as specified.
 - 1. Contractor shall prepare complete construction documents as required to construct the mock-up incorporating components as specified.
 - 2. Contractor shall prepare and mock-up construction documents as a shop drawing submittal.

3. Mock-up shall include elements as designated and as shown on drawings.
 4. Construct as a single structure, co-planar, configured as follows.
 - a. Mock-up shall consist of plaster wall assembly. Panel shall be approximately 6 feet wide x 8 feet high and include both a horizontal and vertical control joint at panel midpoint.
 - b. Mock-up shall include aluminum plate wall assembly. Panel shall be approximately 6 feet wide x 8 feet high, made up of two separate aluminum plate panels with vertical and horizontal joint.
 - c. Provide one panel of aluminum curtainwall CW-02, approximately 4 foot wide x 8 foot high, located between plaster and aluminum plate assemblies.
 - d. All joints between panels shall be as detailed and specified.
- C. Provide composite drawings of Mock-up 1 prior to fabrication for approval by the Architect and Owner. Mock-up 1 shall be constructed out of sequence and will not be incorporated into the final building. The mock-up shall remain in place through the completion of the building exterior and serve as the standard for workmanship once it has been accepted in writing by the Architect and Owner. Construct the mock-ups to accommodate negative pressure chambers and with perimeter walls to protect from water test overspray during the water tests.
- D. Exterior Mock-up 1 – Plaster and Metal Panel Wall Scope:
1. Exterior plaster and metal panel wall assembly systems and finishes, including all transitions and interfaces between different materials and walls to roof coping, openings/curtain wall and storefronts as indicated.
 - a. Concrete edge of slab construction reflecting typical exterior wall condition, of sufficient dimension to construct sill flashing and transitions and testing.
 - b. Cold formed metal framing as specified in Section 05 4000.
 - c. Exterior sheathing as specified in Section 09 2610.
 - d. Weather Barrier as specified in Section 07 2500.
 - e. Cladding support clips as specified in Section 07 4 800.
 - f. Exterior insulation as specified in Section 07 2100.
 - g. Plaster and Metal Wall Panel finish as specified in Section 07 4210 and 09 2400, including screeds, flashings, control and expansion joints, intersections with curtainwall heads/jamb/sills condition. Include detailing for membrane penetrations such as hose bibb boxes, electrical boxes, and structural bracing.
 - h. Curtainwall as specified in Section 08 423, CW-02, glazed as specified.
 2. Interior finishes shall not be installed on the interior side of the mock-up.
 3. Construct Mock-up in scheduled review phases. Architect and Owner will review Mock-up in the following review phase sequences. Notify Architect and Owner when each sequence of the Mock-up is constructed.
 - a. Phase 1:
 - 1) Steel stud and exterior sheathing, weather barrier.
 - 2) Curtainwall, perimeter membrane flashing and metal flashings.
 - 3) Cladding support system.
 - b. Phase 2: Finished plaster assembly and metal panel assembly, including insulation, lath, underlayment and three coat plaster assembly application.
- E. Mock-up Testing:

1. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
2. Testing Services: Testing and inspecting of representative areas to determine compliance of installed system with specified requirements shall take place as follows and in successive stages as indicated. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
3. Mock-up Testing – Phase 1: After completion of specified scope;
 - a. Adhesion Testing: Test weather barrier for minimum weather barrier adhesion of 15 lbf/sq. in. according to ASTM D 4541.
 - b. Static Water penetration Testing: Test at 6.25 PSF per ASTM E 1105.
4. Mock-up Testing – Phase 2 (Plaster Wall and Metal Panel):
 - a. Static Water penetration Testing:
 - 1) Test at 8.0 PSF per ASTM E 1105.
 - b. Perform water penetration test as indicated, including reveals, control joints, trim and joints with adjacent materials.
5. The following water leakage definition supersedes the water penetration definition described in ASTM E1105, Paragraph 3.2.3: Water leakage is defined as any uncontrolled water that appears on any interior surfaces that is not contained or drained back to the exterior or that can cause damage to adjacent materials or finishes. Water contained within drained flashings, wept gutters and wept sills is not considered water leakage.
 - a. If water leakage occurs, review and retest Mock-up. Modifications must be realistic in terms of job conditions, must maintain standards of quality and durability, and are subject to review and action by Architect and Owner.
 - b. Protect Mock-up from moisture flanking sides of Mock-up during testing and review.

2.3 MATERIALS

- A. Incorporate materials required for mock-up as specified in applicable Sections of Division 02 through Division 33.

2.4 FABRICATION

- A. Do not fabricate mock-up until acceptance of submittals required in applicable Sections in Divisions 02 through 33 for all materials incorporated into mock-ups. Include in Project Schedule specified in Section 01 3200 – Construction Progress Documentation shall early submittal of components required for mock-up.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine conditions where mock-ups are to be constructed and notify Architect and Owner of conditions that may violate manufacturer's warranty, installation procedures, or recommendations for any component in mock-up.

1. Do not begin fabrication or installation of mock-up until unsatisfactory conditions have been corrected. Beginning fabrication or installation indicates acceptance of existing conditions.

3.2 CONSTRUCTION / FABRICATION OF MOCK-UPS

- A. Arrange for mock-up assemblies to be constructed by installation personnel who will install subsequent construction under supervision of same personnel that will supervise subsequent construction illustrated by mock-up-.
- B. Ensure personnel representing manufacturers, fabricators, and installers of mock-ups are present during mock-up construction and testing for efficient evaluation and revision if required.

3.3 FIELD QUALITY CONTROL

- A. Review of Mock-up
 1. Notify Architect and Owner at start of mock-up construction or fabrication and submit mock-up construction progress reports to allow Architect and Owner to schedule reviews.
 2. Sequence of Mock-up Review: Arrange review of mock-ups in following sequences:
 - a. Integrated Exterior Mock-up 1: Phase based review as specified in this Section.
 3. Schedule completion and revision of mock-ups necessary to obtain acceptance to avoid delay in Project Construction Schedule. Update Construction Schedule specified in 013200- Construction Progress Documentation to reflect required revisions to mock-ups.
- B. Testing: Conduct tests of mock-ups in presence of Owner, Architect, Contractor, and all related Installers. Proceed with each test only after acceptance of detailed test procedure. Conduct tests as indicated for each mock-up.
 1. Provide testing as specified in applicable Sections in Division 02 through Division 33 for mock-up components and mock-up assembly.
 2. Mock-Up 1: Testing as specified in this Section.
 3. Test Report:
 - a. Photographs: Take photographs at locations and intervals as indicated for each Mock-up. Submit digital color images of mock-up before, during, and after testing and include these images in test report. Provide report to Owner and Architect. Comply with photographic quality requirements specified in Section 01 3233 – Photographic Documentation.
 - b. Details of Test Results: List test results in order of testing and document all tests required by mock-up criteria in test report stating each of following:
 - 1) Test results achieved.
 - 2) Indicate any revisions made to test specimen to achieve test results reported in test report and graphically describe on mock-up shop drawings.
 - 3) Testing dates.
 - 4) Failure analysis as appendix to test report indicting any corrective action taken to achieve compliance with specification.

- C. Corrective Measures: Correct any deficiencies in mock-up observed during testing and repeat tests as required to show compliance with specified performance requirements and Contract Documents. Resubmit any submittals affected by corrections and resubmit Shop Drawings with changes made to assemblies to successfully complete preconstruction testing.
 - 1. Deficiencies requiring repair or modification to mock-up require complete retesting of mock-up. If compliance with specified performance requirements is not achieved after 2 complete retests, replace mock-up completely with revised construction and start testing from beginning.
 - 2. Incorporate corrective measures indicated by test report into final construction based on documentation provided by Architect.
- D. Acceptance of Mock-up: Obtain acceptance of mock-up in writing based on successful testing results and completed test report.

3.4 DISPOSAL

- A. When authorized by Owner, demolish and remove all components of composite mock-ups from Project site.

END OF SECTION 01 4339

SECTION 01 4339.1 – INTEGRATED INTERIOR MOCK-UPS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior Lab Classroom mock-up – Mock-up 1, constructed on-site, out of sequence, within building shell.
 - 2. Engineering of mock-up elements as required to implement scope.
 - 3. Design of mock-up, including shop drawings, showing configuration as specified and designated elements as shown on drawings.
 - 4. Disposal of Mock-up.
 - 5. Testing payment as indicated.
- B. This Section does not represent, or limit application of mock-ups specified in individual Sections.
- C. Refer to applicable Sections in Division 02 through Division 33 for requirements for mock-ups specific to individual sections.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Fabrication / Pre-Installation Meetings: Prior to starting fabrication or installation of mock-ups, schedule meeting at mutually acceptable time with Owner, Owner's consultants, Architect, Contractor, affected Subcontractors and Installers, affected manufacturer's representatives, and other parties affected by mock-ups to review materials, methods, and procedures required for mock-ups.

1.3 SUBMITTALS

- A. Submittal Processing: In order to expedite ordering of components and materials required to construct mock-ups, provide submittals as required to obtain approvals of mock-up components and materials.
- B. Product Data: Prior to construction of mock-ups, provide material samples as specified in the respective specification sections that are included as part of the mock-up.
- C. Shop Drawings: Prior to mock-up fabrication, submit shop drawings for mock-up that integrate shop drawings specified in applicable Sections for each component and finish material required for mock-up.
 - 1. Clearly identify components and materials to be integrated into mock-up.
 - 2. Provide complete details of all materials, clearly showing sequence of installation, method of installation, and all components necessary to fully describe mock-up.
 - 3. Indicate manufacturer and model number of individual components.
 - 4. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
 - 5. Prior to mock-up fabrication and construction, obtain Architect and Owner's acceptance of Shop Drawings in accordance with Section 01 3300 - Submittal Procedures.
- D. Samples: Submit samples specified in applicable Sections for components and materials included in mock-up.

E. Certifications

1. Related Contractor and Subcontractor Review and Acceptance Certification: Submit certification specified in Review and Acceptance paragraph in General - Mock-ups article in Part 2 of this Section.

1.4 QUALITY ASSURANCE

A. General mock-up requirements

1. Purpose of mock-up includes, but is not necessarily limited to, the review of appearance, quality of workmanship, range of aesthetic effects and workmanship, coordination, compatibility, and relationships with adjacent materials, to test user procedure functionality, and to provide Contractor with opportunity to coordinate Subcontractor Work.
2. Maintain quality control over Work of various Sections of Specifications, manufacturers, products, services, workmanship, and site conditions to produce mock-ups in accordance with the Contract Documents.
3. Performance requirements specified for each material shall apply to each Mock-up, including tolerances and material properties.

B. Design, engineer, and construct mock-up, including required shoring, bracing, foundations, power, and related requirements.

1. Comply with performance requirements specified in the individual Specification Sections.
2. Maintain design concept, member profiles, and alignment of components.

C. During Mock-up assembly, notify Architect and Owner of conditions that may violate material manufacturers warranty, installation procedures, or recommendations.

D. Testing Agency Qualifications:

1. Qualified according to ASTM E 329 and E 699 for testing indicated.
2. Testing Agency shall be approved by Owner
3. Testing Agency shall be approved by AHJ.

E. Following acceptance, mock-ups shall serve as a performance standard of quality and appearance of the Work it represents, including the interface with adjacent materials and components as applicable.

1. Contractor shall have subcontractors whose Work is affected by the Mock-up(s) review the Mock-up and agree to certify to meet the standards and quality shown. Submit signed certifications to Owner.
2. Construction of the mock-up assemblies shall be under the supervision of the same personnel who will be employed for the subsequent work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Coordinate fabrication, delivery, assembly, and installation with related materials included in mock-ups.

1.6 FIELD/SITE CONDITIONS

- A. Maintain mock-ups in neat, clean condition until removal or final acceptance. Repair damage as required to maintain in condition suitable for review and approval.
 - 1. Protect mock-ups as required to permit installation during on-going construction. Provide protective coverings required to avoid damage to mock-up assembly until final acceptance, including all testing.

PART 2 - PRODUCTS

2.1 GENERAL – MOCK-UPS

- A. Description of Mock-ups: Full-size, physical assemblies, constructed on-site, to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review construction, coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances.
 - 1. Construct mock-up using materials complying with performance requirements specified in each applicable section, including tolerances and material properties.
 - 2. Demonstrate proposed range of aesthetic effects and workmanship.
- B. Mock-up Construction/Fabrication: Before installing portions of construction requiring mock-ups, fabricate or construct mock-ups for each form of construction and finish required to comply with following requirements, using materials indicated for completed construction:
 - 1. Construct or fabricate mock-up with all components and materials indicated for related subsequent construction. Provide engineering services required for construction or fabrication of mock-up.
 - a. Construct mock-up in location and of size indicated on Drawings, described in this Section, described in individual Section, or if not indicated, as directed by Architect.
 - 2. Construct mock-ups complying with performance requirements specified in applicable individual Sections.
 - 3. Maintain design concept of mock-up assembly, including member profiles and alignment of components.
 - 4. Photograph mock-up assemblies at each review stage and distribute clear and well-defined photographs meeting quality requirements specified in Section 13233, documenting standard of workmanship and construction for observation of subsequent construction.
 - 5. Scheduling: Construct mock-ups in timely manner permitting review and modifications without delaying subsequent construction.
 - a. Do not proceed with ordering of components for subsequent construction or start subsequent construction until after all acceptances of mock-up assemblies have been obtained, including Architect and Owner's acceptance.
 - b. Notify Architect and Owner seven days in advance of dates and times when mock-ups will be constructed.
 - c. Include line item in Construction Schedule specified in Division 01 for each mock-up, showing submittals, construction, review, and acceptance periods.
 - d. Allow sufficient time in schedule to accommodate failures of tests and required modification and retesting of mock-up assembly. Erect mock-up in sufficient time to allow final approval of texture and color of components of mock-up assembly.

- C. Modifications: Provide modifications required to achieve mock-ups acceptable to Architect and Owner, meeting testing requirements and demonstrating quality required by Contract Documents.
 - 1. Approval of mock-ups does not constitute approval of deviations in mock-ups from Contract Documents unless specifically approved in writing by Architect and Owner.
- D. Review and Acceptance: Obtain Architect and Owner's acceptance of mock-up assembly before starting fabrication or construction illustrated by mock-up assembly.
 - 1. Timing: Provide not less than 7 days for initial review of each mock-up assembly phase and not less than 7 additional days for review of each revision to mock-up assembly.
 - 2. Architect and Owner's Review of Partial Mock-ups: If requested by Contractor or Owner, review of partial mock-ups does not constitute acceptance of incomplete mock-up construction or mock-up construction not installed. Review of partial mock-ups applicable only for completed work as requested and not for adjacent construction.
 - 3. Related Contractor and Subcontractor Review: Arrange for review of mock-up by Contractors and Subcontractors whose construction is affected by construction illustrated by mock-up assembly.
 - a. Certification: Obtain written certification from related Contractors and Subcontractors that construction of mock-up assembly meets standard and quality required for their construction.
 - 4. Accepted Mock-ups: Following acceptance, mock-ups provide performance standard of quality and appearance for construction represented by mock-up, including interface with adjacent materials and components.
- E. Maintain mock-ups in neat, clean condition until removal or final acceptance. Repair damage as required to maintain in condition suitable for review and approval.
 - 1. Provide protective coverings or enclosure as required to secure mock-up from vandalism, theft, and damage until final approval, including all testing.
- F. Incorporation into Subsequent Construction: Maintain mock-up assembly through completion of building to provide standard for workmanship. Subject to compliance with requirements, accepted mock-ups may be incorporated into subsequent construction if undisturbed at Substantial Completion.

2.2 LAB MOCK-UP ASSEMBLY 1

- A. Mock-up Assembly 1 Description: Mock-up of typical interior lab constructed in place and in stages, as an accelerated mock-up complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
 - 1. Provide a full-scale mock-up of typical laboratory spaces for a three stage (rough-in, templates, and finish) review by Owner. The laboratory mock-up shall include all materials including basic peninsula, basic wall units, fume hood, and utility lines. The actual utilities and equipment does not need to be functional or energized, unless specified otherwise.
 - 2. Construct Mock-up 1 within building shell at location as selected by Contractor and approved by Owner.

3. In the event that problems with coordination of Work of different trades becomes apparent during the construction and review of the mock-up and results in design changes, Owner shall be responsible only for replacement of Work in the actual mock-up construction that satisfies the original design and quality requirements as indicated in the Contract Documents. The Contractor shall be responsible for replacing, without alteration of the Contract Sum or the Contract Time, any such Work outside the extent of the mock-up that is provided before approval of the mock-up construction, and which must be replaced due to design changes resulting from the mock-up review.
4. Comply with requirements specified in individual Sections in Divisions 03 through 33 applicable to mock-up including related supporting components, including materials and assemblies indicated and finished as specified in individual Sections.
5. Provide required lighting and additional lighting as required to enable Architect and Owner to evaluate Room Mock-up.

B. Mock-up Sequence:

1. Stage 1:
 - a. Floor / ceiling shell structure complete.
 - b. Wall framing enclosing room complete.
 - c. Plumbing rough complete, with valves and stub-outs for all connections of all systems. Label all functions.
 - d. Electrical, data, communication and AV rough complete, including pull boxes, device junction-boxes, and controls back boxes. Label all functions.
 - e. Fire sprinkler piping, including head locations.
 - f. Mechanical hydronic piping and air distribution (supply, return, and exhaust drops) as applicable.
 - g. Backing and blocking for finish and equipment elements attached to wall surface, based on drawings.
2. Stage 2:
 - a. Gypsum board finish, taped and textured, un-painted
 - b. Lab equipment, lab fittings, light switches, plumbing fixtures, furniture, and casework/cabinet representations in fire rated foam or cardboard, pasted/screwed to surface and marked on sub-floor.
 - c. Access panels for all valves, shut-off controls.
 - d. Window and glazing representation as required for interior glazing.
 - e. Door Frames
 - f. Door swing radius marked on flooring.
3. Stage 3:
 - a. Finish Flooring and Finish ceiling, including specialty floor, wall and ceiling finishes such as epoxy/resin systems.
 - b. Final wall finish, including paint, in selected colors.
 - c. Doors and door hardware, complete.
 - d. Laboratory casework, countertops of each type, drawer units, cabinets, shelving, sinks with all fittings/fixtures, lab gas/utility outlets, markerboards, tech desks, wire mold, and splash guards.
 - e. Window covering.
 - f. Partition closure on exterior wall.
 - g. Light fixtures and under-cabinet task-light fixtures, with specified lamps, fully energized and operational from switch as designed.

- h. Sprinkler heads, fire alarm horn/strobe, and smoke detector.
 - i. Mechanical air diffuser, registers, grilles.
 - j. Equipment; except Owner-furnished equipment.
 - k. Acoustic insulation.
 - l. Light switches, electrical outlets, temperature and humidity sensors and controls, telephone and data outlets, intercom speakers, and all weather-resistant covers.
 - m. All access panels, diffusers, and grilles
 - n. Room furniture
- C. Evaluation and testing: At each stage, Owner and Architect will evaluate function and location of mock-up elements. Where required, relocate or modify elements prior to construction of next stage.
- 1. Anchorage: As required for seismic compliance.
 - 2. Emergency access to utility shut offs
 - 3. Security of lab equipment.
 - 4. Functional reach ranges and proximities.

2.3 MATERIALS

- A. Incorporate materials required for mock-up as specified in applicable Sections of Division 02 through Division 33.

2.4 FABRICATION

- A. Do not fabricate mock-up until acceptance of submittals required in applicable Sections in Divisions 02 through 33 for all materials incorporated into mock-ups. Include in Project Schedule specified in Section 013 200 – Construction Progress Documentation early submittal of components required for mock-up.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine conditions where mock-ups are to be constructed and notify Architect and Owner of conditions that may violate manufacturer's warranty, installation procedures, or recommendations for any component in mock-up.
- 1. Do not begin fabrication or installation of mock-up until unsatisfactory conditions have been corrected. Beginning fabrication or installation indicates acceptance of existing conditions.

3.2 CONSTRUCTION / FABRICATION OF MOCKUPS

- A. Arrange for mock-up assemblies to be constructed by installation personnel who will install subsequent construction under supervision of same personnel that will supervise subsequent construction illustrated by mock-up.
- B. Ensure personnel representing manufacturers, fabricators, and installers of mock-ups are present during mock-up construction and testing for efficient evaluation and revision if required.

3.3 FIELD QUALITY CONTROL

- A. Review of Mock-up
 - 1. Notify Architect and Owner at start of mock-up construction or fabrication and submit mock-up construction progress reports to allow Architect and Owner to schedule reviews.
 - 2. Sequence of Mock-up Review: Arrange review of mock-ups in following sequences:
 - a. Integrated Interior Mock-ups: Construct Mock-up 1 in sequence as specified in this Section.
 - 3. Schedule completion and revision of mock-ups necessary to obtain acceptance to avoid delay in Project Construction Schedule. Update Construction Schedule specified in 013200 - Construction Progress Documentation to reflect required revisions to mock-ups.
- B. Testing: Conduct tests of mock-ups in presence of Owner, Architect, Contractor, and all related Installers. Proceed with each test only after acceptance of detailed test procedure. Conduct tests as indicated for each Mockup.
 - 1. Provide testing as specified in applicable Sections in Division 02 through Division 33 for mock-up components and mock-up assembly.
- C. Mock-up 1 Testing Scope:
 - 1. Anchorage: Testing criteria as required per project.
 - 2. Emergency access to utility shut offs.
- D. Test Report:
 - 1. Photographs: Take photographs at locations and intervals as indicated for each Mockup. Submit digital color images of mock-up before, during, and after testing and include these images in test report. Comply with requirements specified in Section 01 3233 – Photographic Documentation.
 - 2. Details of Test Results: List test results in order of testing and document all tests required by mock-up criteria in test report stating each of following:
 - a. Test results achieved.
 - b. Indicate any revisions made to test specimen to achieve test results reported in test report and graphically describe on mock-up shop drawings.
 - c. Testing dates.
 - d. Failure analysis as appendix to test report indicting any corrective action taken to achieve compliance with specification.
- E. Corrective Measures: Correct any deficiencies in mock-up observed during testing and repeat tests as required to show compliance with specified performance requirements and Contract Documents. Resubmit any submittals affected by corrections and resubmit Shop Drawings with changes made to assemblies to successfully complete preconstruction testing.
 - 1. Deficiencies requiring repair or modification to mock-up require complete retesting of mock-up. If compliance with specified performance requirements is not achieved after 2 complete retests, replace mock-up completely with revised construction and start testing from beginning.
 - 2. Incorporate corrective measures indicated by test report into final construction based on documentation provided by Architect.

- F. Acceptance of Mock-up: Obtain acceptance of mock-up in writing based on successful testing results and completed test report.

3.4 DISPOSAL

- A. When authorized by Owner, demolish and remove all components of composite mock-ups from Project site.

END OF SECTION 01 4339.1

SECTION 01 4339.2 –CUSTOM CURTAIN WALL MOCK-UP - LAB TESTED**PART 1 – GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Custom Curtainwall Lab Tested mock-up, specified as Mock-up 1.
 - 2. Independent Lab Testing at off-site location
 - 3. Structural engineering of mockup as required to implement Mock-up.
 - 4. Design of mock-up, including shop drawings, showing configuration as specified and designated elements as shown on drawings.
 - 5. Disposal of Mock-up.
 - 6. Testing payment as indicated.
- B. This Section does not represent, or limit application of mock-up specified in individual Sections.
- C. Refer to applicable Sections in Division 02 through Division 33 for requirements for mock-up specific to individual sections.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Fabrication / Pre-Installation Meetings: Prior to starting fabrication or installation of mock-up, schedule meeting at mutually acceptable time with Owner, Owner's consultants, Architect, Contractor, affected Subcontractors and Installers, affected manufacturer's representatives, and other parties affected by mock-up to review materials, methods, and procedures required for mock-up.

1.3 SUBMITTALS

- A. Submittal Processing: In order to expedite ordering of components and materials, provide submittals as required to obtain approvals of mock- up components and materials.
- B. Product Data: Prior to construction of mock-up, provide material samples as specified in the respective specification sections that are included as part of the mock-up.
- C. Shop Drawings – Custom Curtainwall Mock-up 1: Prior to mock-up fabrication, submit shop drawings for mock-up that integrate shop drawings specified in Section 08 4424 for each component and finish material required for mock-up.
 - 1. Clearly identify components and materials to be integrated into mock-up.
 - 2. Provide complete details of all materials, clearly showing sequence of installation, method of installation, and all components necessary to fully describe mock-up.
 - 3. Indicate manufacturer and model number of individual components.
 - 4. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
 - 5. Prior to mock-up fabrication and construction, obtain AHJ, Architect and Owner's acceptance of Shop Drawings and related submittals in accordance with Section 01 3300 - Submittal Procedures and Section 08424.
- D. Samples: Submit samples specified in applicable Sections for components and materials included in mockup.

- E. Delegated Design Submittals: Submit structural calculations indicating structural integrity of mock-up, signed by professional engineer licensed in state where Project is located. Comply with Section 01 3573.
- F. Certifications
 - 1. Related Contractor and Subcontractor Review and Acceptance Certification: Submit certification specified in Review and Acceptance paragraph in General - Mock-up article in Part 2 of this Section.

1.4 QUALITY ASSURANCE

- A. General mock-up requirements
 - 1. Purpose of mock-up includes, but is not necessarily limited to, the review of overall configuration appearance, quality of workmanship, coordination, compatibility of materials used in the mock-up, to test seismic, structural, air and water infiltration performance, and to provide Contractor with opportunity to coordinate Subcontractor Work.
- B. Design, engineer, and construct mock-up, including required shoring, bracing, foundations, power, and related requirements.
 - 1. Comply with performance requirements specified in the individual Specification Sections.
 - 2. Maintain design concept, member profiles, and alignment of components.
- C. During Mock-up assembly, notify Architect and Owner of conditions that may violate material manufacturer's warranty, installation procedures, or recommendations.
- D. Testing Agency Qualifications:
 - 1. Qualified according to ASTM E 329 and E 699 for testing indicated.
 - 2. Testing Agency shall be approved by Owner
 - 3. Testing Agency shall be approved by AHJ.
- E. Following acceptance, mock-up shall serve as a performance standard of quality and appearance of the Work it represents, including the interface with adjacent materials and components as applicable.
 - 1. Contractor shall have subcontractors whose Work is affected by the Mock-up(s) review the Mock-up and agree to certify to meet the standards and quality shown. Submit signed certifications to Owner.
 - 2. Construction of the mock-up assemblies shall be under the supervision of the same personnel who will be employed for the subsequent work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate fabrication, delivery, assembly, and installation with related materials included in mock-up.

1.6 FIELD/SITE CONDITIONS

- A. Maintain mock-up in neat, clean condition until removal or final acceptance. Repair damage as required to maintain in condition suitable for review and approval.
 - 1. Protect mock-up as required to permit installation during inclement weather and high winds. Provide protective coverings required to avoid damage to mock-up assembly until final acceptance, including all testing.

PART 2 – PRODUCTS

2.1 GENERAL – MOCKUPS

- A. Description of Mock-up: Full-size, physical assemblies, fabricated at trade partner facility and constructed on-site at lab/testing facility, to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review construction, coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances.
 - 1. Construct mock-up using materials complying with performance requirements specified in applicable section, including tolerances and material properties.
- B. Mock-up Construction/Fabrication: Before installing portions of construction requiring mock-up, fabricate or construct mock-up for each form of construction and finish required to comply with following requirements, using materials indicated for completed construction:
 - 1. Construct or fabricate mock-up with all components and materials indicated for related subsequent construction, including required shoring, bracing, foundations, power, and related requirements, unless otherwise shown on Drawings. Provide engineering services required for construction or fabrication of mock-up.
 - a. Construct mock-up in location and of size indicated on Drawings, described in this Section, described in individual Section, or if not indicated, as directed by Architect.
 - 2. Construct mock-up complying with performance requirements specified in applicable individual Sections.
 - 3. Maintain design concept of mock-up assembly, including member profiles and alignment of components.
 - 4. Photograph mock-up assemblies at each review stage and distribute clear and well-defined photographs to establishing standard of workmanship and construction for observation of subsequent construction.
 - 5. Scheduling: Construct mock-up as required by construction schedule, in timely manner permitting review and modifications.
 - a. Notify Architect and Owner seven days in advance of dates and times when mock-up will be constructed.
 - b. Include line item in Construction Schedule specified in Division 01 for mock-up, showing submittals, construction, review, and acceptance periods.
 - c. Allow sufficient time in schedule to accommodate failures of tests and required modification and retesting of mock-up assembly.
- C. Modifications: Provide modifications required to achieve mock-up acceptable to Architect and Owner, meeting testing requirements and demonstrating quality required by Contract Documents.

1. Approval of mock-up does not constitute approval of deviations in mock-up from Contract Documents unless specifically approved in writing by Architect and Owner.
- D. Review and Acceptance: Obtain Architect and Owner's acceptance of mock-up assembly before starting fabrication or construction illustrated by mock-up assembly.
1. Timing: Provide not less than 7 days for initial review of mock-up assembly and not less than 7 additional days for review of each revision to mock-up assembly.
 2. Architect and Owner's Review of Partial Mock-up: If requested by Contractor or Owner, review of partial mock-up does not constitute acceptance of incomplete mock-up construction or mock-up construction not installed. Review of partial mock-up applicable only for completed work as requested and not for adjacent construction.
 3. Related Contractor and Subcontractor Review: Arrange for review of mock-up by Contractors and Subcontractors whose construction is affected by construction illustrated by mock-up assembly.
 - a. Certification: Obtain written certification from related Contractors and Subcontractors that construction of mock-up assembly meets standard and quality required for their construction.
 4. Accepted Mock-up: Following acceptance, mock-up provide performance standard of quality and appearance for construction represented by mock-up, including interface with adjacent materials and components.
- E. Maintain mock-up in neat, clean condition until removal or final acceptance. Repair damage as required to maintain in condition suitable for review and approval.
1. Protect mock-up as required to permit mock-up materials installation during wet weather and/or high winds if necessary. Provide protective coverings as required to avoid mock-up damage until final approval, including all testing.
- F. Incorporation into Subsequent Construction: Do not incorporate mock-up assembly into subsequent construction. Disposal of mock-up and components is responsibility of Contractor. Reuse of components in new construction is not permitted.

2.2 MOCK-UP 1 – CUSTOM CURTAINWALL STRUCTURAL TESTING MOCK-UP

- A. Mock-up Assembly Description: Mock-up(s) of custom curtainwall erected at testing facility site. Construct mock-up as shown on Drawings, according to accepted Shop Drawings for deferred approval testing, and as specified in Section 08 4424.
1. Comply with requirements specified in individual Sections in Divisions 01 through 09 applicable to mock-up including related supporting components.
- B. Preconstruction Testing Service: Provide custom curtainwall that comply with test-performance requirements indicated, as evidenced by reports based on Project-specific preconstruction testing by a qualified testing agency approved by AHJ.
1. Owner will engage a qualified testing agency to perform preconstruction testing on preconstruction laboratory mock-up.
 2. Build preconstruction laboratory mock-up at testing agency facility using personnel, materials, and methods of construction that will be used at Project site. See mockup drawing as attached.
 - a. Size: As approved by Owner.

- b. Configuration: As approved by Owner.
 - c. Vertical off-set: Approximately 12 degrees from vertical.
 - d. Notify Architect and Owner 14 days in advance of the dates and times when laboratory mock-up will be constructed.
3. Re-glazing test Panel: Before preload tests, reglaze one vision and one spandrel lite, as selected by the Architect, using proposed field reglazing techniques and material. Allow time for proper sealant curing, as required, prior to continuation of test procedure.
 4. Preconstruction Laboratory Mock-up Testing Program: Perform tests specified in this Section on preconstruction laboratory mock-up in the following order:
 - a. Structural: ASTM E 330 at 50 percent of positive test load.
 - b. Air Infiltration: ASTM E 283.
 - c. Water Penetration under Static Pressure: ASTM E 331.
 - d. Water Penetration under Dynamic Pressure: AAMA 501.1.
 - e. Structural Performance: ASTM E 330 at 100 percent of positive and negative test loads. Repeat the following:
 - 1) Air Infiltration: ASTM E 283.
 - 2) Water Penetration under Static Pressure: ASTM E 331.
 - f. Structural: ASTM E 330 at 50 percent and 100 percent of positive and negative test loads. Repeat the following:
 - 1) Air Infiltration: ASTM E 283.
 - 2) Water Penetration under Static Pressure: ASTM E 331.
 5. Interstory Drift: AAMA 501.4 at 100 percent of design displacement. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
 6. Vertical Interstory Movement: AAMA 501.7. Repeat the following:
 - a. Air Infiltration: ASTM E 283.
 - b. Water Penetration under Static Pressure: ASTM E 331.
- C. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility with and adhesion of each material that will come in contact with sealants and each condition.
1. Test a minimum five production-run samples each of metal, glazing, and other material.
 2. Prepare samples using techniques and primers required for installed assemblies.
 3. Perform tests under environmental conditions that duplicate those under which assemblies will be installed.
 4. For materials that fail tests, determine corrective measures necessary to prepare each material to ensure compatibility with and adhesion of sealants including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

2.3 MATERIALS

- A. Incorporate materials required for mock-up as specified in applicable Sections of Division 02 through Division 33.

2.4 FABRICATION

- A. Do not fabricate mock-up until acceptance of submittals required in applicable Sections in Divisions 02 through 33 for all materials incorporated into mock-up. Include in Project Schedule specified in Section 01 3200 – Construction Progress Documentation shall early submittal of components required for mock-up.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine conditions where mock-up are to be constructed and notify Architect and Owner of conditions that may violate manufacturer's warranty, installation procedures, or recommendations for any component in mock-up.
 - 1. Do not begin fabrication or installation of mock-up until unsatisfactory conditions have been corrected. Beginning fabrication or installation indicates acceptance of existing conditions.

3.2 CONSTRUCTION / FABRICATION OF MOCKUPS

- A. Arrange for mock-up assemblies to be constructed by installation personnel who will install subsequent construction under supervision of same personnel that will supervise subsequent construction illustrated by mock-up.
- B. Ensure personnel representing manufacturers, fabricators, and installers of mock-up are present during mock-up construction and testing for efficient evaluation and revision if required.

3.3 FIELD QUALITY CONTROL

- A. Review of Mock-up
 - 1. Notify Architect and Owner at start of mock-up construction or fabrication and submit mock-up construction progress reports to allow Architect and Owner to schedule reviews.
 - 2. Schedule completion and revision of mock-up necessary to obtain acceptance to avoid delay in Project Construction Schedule. Update Construction Schedule specified in 013200 - Construction Progress Documentation to reflect required revisions to mock-up.
- B. Testing: Conduct tests of mock-up in presence of Owner, Architect, Contractor, and all related Installers. Proceed with each test only after acceptance of detailed test procedure. Conduct tests as indicated for each Mockup.
 - 1. Provide testing as specified in applicable Sections in Division 02 through Division 33 for separate mock-up components and mock-up assembly.
 - 2. Structural loads.
 - a. As indicated on Structural Drawings and as specified in this Section.

3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Air and Water Penetration in excess of specified values.
 - c. Loosening or weakening of fasteners, attachments, and other components.
 - d. Sealant failure at 1/2 maximum story drift.

- C. Structural Loads
 1. Wind Loads: As indicated on Drawings.
 - a. Wind speed = 101 mph Vult; 78 mph nominal
 - b. Exposure: B
 - c. Internal Pressure Coefficient: GCpi = 0.18
 - d. Design Wind Pressure:
 - 1) Region 4: Based on wind loads as shown
 - 2) Region 5: Based on wind loads as shown

 2. Seismic Loads: Design curtainwall assemblies to comply with all criteria shown on Structural Drawings, including:
 - a. ASCE 7, as referenced in the California Building Code.
 - b. 2019 California Building Code, including Chapters 16 and 24.
 - c. Component Importance Factor is 1.25.
 - d. Risk Occupancy Category: III

- D. Structural-Test Performance – Uniform Load Structural Test: Provide test according to ASTM E 330 as follows:
 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Duration: As required by design wind velocity but not less than 10 seconds.

- E. Vertical Inter-Story Movement. Provide test according to ASTM E 330 as follows
 1. No air and water infiltration in excess of primary performance requirements, no breakage, no damage, or disengagement resulting from vertical displacement of the intermediate level support in the plane of the main wall 3/4 inch up and down six complete cycles.

- F. Elastic Lateral Racking – Parallel to Wall. Provide test according to ASTM E 330 as follows:
 1. No air and water infiltration in excess of primary performance requirements, no breakage, no damage, or disengagement resulting from lateral displacement of the intermediate level support in the plane of the main wall at +/- 0.44 percent of story height for three complete cycles in accord with AAMA 501.4.

- G. Deflection of Framing Members: Provide test according to ASTM E 330 as follows:
 1. Deflection Normal to Wall Plane: When tested at both positive and negative design loads, deflection is limited to 1/175 of clear span for spans up to 13 feet 6 inches, and

- to 1/240 of clear span plus 1/4 inch, for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller. Limiting criteria is 1 /4 inch at corners.
- H. Story Drift: Provide test for design displacement of adjacent stories as indicated.
1. Design Displacement: When tested to AAMA 501.4, system design displacement shall not exceed 0.44 percent x the story height and ultimate displacement of 1.75 percent of story height or 3.36 inches for 16 foot story height and 3.78 inch for 18 foot story height, or as indicated on Drawings, whichever is most restrictive.
 2. Test Performance: No glass breakage, anchor failures, or structural damage when tested according to AAMA 501.4.
- I. Air Infiltration Requirements: ASTM E 283; at 6.24 PSF (0.03 kPa).
1. Total amount of air infiltration shall not exceed 0.06 cubic foot/minute/square foot of wall area tested.
- J. Water Penetration Under Static Pressure: In accordance with ASTM E 331; air pressure 20 percent design of wind load; 15 PSF (0.0718 kPa) maximum, applied against face.
1. No uncontrolled water penetration allowed.
- K. Seismic Requirements:
1. Basic System: Per AAMA 501.4, passed for use with NEHRP Group III performance at +/- 3.36 inches for 16 foot story height and 3.78 inch for 18 foot story height lateral displacement from zero when tested at maximum project span conditions. Test reports from certified test laboratory verifying the performance of the system to these criteria shall be submitted to the architect prior to review of any shop drawings.
- L. Test Report:
1. Photographs: Take photographs at locations and intervals as indicated for each Mockup. Submit digital color images of mock-up before, during, and after testing and include these images in test report. Comply with photographic quality requirements specified in Section 01 3233 – Photographic Documentation.
 2. Details of Test Results: List test results in order of testing and document all tests required by mock-up criteria in test report stating each of following:
 - a. Test results achieved.
 - b. Indicate any revisions made to test specimen to achieve test results reported in test report and graphically describe on mock-up shop drawings.
 - c. Testing dates.
 - d. Failure analysis as appendix to test report indicating any corrective action taken to achieve compliance with specification.
- M. Corrective Measures: Correct any deficiencies in mock-up observed during testing and repeat tests as required to show compliance with specified performance requirements and Contract Documents. Resubmit any submittals affected by corrections and resubmit Shop Drawings with changes made to assemblies to successfully complete preconstruction testing.

1. Deficiencies requiring repair or modification to mock-up require complete retesting of mock-up. If compliance with specified performance requirements is not achieved after 2 complete retests, replace mock-up completely with revised construction and start testing from beginning.
 2. Incorporate corrective measures indicated by test report into final construction based on documentation provided by Architect.
- N. Acceptance of Mockup: Obtain Architect, Owner and AHJ acceptance of mock-up in writing based on successful testing results and completed test report.

3.4 DISPOSAL

- A. When authorized by Owner, testing lab shall demolish and remove all components of mock-up.

END OF SECTION 01 4339.2

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS**PART 1 – GENERAL****1.1 SUMMARY**

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow all other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water service use charges for water used by all entities for construction operations.
 - 1. Contractor will pay for water used during the course of the Work. To the extent water is available on the Site, Contractor may use the Owner's existing utilities by paying cost of water used based on Owner supplied meter readings and current water charges. Contractor shall be responsible for providing temporary facilities required to deliver such utility service from its existing location on the Site to point of intended use.
 - 2. Where temporary water is obtained from an Owner approved fire hydrant, connect using only with a water meter supplied by the Owner and an approved backflow device supplied by the Contractor. Contractor shall pay water cost as specified, as well as meter deposits as required by Owner.
 - 3. Contractor shall make potable water available for human consumption.
- D. Electric Power Service:
 - 1. Provide connections and extensions of services as required for construction operations. The Owner will advise the Contractor of the most appropriate source of temporary power. Provide all equipment, including metering, connections, transformers, and other materials necessary for construction operations. Provide temporary power service in compliance with all applicable regulations for temporary power connections as required by serving utility.
 - 2. Restore the Owners facilities to their original condition, except for those portions to be constructed or reconstructed as shown on the Drawings.
 - 3. When necessary, provide self-contained engine generators.
 - 4. Coordinate location of temporary power sources, including poles, generators and disconnect panels, with Owner.
 - 5. Permanent convenience receptacles within area of work may not be utilized during construction

1.3 INFORMATIONAL SUBMITTALS

- A. Construction Phase Site Plan: Show temporary facilities, utility hookups, staging areas, pedestrian and vehicular ingress/egress, storage and office buildings, and parking areas for construction personnel
 - 1. Indicate material storage flow, including notification protocols, delivery, storage and staging, and transfer into building, including temporary vertical access lifts, cranes or material handling conveyors.
 - 2. Define phasing schedule as required for changes in plan layout.
- B. Implementation and Termination Schedule: Submit schedule indicating implementation and termination dates of each temporary utility prior to commencement of construction.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. LEED Submittals: Comply with Section 01 5723 and 01 8113.
- E. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- F. Contractors Emergency Response Contacts: Contractor shall identify responsible Contractor staff and key subcontractor staff to contact in the event of designated emergencies.
 - 1. Water leaks
 - 2. Building element collapse or failure.
 - 3. Underground utility system failures, pipe or conduit damage, and similar underground impacts.
 - 4. Smoke or fire
 - 5. Objectionable odors.
- G. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage. Comply with Section 01 5719 and 01 8113.
- H. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Comply with Section 01 5719 and 01 8113. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste handling procedures.
 - 5. Other dust-control measures.
 - 6. Protection of outside air intakes in adjacent and/or impacted buildings.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary access and egress: Comply with applicable provisions in the 2010 ADA Standards and CBC Chapter 11B regarding access and egress to the Work and temporary office facilities, including parking.
- D. In addition to requirements specified in this Section and related Sections, comply with applicable provisions of the current edition of the California Institute of Technology "General Construction Guide", issued by Caltech Environment, Health, and Safety Office.

1.5 PROJECT CONDITIONS

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

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Pavement: Comply with Division 32 pavement Sections.
- B. Provide site enclosure fencing as shown on drawings reflecting AHJ approved materials, design, and location.
 - 1. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts.
 - 2. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
 - 3. Wood Enclosure Fence: Plywood, 8 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.
- C. Lumber and Plywood: Comply with requirements in Division 06 Section 06 1053 Miscellaneous Rough Carpentry.
- D. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; Type X panels with tapered edges. Comply with ASTM C 36/C 36M.
- E. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- F. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
- G. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
- H. Paint: Comply with requirements in Division 09 painting Sections.

2.2 PROJECT SIGNAGE

- A. Provide project identification sign, prepared by professional sign company.
 - 1. Size: 5 foot wide x 3 foot high.
 - 2. Location: As approved by Owner.
 - 3. Construction: 3/4 inch thick exterior grade, A-C plywood, supported on painted wood frame and post construction, with concrete post footing.
- B. Graphic and Message:
 - 1. Media: Prepared as vinyl printed image, adhesive applied to substrate.
 - 2. Project perspective image as provided by Architect.
 - 3. Text: Project name and content as provided by Owner, Contractor design build team including Architect and consultants.

2.3 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Field Offices, General: Owner may provide conditioned interior space for field offices. Verify availability with Owner.
- C. Common-Use Field Office: Of sufficient size to accommodate needs of Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack board.
 - 3. Communications and Data Services:
 - a. High speed internet WiFi Access.
 - 4. Unisex accessible toilet complying with CBC Chapter 11B.
 - 5. Drinking water.
 - 6. Coffee machine and supplies.
 - 7. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 8. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.4 EQUIPMENT

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

- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section 017700 Closeout Procedures.
 - 4. Provide the following temporary filtration and pressure systems:
 - a. Exhaust air directly to the exterior or into an existing return air system through portable HEPA filters.
 - b. Locate ventilation discharge point at an approved location, away from walkways, HVAC intakes, windows of occupied areas, and other similar locations.
 - c. No internal combustion engines will be allowed within 50 feet of the building or existing buildings without prior written authorization from the Owner.
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work. Obtain Owner approval for location and relocation of facilities.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 Summary.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
 2. Temporary office facilities toilets may be served by storage tanks when approved by Owner.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Verify with Owner. Connect to Owner's existing water service facilities,
1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
 2. Where required by code, provide backflow preventers.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Obtain Owner approval of location.
1. Use of toilet facilities constructed in this Project is not permitted.
- F. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations and existing conditions or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- G. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

- H. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead, unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.
 - 3. Provide minimum lighting levels as required by AHJ and OSHA.
- K. Electronic Communication Service: Provide internet access for use by Project Inspector, Architect and Owner to access electronic communications as specified in Part 2 of this Section.
 - 1. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 15 Mbps upload and 50 Mbps download speeds.

3.4 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide non-combustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Contractor and Owner schedule Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
 - 2. Provide gravel transition bed and dust and mud "shaker plates" at each ingress/egress as required by SWPPP and AHJ.
- C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend

temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 and 32 sections on earthwork and paving.
3. Recondition base after temporary use, including removing contaminated material, regrading, proof rolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section on asphalt paving.

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. Provide and maintain access to fire lanes and fire hydrants at all times, free of obstructions. Coordinate location, locking device and dimension of gates with fire department having jurisdiction.
4. Provide trench plates as required to resist traffic loads, including fire department vehicles. Obtain Fire Marshal approval of all trench plate installations.
5. Where trench plates occur in pedestrian paths, install with transitions as required to comply with accessibility regulations.

E. Parking: Use designated areas of Owner's existing parking only when authorized by Owner, and only in number and use limits as defined by Owner. Contractor is responsible for all parking for Contractor staff if on-site parking is available. If Owner makes existing parking available, Contractor is responsible for all additional parking required in excess of spaces provided by Owner.

1. Construct and maintain temporary parking areas where indicated on Drawings.
2. Where temporary parking areas occur at same location as permanent areas, construct as specified under Division 32 paving sections, except omit top course, and reconstruct as specified to convert to permanent pavement.
3. Where temporary parking areas do not occur at same location as permanent areas, remove topsoil and excavate as required to install minimum 12-inches run-of-crusher limestone. After road is no longer needed, remove stone and restore to original condition, unless otherwise indicated.
4. All costs for contractor and sub-contractor parking shall be included in the bid.
5. The Owner does not provide designated parking or transportation to the job site from available parking areas.
6. Construction workers may park within a designated on-site construction yard if authorized by Owner. This area shall be fenced and it is the responsibility of the Contractor project manager/construction foreman to inform workers that any vehicles parked outside the fenced area are subject to parking citation as applicable. Only contractor company vehicles or equipment are permitted to park inside the fenced construction area.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated on Drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touchup signs so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Section 01 7419 Construction Waste Management and Disposal.
- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Section 017300 Execution for progress cleaning requirements.
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- K. Temporary Elevator Use: See Division 14 sections on elevators for temporary use of new elevators where authorized by Owner.
1. Do not load elevators beyond their rated weight capacity.
 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- L. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- M. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.
- N. Existing Structures: 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.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 1. Comply with work restrictions specified in Section 01 1000 Summary.
- C. Temporary Storm water control, Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to Section 015723, erosion- and sedimentation-control Drawings, requirements of EPA Construction General Permit or authorities having jurisdiction, whichever are more stringent.
 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- D. Tree and Plant Protection: Comply with requirements specified in Section 01 5639 "Temporary Tree and Plant Protection."
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.
- G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

- J. Covered Walkway: Erect structurally adequate, protective, covered walkway for passage of individuals along adjacent public street(s). Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
1. Construct covered walkways using scaffold or shoring framing.
 2. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 3. Extend back wall beyond the structure to complete enclosure fence.
 4. Paint and maintain appearance of walkway for duration of the Work in a manner approved by Owner and Architect.
- K. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and users from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
 2. Construct dustproof partitions with 2 layers of 6-mil polyethylene sheet on each side. Cover floor with 2 layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 4. Insulate partitions to provide noise protection to occupied areas.
 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks.
 6. Protect air-handling equipment.
 7. Weather strip openings.
 8. Provide walk-off mats at each entrance through temporary partition.
- L. Noise Control
1. Contractor acknowledges that adjacent facilities will remain in operation during all or a portion of the Work period, and it shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents.
 2. No radios or other electronic entertainment devices capable of playing music and/or video will be permitted
 3. Notice of proposed loud noise generating operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the Owner a minimum of seventy-two (72) hours in advance of their performance.
 4. Comply with Section 01 5719.
- M. Noise and Vibration
1. Equipment and impact tools shall have intake and exhaust mufflers.
 2. Contractor shall develop noise and vibration control plan for Owners review and approval prior to commencement of such work. When determined solely by Owner, Contractor shall cease the use of noisy and vibratory equipment if such equipment becomes objectionable by its term and duration of use.
 3. Comply with Section 01 5719.

- N. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in all areas of the Site. Comply with additional limits on smoking specified in other Sections.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
 5. Maintain existing fire sprinkler systems operational to extent required by AHJ.
 6. Provide fire watch where required by AHJ.

3.6 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage. Comply with Section 01 5719.
1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 3. Indicate methods to be used to avoid trapping water in finished work.
 4. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
 6. Comply with Weather Protection Plan as applicable.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Contractor shall develop Moisture Protection Plan as specified to minimize potential for water or moisture damage before building is enclosed.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace, or clean stored or installed material that begins to grow mold.

7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Weather Protection Program: When the construction schedule proposed by the contractor requires materials to be installed prior to reaching and maintaining manufacturer's required environmental conditions, provide the following Weather Protection Program:
1. A letter from the material manufacturer acknowledging the deviation from manufacturer's requirements and the manufacturer's acknowledgement of one of the following:
 - a. Agreement with conditions present for installation of materials, including a letter from the manufacturer stating that applicable warranties will not be compromised by these conditions.
 - b. Based on use of glass mat interior gypsum board as specified, provide materials and installation procedures accompanied by material samples, written detailed procedures for all materials, and a letter from the material manufacturer acknowledging the weather conditions and confirming all material warranties will remain intact.
 2. Obtain Owner approval of Weather Protection Program. Provide submittals in accordance with requirements as specified.
- E. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 - 3. At Substantial Completion, repair, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 Closeout Procedures.

END OF SECTION 01 5000

SECTION 01 5639 - TEMPORARY TREE PROTECTION

PART 1 – GENERAL

1.1 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. Tree protection also applies to trees located with public right of way.

1.2 DEFINITIONS

- A. Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and defined by a circle concentric with each tree or shrub with a radius 1.25 times the diameter of the drip line unless otherwise indicated.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each type of organic mulch in sealed plastic bags labeled with composition of materials by percentage of weight, protection-zone fencing and protection-zone signage.
- C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
- D. 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.
- E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

1.4 INFORMATIONAL SUBMITTALS

- A. 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. Comply with Section 01 3233.

1.5 QUALITY ASSURANCE

- A. Contractor shall engage a qualified arborist to monitor all tree protection, including review of submittals, inspection, protection, and execution of work.
 - 1. Arborist Qualifications: Certified Arborist as certified by ISA, licensed arborist in jurisdiction where Project is located, current member of ASCA, or registered Consulting Arborist as designated by ASCA.
- B. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones without prior Owner approval:
 - 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.
- 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. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil; 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 1 inch in diameter; and free of weeds, roots, and toxic and other non-soil materials.
- B. Organic Mulch: Ground or shredded bark, free from deleterious materials.
- C. Ground Level Root Zone Protection: Wood planking, plywood or other temporary protective materials.
- D. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements unless otherwise directed by Owner. Previously used materials may be used when approved by Owner.
 - 1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with pipe posts, minimum 2- 3/8-inch- OD line posts, and 2-7/8-inch- OD corner and pull posts; with 1- 5/8-inch- OD top rails and 0.177-inch- diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
 - a. Plastic netting "Snow Fence" may be approved by Owner when properly supported.
 - 2. Height of Fencing: 6 feet.
 - 3. Gates: Swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones.
- E. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- 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. 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.
 - 1. Do not dump excess concrete, chemicals, or other liquid wastes within 10 feet of protection zone.
- C. Protection Zones: Mulch areas inside protection zones and other areas indicated with 6 inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.
 - 1. Where temporary access is required within protection zone with exposed roots, provide minimum 6 inches of mulch as cushion layer, with planking or plywood placed over root area. Minimize access and remove planking when no longer required.

3.2 PROTECTION ZONES

- A. General
 - 1. Do not place materials, debris, earth, vehicles or temporary structures within protection zone.
 - 2. Do not operate vehicles or equipment within the spread of any trees without prior approval by Owner.
- B. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected area except by entrance gates.
 - 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 Owner.
 - 3. Access Gates: Install where indicated.
- C. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Owner.
- D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Owner.
- E. Maintain protection-zone fencing and signage in good condition as acceptable to Owner and remove when construction operations are complete, and equipment has been removed from the site.

3.3 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 sections.

- B. When excavating, digging, or setting pilings within protection zone, carefully dig pilot holes a minimum of 3 feet deep prior to driving the piles.
- C. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots 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 for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill.

3.4 ROOT PRUNING

- A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 1. Prune under the direction of the Owner and the Contractors arborist.
 - 2. Expose roots by hand.
 - 3. Extend work by tunneling under roots, where tunneling is not feasible or is not approved by Owner, 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.
 - 4. Temporarily support and protect roots from damage until they are permanently covered with soil.
 - 5. Cover exposed roots with burlap and water regularly.
 - 6. Backfill as soon as possible according to requirements in Division 31 sections.
- B. Root Pruning at Edge of Protection Zone: Prune roots by cleanly cutting all roots to the depth of the required excavation.
- C. Dispose of root material off-site.

3.5 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:
 - 1. Prune under the direction of the Owner and the Contractors arborist.
 - 2. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
 - 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
 - 4. Cut branches with sharp pruning instruments; do not break or chop.
 - 5. Do not apply pruning paint to wounds.
- B. Dispose of prunings off-site per Section 01 7419.

3.6 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 unless cutting is approved by Owner

- B. 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 unless fill is approved by Owner.
 - 1. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.7 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.

3.8 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Owner.
 - 1. Contractors arborist shall perform the root cutting, branch pruning, and damage repair of trees and shrubs.
 - 2. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
 - 3. Perform repairs within 24 hours.
 - 4. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Owner or AHJ.
 - a. When Owner determines that irreparable damage is done to any tree or trees, Replacement value shall be determined in accordance with the International Society of Arboriculture Guide for Plant Appraisal, current edition. Replacement value technique shall be as determined by Owner.

3.9 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 01 5639

SECTION 01 5719 - TEMPORARY ENVIRONMENT CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. No smoking policy.
 - 2. Special requirements for Indoor Air Quality (IAQ) management during construction operations.
 - a. Control of emissions during construction.
 - b. Moisture control during construction.
 - c. Avoiding construction practices that could result in contamination of installed products leading to indoor air pollution.
 - 3. Procedures for testing baseline IAQ; Baseline IAQ requirements specify maximum indoor pollutant concentrations for acceptance of the facility.
 - 4. Special requirements for noise and acoustics management during construction operations.
 - 5. Protection of air resources during construction operations.

1.2 DEFINITIONS

- A. Definitions Pertaining to Sustainable Development: As defined in ASTM E2114.
- B. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- C. Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.
- D. Ambient Noise Level: The total noise associated with a given environment, being usually a composite of normal or existing sounds from all sources near and far, excluding the noise source at issue.
- E. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- F. Hazardous Materials: Any material that is regulated as a hazardous material or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in governmental regulations. Throughout this specification, hazardous material includes hazardous chemicals.
 - 1. Hazardous Materials Include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).
- G. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is

determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.

- H. Interior Final Finishes: Materials and products that will be exposed at interior, occupied spaces; including flooring, wallcovering, finish carpentry, and ceilings.
- I. Nighttime: All non-daytime hours.
- J. Packaged Dry Products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.
- K. Particulates: Dust, dirt, and other airborne solid matter.
- L. Property Line: The real or imaginary line along the ground surface and its vertical extension, which separates real property owned or controlled by one person from contiguous real property owned or controlled by another person or from any public right-of-way or from any public space.
- M. Receiving Noise Area: Any real property where people live or work and where noise is heard, excluding the project or source area.
- N. Ventilation: The process of supplying and removing air to and from interior spaces by natural or mechanical means.
- O. Volatile Organic Compound (VOC): Carbon compounds that participate in atmospheric photochemical reactions, (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate); the compounds vaporize (become a gas) at normal room temperatures.
- P. Wet Products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.
- Q. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.3 QUALITY ASSURANCE

- A. Inspection and Testing Agency Qualifications: Minimum of five (5) years' experience in performing the types of testing specified herein.
- B. Coordinate with Division 01 Section "Temporary Facilities and Controls", as required for pest control.
- C. Coordinate with Division 01 Section "Closeout Procedures", as required for cleaning operations.

1.4 PRECONSTRUCTION MEETING

- A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner to discuss the proposed plans and controls to comply with the requirements of this Section; develop mutual understanding relative to details of environmental protection.

1.5 SUBMITTALS

- A. Indoor Air Quality (IAQ) Management Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit an IAQ Management Plan including, but not limited to, the following:
1. Identify potential sources of odor and dust.
 2. Identify construction activities likely to produce odor or dust.
 3. Evaluate potential problems by severity and describe methods of control.
 4. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 5. Describe cleaning and dust control procedures.
 6. Procedures for control of emissions during construction.
 - a. Identify schedule for application of interior finishes.
 - b. Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors.
 - c. Indicate air handling zone, sequence of application, and curing times.
 7. Procedures for moisture control during construction.
 - a. Identify porous materials and absorptive materials.
 - b. Identify schedule for inspection of stored and installed absorptive materials.
 8. Revise and resubmit Plan as required by Owner.
 - a. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.
 9. Submit separate proposals as alternates for testing baseline IAQ and building flush-out, as specified within this Section; contract price does not include testing baseline IAQ or building flush-out.
- B. Air Contaminant Test Plan - Identify:
1. Testing agency qualifications.
 2. Locations and scheduling of air sampling.
 3. Test procedures, in detail.
 4. Test instruments and apparatus.
 5. Sampling methods.
- C. Ventilation Effectiveness Test Plan - Identify:
1. Testing agency qualifications.
 2. Description of test spaces, including locations of air sampling.
 3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
 4. Test instruments and apparatus; identify tracer gas to be used.
 5. Sampling methods.
- D. Noise Control Monitoring Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit a Noise Monitoring Plan.

- E. Protection of Air Resources Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit a plan that identifies controls to limit disturbance on site and site dust limitation.
 - 1. Make record within each daily report of non-road, on-road diesel equipment and diesel generators present on site; and for first occurrence of diesel equipment's appearance, provide record that compliance documents have been reviewed and certified by Contractor.

- F. Product Data:
 - 1. Submit product data for filtration media used during construction and during operation; include Minimum Efficiency Reporting Value (MERV).
 - 2. Submit air pressure difference maps for each mode of operation of HVAC.

- G. Inspection and Test Reports:
 - 1. Air Contaminant Test Reports - Show:
 - a. Location where each sample was taken and time.
 - b. Test values for each air sample; average the values of each set of 3.
 - c. HVAC operating conditions.
 - d. Certification of test equipment calibration.
 - e. Other conditions or discrepancies that might have influenced results.

 - 2. Ventilation Effectiveness Test Reports - Show:
 - a. Preliminary tests of instruments and apparatus and of test spaces.
 - b. Calculation of ventilation effectiveness, E.
 - c. Location where each sample was taken and time.
 - d. Test values for each air sample.
 - e. HVAC operating conditions.
 - f. Other conditions or discrepancies that might have influenced results.

 - 3. Moisture control inspections.
 - 4. Moisture content testing.
 - 5. Moisture penetration testing.
 - 6. Microbial growth testing.
 - 7. Noise control reports.

- H. Closeout Submittals: At completion of construction and prior to contract close-out, submit the following for information purposes in electronic format.
 - 1. Approved Construction Indoor Air Quality Management Plan.
 - 2. Construction Photographs: Six taken at three separate times for a total of eighteen digital photographs of required construction indoor air quality management measures.
 - a. HVAC protection.
 - b. Source Control.
 - c. Pathway Interruption.
 - d. Housekeeping.
 - e. Scheduling.
 - f. Protection of absorptive or dry sink materials, including but not limited to carpet, gypsum board, acoustical ceiling tiles, and insulation.
 - g. Temporary filtration media, if HVAC is operated during construction.

3. Product data of filtration media used during construction and installed immediately prior to occupancy including MERV values, manufacturer's name and model number.
4. Meeting minutes, checklists, worksheets, notifications and deficiency or resolution logs related to the project IAQ issues.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE 52.2, during construction.

2.2 DUST SUPPRESSANTS

- A. Products formulated to reduce or eliminate the spread of dust associated with gravel roads, dirt parking lots, or similar sources of dust, including products used in equivalent indoor applications.
- B. Provide minimum 85 percent biobased content.

PART 3 – EXECUTION

3.1 NO SMOKING POLICY

- A. No smoking will be permitted anywhere on project site locations at any time.

3.2 IAQ MANAGEMENT – EMISSIONS CONTROL

- A. During construction operations, follow the recommendations in SMACNA IAQ Guidelines for Occupied Building under Construction and as specified.
- B. Prevent the absorption of moisture and humidity by adsorptive materials by:
 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 3. Provide sufficient ventilation for drying within reasonable time frame.
- C. Begin construction ventilation when building is substantially enclosed.
- D. HVAC Protection: HVAC system shall be kept clean, free of dust, debris, moisture, gaseous and microbial contamination during storage, handling, installation and punch-out. Inspect all air inlets, air outlets, grilles, diffusers, plenums, and ducts upon completion of Work.
 1. Cover and protect (taped plastic or similar method) all exposed air inlet and outlet openings, grilles, ducts, plenums, to prevent water, moisture, dust and other contaminate intrusion.
 2. Apply protection immediately after installation of equipment and ducting.
 3. Ducting runs that require more than a single day to install shall be protected at end of each day's Work.

4. Leaks in return ducts and air handlers shall be checked and repaired.
 5. Inspect filtration monthly and replace as needed with new media throughout the HVAC system; filtration media shall be minimum *MERV 8*.
 6. After final phase of construction, install new filtration media throughout the HVAC system; filtration media shall be per Division 23 Caltech Design Guideline.
 7. Provide temporary exhaust during construction operations
 8. To the greatest extent possible, isolate and/or shut down the return side of the HVAC system during construction. When ventilation system must be operational during construction activities, provide temporary filters.
 9. Install supply grilles prior to HVAC system operation.
 10. Prevent deposition of dust and other particulates on or in HVAC ducts and equipment.
 11. Bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
- E. Source Control: Provide low and zero VOC materials as specified.
- F. Pathway Interruption: Isolate areas of work as necessary to prevent contamination of clean or occupied spaces. Provide pressure differentials and/or physical barriers to protect clean or occupied spaces.
1. Provide negative pressurization of spaces under construction and/or demolition and positive pressurization of occupied or finished spaces while construction work proceeds in adjacent areas.
 2. Relocate pollutant sources when project equipment or staging areas coincide with critical air flow pathways and place plastic barriers to contain construction areas.
 3. Temporarily seal building, including air intakes and exhaust vents, and any other building openings, when dust-generating or strong-emitting construction products or procedures are used on the exterior of the building.
 4. Once spaces within building become occupied, work areas must remain under negative pressure. Exhaust air at a rate at least 10 percent greater than the rate of supply. Do not exhaust air where it can be drawn back into occupied spaces and place a continuous plastic barriers creating a seal between construction areas and occupied spaces.
- G. Housekeeping: During construction, maintain project and building products and systems to prevent contamination of building spaces.
- H. Temporary Ventilation: Provide an ACH (air changes per hour) of 1.5 or more and as follows:
1. HVAC equipment and ductwork installed as part of the Work may not be used for ventilation during construction without Owner written authorization of specific application.
 2. Seal HVAC air inlets and outlets immediately after duct installation.
 3. Provide minimum 48 hour pre-ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues.
 4. Provide a temperature range of 60 degrees F minimum to 90 degree F maximum continuously during the ventilation period.
 5. Exhaust directly outside; do not ventilate within limits of Work unless otherwise approved by Owner.
 6. Provide adequate ventilation during and after installation of interior wet products and interior final finishes.

7. Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 during construction and during Owner occupancy. Coordinate with work of Division 23 (15), Heating Ventilating and Air Conditioning (HVAC).
- I. Scheduling:
 1. Coordinate construction activities to minimize or eliminate disruption of operations in occupied portions of building.
 2. Schedule for storage, installation, and protection of all components of air distribution systems.
 3. Schedule for storage, installation, and protect of absorptive materials (woven, fibrous or porous in nature, such as carpet, ceiling tiles, insulation, and fabrics) from exposure to emissions during and after installation from materials and finishes with potential for short- term release of off-gassing volatile organic compounds.
 - a. Highlight critical methods used to protect absorptive materials from airborne pollutants such as: dust, debris, moisture, gaseous and microbial contamination.
 - b. Sequence installation of absorptive materials after odor-emitting activities have occurred and have been mitigated by ventilation.
 4. Do not store absorptive materials on-site if protection measures as described above cannot be ensured.
 5. Avoid building occupancy while construction related pollutants are present.
 6. Ensure proper and complete curing of concrete before covering.
 7. Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.
 - J. "Bake-out" or "super-heating" of spaces to accelerate the release of gaseous emissions is not permitted.
 - K. Prohibit smoking and use of fossil-fueled temporary heating units inside the building and near building entrances, windows and intakes and within 25 feet of building entrances.
 - L. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
 1. Inspect duct intakes, return air grilles, and terminal units for dust.
 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 3. Clean tops of doors and frames.
 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 5. Clean return plenums of air handling units.
 6. Remove intake filters last, after cleaning is complete.
 - M. Use low-toxic pest control chemicals such as boron, if needed, unless otherwise directed.
 - N. Remove spills or excess application of solvent-containing products as soon as possible. Use low- emitting cleaning agents, giving preference to Green Seal products.
 - O. Keep work areas as dry as possible; replace any absorptive (dry sink) material that is exposed to moisture.

- P. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

3.3 IAQ MANAGEMENT - EMISSIONS CONTROL TESTING PRIOR TO OCCUPANCY

A. Baseline IAQ Testing:

1. HVAC System Verification: To assure compliance with recognized standards for indoor air quality including ASHRAE Standard 62.1-2004, the Contractor's independent testing and balancing agency shall verify the performance of each HVAC system prior to Indoor Air Quality testing, including space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources.
2. Areas with 100 percent outside air ventilation rates such as laboratories are excluded from these testing requirements; Owner reserves the rights as sole judge of areas exempt from testing.
3. Upon verification of HVAC system operation, engage an independent inspection and testing agency to test levels of indoor air contaminants for compliance with specified requirements.
 - a. Conduct baseline IAQ testing using testing protocols consistent with the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
 - b. Submit IAQ test plan; the plan shall specify procedures, times, instrumentation, and sampling methods that will be employed.
 - c. Perform IAQ testing for at least the minimum number of required sampling locations, determined as follows: For each portion of the building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft., or for each contiguous floor area, whichever is larger, and include areas with the least ventilation as calculated by Ventilation Rate Procedure of ASHRAE Standard 62.1-2004 and greatest presumed source strength as identified by Owner. Collect air samples on three consecutive days and average the results of each three-day test cycle to determine compliance or non-compliance of indoor air quality for each air handling zone tested.
 - d. Perform IAQ testing following the completion of all interior construction activities and prior to occupancy. The building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Perform testing prior to installation of loose furniture.
 - e. Perform IAQ testing within the breathing zone, between 3'-0" and 6'-0" above the finished floor and over a minimum 4-hour period.
 - f. Collect air samples during normal occupied hours (prior to occupancy) with the building ventilation system starting at the daily normal start times and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
 - g. Sample and record outside air levels of formaldehyde and TVOC contaminants at three outside air locations (as determined by Owner) simultaneously with indoor tests to establish basis of comparison for these contaminant levels by averaging the three outdoor readings for each contaminant.
 - h. Perform airborne mold and mildew air sampling and speciation with simultaneous indoor and outdoor readings.
 - 1) Samples are to be collected using a 12 liter-per-minute pump and a 0.45 micron polycarbonate filter, with a 4-hour duration for each sample.
 - 2) Speciation shall be done with DNA detection using the quantitative

polymerase chain reaction (QPCR) method. To ensure that filters are not precontaminated with mold, a field blank filter cartridge shall be tested after every eighth sample is tested.

- i. Acceptance of respective portions of the building by the Owner is subject to compliance with specified limits of indoor air quality contaminant levels.
4. Indoor air quality shall conform to the following standards and limits:
 - a. Formaldehyde: <20 microgram/m³ (16.3 ppb).
 - b. Sum of VOCs: <200 microgram/m³.
 - c. Carbon Monoxide: Not to exceed 9 ppm.
 - d. Other compounds found on the California Office of Environmental Health Hazard Assessment's list of chronic inhalation Reference Exposure Levels (RELs) are not to exceed those levels, as published on: http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html.
 - e. Airborne Mold and Mildew: The species identified in indoor air cannot vary by more than 10 percent from those identified in the exterior samples.
 - f. Particulates (PM₁₀): Not more than 50 micrograms per cubic meter.
 - g. Total Particulates (PM): Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.
 5. Test Reports: Prepare test reports showing the results and location of each test, a summary of the HVAC operating conditions, and a listing of any discrepancies and recommendations for corrective actions, if required.
 6. Include certification of test equipment calibration with each test report.
 7. Take all measures necessary to bring facility within the specified indoor air quality limits and retest until specified limits are achieved, at no additional cost to the Owner.
 8. For each sampling point where the maximum concentration limits are exceeded, the Contractor is responsible for conducting additional flush-out with outside air and retesting the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as in the first test. Retesting shall be performed at no additional expense to the Owner.
 9. For each sampling point where the airborne mold and mildew indoor species distribution varies by more than 10 percent from exterior sampling speciation, Contractor shall identify the source of the mold and/or mildew and remediate with corrective action, then retest in accordance with this Section until compliant results are attained.
 10. In the event that any non-compliant test results occur, Contractor must provide a written report to the Owner describing the source(s) of the non-compliant condition(s) and the corrective action(s) implemented.

3.4 IAQ MANAGEMENT - MOISTURE CONTROL

A. Resources for Moisture Control Plan:

1. ASTM E 241 - Standard Guide for Limiting Water-Induced Damage to Buildings.
2. MOIST developed by the National Institute of Standards and Technology (NIST); <http://www.bfrl.nist.gov/863/moist.html>.

B. Housekeeping:

1. Keep materials dry.
2. Prevent accumulation of moisture on packaging.

3. Protect stored on-site and installed absorptive materials from moisture damage.
 4. Verify that installed materials and products are dry prior to sealing and weatherproofing the building envelope.
 5. Install interior absorptive materials only after building envelope is sealed and weatherproofed.
- C. Inspections: Document and report results of inspections; state whether or not inspections indicate satisfactory conditions.
1. Examine materials for dampness as they arrive. If acceptable to Owner, dry damp materials completely prior to installation; otherwise, reject materials that arrive damp.
 2. Examine materials for mold as they arrive and reject materials that arrive contaminated with mold.
 3. Inspect stored and installed absorptive materials regularly for dampness and mold growth. Inspect after each rain event, and after fog or dew drop.
 - a. Where stored on-site or installed absorptive materials become wet, notify Owner. Inspect for damage. If acceptable to Owner, dry completely prior to closing in assemblies; otherwise, remove and replace with new materials.
 - b. Verify no accumulation of moisture on or within packaging.
 4. Basement: Monitor basement and crawlspace humidity, and dehumidify when relative humidity is greater than 85 percent for more than 2 weeks or at the first sign of mold growth.
 5. Site Drainage: Verify that final grades of site work and landscaping drain surface water and ground water away from the building.
 6. Weather-proofing: Inspect moisture control materials as they are being installed. Include the following:
 - a. Air Barrier: Verify air barrier is installed without punctures and/or other damage. Verify air barrier is sealed completely.
 - b. Flashing: Verify correct shingling of the flashing for roof, walls, windows, doors, and other penetrations.
 - c. Insulation Layer: Verify insulation is installed without voids.
 - d. Roofing: In accordance with ASTM D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair
 7. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.
 8. HVAC: Inspect HVAC system as specified by Division 23 and commissioning requirements.
 - a. Inspect HVAC to verify:
 - 1) Condensate pans are sloped and plumbed correctly;
 - 2) Access panels are installed to allow for inspection and cleaning of coils and ductwork downstream of coils;
 - 3) Ductwork and return plenums are air sealed;
 - 4) Duct insulation is installed and sealed; and
 - 5) Chilled water line and refrigerant line insulation are installed and sealed.
- D. Materials with evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials; immediate remove for site, properly dispose and provide replacement at no additional cost to the Owner.

- E. Immediately remove from site and properly dispose of materials showing signs of mold and signs of mildew on packaging and on products; provide replacement at no additional cost to the Owner.
- F. Schedule:
 - 1. Schedule work such that absorptive materials, including but not limited to porous insulations, paper-faced gypsum board, ceiling tile, and finish flooring, are not installed until they can be protected from rain and construction-related water. See Section 015000 for Weather Protection Program requirements.
 - 2. Weather-proof as quickly as possible. Schedule installation of moisture-control materials, including but not limited to air barriers, flashing, exterior sealants and roofing, at the earliest possible time.
- G. Testing for Moisture Content: Test moisture content of porous materials and absorptive materials to ensure that they are dry before sealing them into an assembly. Document and report results of testing. Where tests are not satisfactory, dry materials and retest. If satisfactory results cannot be obtained with retest, remove and replace with new materials. Test materials as specified in respective Sections.

3.5 NOISE AND ACOUSTICS MANAGEMENT

- A. Noise Control: Perform construction operations to minimize noise. Perform noise-producing work in less sensitive hours of the day or week as directed by Owner.
- B. Repetitive and/or intermittent, high-level noise: Comply with noise limitations as established by AHJ, Owner, Cal-OSHA, and final EIR mitigation measures.
 - 1. Provide equipment, sound-deadening devices, and take noise abatement measures that are necessary for compliance.
- C. Assess potential effects of construction noise on adjacent neighbors, occupants of adjacent structures, and facility occupants after partial occupancy in accordance with ASTM E1686 and as specified in Section 01 5000.
- D. Monitor noise produced from construction operations in accordance with ASTM E1780.

3.6 PROTECTION OF AIR RESOURCES

- A. Prevent creation of dust, air pollution, and odors.
- B. Sequence construction to avoid disturbance to site to the greatest extent possible.
- C. Use mulch, water sprinkling, temporary enclosures, and other appropriate methods or dust suppressants to limit dust and dirt rising and scattering in air to lowest practical level; do not use water when it may create hazardous or other adverse conditions such as flooding and pollution.
- D. Store volatile liquids, including fuels and solvents, in closed containers.
- E. Properly maintain equipment to reduce gaseous pollutant emissions.
- F. Comply with air quality requirements established by AHJ, Owner, Cal-OSHA, and final EIR mitigation measures.

END OF SECTION 01 5719

SECTION 01 5723 - TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Installation of Storm Water Pollution Prevention Plan (SWPPP) measures as per plans, specifications and the project SWPPP document for the purpose of preventing the discharge of pollutants from the construction site.
 - 2. Compliance with local, state and federal regulations.

1.2 REFERENCES

- A. California Storm Water Best Management Practice Handbook for Construction Activity (BMP Handbook).
- B. Construction General Permit (CGP) Order No. 2009-009-DWQ.

1.3 SUBMITTAL REQUIREMENTS

- A. Product Data: Provide product catalog cut sheets of all temporary and permanent equipment and specialty items that will be provided to comply with the SWPPP, including items necessary for storage, disposal and recycling.
- B. Shop Drawings: Provide site plan indicating construction staging, storage, refuse areas and vehicular routing and parking areas.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Use materials of a class, grade and type needed to meet the performance described in the BMP Handbook and project SWPPP document.

PART 3 – EXECUTION

3.1 QUALIFIED SWPPP DEVELOPER (QSD)

- A. The Design-Builder shall designate a Qualified SWPPP Developer (QSD) having registrations, certifications and appropriate experience as defined by the State of California Construction General Permit (CGP) Order No. 2009-009-DWQ to perform the following:
 - 1. Prepare, certify and amend as required the project SWPPP document.
 - 2. Assist the Owner in obtaining permit coverage prior to the commencement of construction activity through filing of Permit Registration Document (PRDs) on the Storm Water Multiple Application and Report Tracking System (SMARTS).
 - 3. Assist the Owner in filing the Notice of Termination (NOT) when construction is complete and final stabilization has been reached.

3.2 QUALIFIED SWPPP PRACTITIONER (QSP)

- A. The Design-Builder shall designate a Qualified SWPPP Practitioner (QSP) having registrations, certifications and appropriate experience as defined by the State of California Construction General Permit (CGP) Order No. 2009-009-DWQ to perform the following:
1. Conduct stormwater and non-stormwater visual inspections of Best Management Practice's (BMP) and prepare documentation as prescribed by the CGP according to the risk level and project type.
 2. Identifying BMP failures or shortcomings and provide an action plan to correct the deficiencies.
 3. Conduct discharge monitoring as prescribed by the CGP for pH, turbidity, and non-visible pollutant monitoring, according to the project risk level and project type.
 4. Develop a Rain Event Action Plan (REAP) for Risk Level 2 and 3 projects for qualifying rain events. Update REAP as required for each qualifying event.
 5. Conduct pre-storm event visual inspections for qualifying rain events.
 6. Implement a Construction Site Monitoring Program (CSMP).
 7. Track weather forecasts from the National Oceanic and Atmospheric Administration (NOAA) in accordance with Permit requirements.
 8. Complete applicable monitoring, sampling, and inspection logs, forms and documents for filing to the Storm Water Multiple Application and Report Tracking System (SMARTS).
 9. Report Numeric Action Level (NAL) exceedances to SMARTS for Risk Level 2 and 3 projects.
 10. Provide assistance to the Owner with annual reporting requirements.

3.3 PERFORMANCE BY CONTRACTOR

A. General:

1. Keep the original SWPPP document in a readily accessible location at the construction site from the commencement of construction activity until submission of the Notice of Termination (NOT) for storm water discharges associated with construction activity. Contractors with day to day operation control over SWPPP implementation shall have the original SWPPP document available at a central location, on-site, for the use of all operators and those identified as having responsibility under the SWPPP.
2. Review the SWPPP. Ensure that all key personnel understand the requirements of the SWPPP.
3. Provide to the QSD, names of all key subcontractors involved in earthwork/land disturbing activities.

B. Good Site Management "Housekeeping":

1. For projects designated as Risk Level 1 and above, implement good site management (i.e., "housekeeping") measures for construction materials that could potentially be a threat to water quality if discharged. At a minimum, the contractor shall implement the following good housekeeping measures:
 - a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).
 - c. Store chemicals in watertight containers (with appropriate secondary containment

- to prevent any spillage or leakage) or in a storage shed (completely enclosed).
- d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).
 - e. Implement Best Management Practices to prevent the off-site tracking of loose construction and landscape materials.
2. For projects designated as Risk Level 1 and above, implement good housekeeping measures for waste management, which, at a minimum, shall consist of the following:
 - a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.
 - b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.
 - c. Clean or replace sanitation facilities and inspect them regularly for leaks and spills.
 - d. Cover waste disposal containers at the end of every business day and during a rain event.
 - e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.
 - f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.
 - g. Implement procedures that effectively address hazardous and non-hazardous spills.
 - 1) Equipment and materials for cleanup of spills shall be available on site. Spills and leaks shall be cleaned up immediately and disposed of properly.
 - 2) Appropriate spill response personnel shall be assigned and trained.
 - 3) Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.
 3. For projects designated as Risk Level 1 and above, implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:
 - a. Prevent oil, grease, or fuel to leak into the ground, storm drains or surface waters.
 - b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate Best Management Practices.
 - c. Clean leaks immediately and dispose of leaked materials properly.
 4. For projects designated as Risk Level 1 and above, implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:
 - a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.
 - b. Contain all fertilizers and other landscape materials when they are not actively being used.
 - c. Discontinue the application of any erodible landscape material within two days before a forecasted rain event or during periods of precipitation.
 - d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.
 - e. Stack erodible landscape material on pallets and cover or store such materials when not being used or applied.

5. Maintain an inventory of materials in association with the Material Safety Data Sheet (MSDS) per OSHA requirements. Provide to QSP upon request.
6. For projects designated as Risk Level 1 and above, implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.
7. For projects designated as Risk Level 2 or 3, implement the Rain Event Action Plan (REAP) as directed by the QSP.
8. For projects designated as Risk Level 1 and above, begin implementing repairs or changes to BMPs within 72 hours of identification as directed by the AHJ, Owner, or QSP and complete the changes as soon as possible.

C. Non-Storm Water Management:

1. For projects designated as Risk Level 1 and above, implement measures to control all non-storm water discharges during construction.
2. For projects designated as Risk Level 1 and above, wash vehicles in such a manner as to prevent non-storm water discharges.
3. For projects designated as Risk Level 1 and above, clean streets in such a manner as to prevent unauthorized non-storm water discharges.

D. Erosion Control:

1. For projects designated as Risk Level 1 and above, implement effective wind erosion control.
2. For projects designated as Risk Level 1 and above, provide effective soil cover for inactive areas and all finished slopes, open space, utility backfill, and completed lots.
3. For projects designated as Risk Level 1 and above, limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls:

1. For projects designated as Risk Level 1 and above, establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.
2. For projects designated as Risk Level 1 and above, on sites where sediment basins are to be used, at minimum, install and maintain sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.
3. For projects designated as Risk Level 2 or 3, implement appropriate erosion control Best Management Practices (runoff control and soil stabilization) in conjunction with sediment control Best Management Practices for areas under active construction. Active areas of construction are areas undergoing land surface disturbances.
4. For projects designated as Risk Level 2 or 3, install linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths in accordance with Table 1.

Table 1 – Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet Flow Length Not to Exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

5. For projects designated as Risk Level 2 or 3, ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.
 6. For projects designated as Risk Level 2 or 3, ensure that all storm drain inlets and perimeter controls, runoff control Best Management Practices, and pollutant controls at entrances and exits (e.g. tire wash off locations) are maintained and protected from activities that reduce their effectiveness.
 7. For projects designated as Risk Level 2 or 3, inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, remove any sediment or other construction activity related materials that are deposited on the roads (by vacuuming or sweeping).
 8. For projects designated as Risk Level 1 and above, inspect all protection methods after each qualifying rain event.
- F. Run-on and Run-off Controls: For projects designated as Risk Level 1 and above, effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from offsite shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

END OF SECTION 01 5723

SECTION 01 6000 - PRODUCT AND SUBSTITUTION REQUIREMENTS**PART 1 – GENERAL****1.1 SUMMARY**

- A. This 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; product substitutions; and comparable products.

1.2 DEFINITIONS

- A. Products: Items purchased 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, except that products containing material with recycled-content are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved 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. Comparable Products include:
 - a. Product of manufacturer listed without identified product; either with or without Basis- of-Design product identified in the Section.
 - b. Product of manufacturer other than manufacturer/product listed as Basis-of-Design and followed with "or comparable product," "or equal," "or approved equal," or similar phrase.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. 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, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, weight, durability, visual characteristics, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- D. 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.

1.3 ACTION SUBMITTALS

A. Substitution Requests:

1. Substitution Request Form: Use Form attached to this Section.
2. Documentation: Show compliance with requirements for substitutions specified in Product Substitutions article in Part 2 and the following, as applicable:
 - a. Statement indicating why specified material or product or Basis-of-Design material or product cannot be provided.
 - b. 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 that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated. Include cost difference.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Electronic Submission: Substitution requests may be submitted electronically in accordance with following requirements:
 - a. Assemble complete substitution request package into a single indexed file incorporating all required information for the substitution request as specified in this Section with completed Substitution Request form and including links enabling navigation to each item.
 - 1) Substitution requests not including the Substitution Request form will be returned as "Not Reviewed."
 - b. Name file with submittal number or other unique identifier, including revision identifier.
 - c. Include the following information as keywords in the electronic submittal file naming or identification:
 - 1) Project name.
 - 2) Number and title of appropriate Specification Section.

- 3) Manufacturer name.
- 4) Product name.
- 5) Keynote or finish code.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
 1. Contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between sub-contractors over concurrently selectable but incompatible products, Owner will determine which products shall be used.
- B. Asbestos Content: All products furnished and/or installed for this Project must be 100 percent free of asbestos containing materials.
 1. Comply with Owners remediation requirements for improperly installed asbestos containing materials at no cost to Owner or schedule delay.
- C. Electrical Products and Materials: All electrical products and materials furnished and/or installed for this Project must bear the Underwriter's Laboratories (U.L.), or other accepted agencies listing label. Any Project-related modification to these products must be in compliance with the National Electrical Code requirements and listed by U.L.
- D. 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 for additional identification requirements.

1.5 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.
 1. Coordinate deliveries to the site with the Owner, Owner so as to allow for inspection by these parties prior to incorporation in the Work.

2. Where material deliveries or storage of materials impact Owners use of the site or facilities, including access to buildings, create objectionable odors, or other similar negative impacts, Contractor shall store such materials off-site in a secure location, at no additional cost to the Contract, until they can be received at the site. Contractor/Subcontractor must insure off-site storage against damage or loss and provide record of material insurance to the Owner.
 3. Be prepared to provide signed material receipts to the Owner upon request.
- 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 ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 5. Owner Furnished Products: Comply with Section 01 1100.
- C. Storage:
1. Contractor is responsible for designating and allotting on-site storage space. Any relocation of stored materials necessitated by Work progress will be accomplished promptly without additional cost to the Contract.
 2. Except as otherwise specified, each Contractor/Subcontractor is responsible for its tools, equipment, materials, and supplies on the Site whether just stored or incorporated into the Work until building is accepted by the Owner.
 3. Store products to allow for inspection and measurement of quantity or counting of units.
 4. Store materials in a manner that will not endanger Project structure.
 5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 6. Store cementitious products and materials on elevated platforms.
 7. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 9. Protect stored products from damage and liquids from freezing.
 10. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 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. Submit a draft for approval before final 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 appropriate form properly executed.
 3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 7700 Closeout Procedures.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that 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 not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection, subject to Owner approval.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. 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 "Product Substitutions " Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect and Owner in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect, whose determination is final subject to Owner approval.
- B. Product Selection Procedures:
1. Sole Product: Where Specifications name a single product and manufacturer, 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 not 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 not 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 that includes all modifications necessary to ensure comparable product complies with type, function, dimension, in-service performance, physical properties, appearance, and other characteristics established by Basis-of-Design product. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Product Substitutions Article for consideration of an unnamed product by the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in this Section for "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, subject to Owner approval.

1. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures, or a 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.
1. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 2. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. The materials, products and equipment items described in the Contract Documents establish the standard of required quality, performance, function, dimension and appearance expected. Unless the phrase "Or approved equal," "Equivalent to," or similar phrase is stated, the Work must be based on the use of one or more of these items.
1. Within 60 days after award of contracts, Contractors are required to submit substitution requests in accordance with procedures and requirements specified in Part 1 of this Section.
 2. No additional substitutions will be considered after this initial process unless substitution is required due to a specified material, product or equipment being removed from or made unavailable in the marketplace after execution of the Contract.
- B. Architect will consider Contractor's Request for Substitutions when the requirements specified in this Section and the following conditions are met. If all conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements. The Contractor may proceed with substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.
1. The materials, products and equipment described in the Contract Documents establish the standard of required quality, function, dimension and appearance expected. Substitution requests will be considered only if these standards are met, or exceeded, and the Architect and Owner subsequently approve the substitutions. The burden of proof of the merit of the proposed substitution is upon the proposer
 2. Requests for substitution must include clear identification of the material, product or equipment item and complete description including drawings, cuts, performance and test data, along with any other information necessary for a complete evaluation.
 3. Substitution request is fully documented and properly submitted.
 4. Requested substitution will not adversely affect Contractor's Construction Schedule.
 5. Requested substitution has received necessary approvals of authorities having jurisdiction.
 6. Requested substitution is compatible with other portions of the Work.
 7. Requested substitution provides specified warranty.
 8. Requested substitution will not delay the Work.
 9. If requested substitution involves more than one sub-contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all sub-contractors involved.

- C. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 10 days of receipt of a request for substitution. Architect shall review proposed substitution with Owner. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
1. Form of Acceptance:
 - a. Architect shall return Signed Substitution Form provided in this Project Manual.
 - b. Owner shall prepare and issue Change Order or Construction Change Directive per Section 01 2600.
 2. Use product specified if Substitution Request and requested supporting information is not submitted in sufficient time for Architect to make a decision on use of a proposed substitution or if proposed substitution is rejected.
 3. Subject to Owner approval, The Architect's decision to accept or reject the proposed substitution shall be final and will be set forth in writing.

PART 3 - EXECUTION (Not Used)

Attachments:

SUBSTITUTION REQUEST

END OF SECTION 01 6000

PRODUCT SUBSTITUTION REQUEST FORM

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

Re: _____ Contract For: _____

Specification Description: _____

Title: _____ Article/Paragraph: _____

Section: _____ Page: _____

Proposed Substitution: _____

Trade Name: _____

Model No.: _____

Manufacturer: _____

Address: _____

Phone: _____ Manufacturer Web Page: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

Savings to Owner for accepting substitution: _____ (\$ _____)

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days.

The Undersigned Contractor Certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified products.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.

- The following supporting data is attached to this request and verifies the above statements:
 - Drawings
 - Product Data
 - Samples
 - Tests
 - Reports
 - Other

(explain) _____

Submitted by:

Signed by:

Contractor:

Address:

Email

Phone: _____: _____

Review and Action

- Substitution approved – Make submittals in accordance with the Specifications.
- Substitution approved as noted – Make submittals in accordance with the Specifications.
- Substitution rejected – Use specified materials.
- Substitution received after 60 days of Notice of Award – Use specified materials.

Comments: _____

Signed by: _____ Date: _____

SECTION 01 7300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.

1.2 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor or professional engineer.
- B. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by land surveyor or professional engineer, as required by AHJ.
- E. Final Property Survey: Submit 5 copies showing the Work performed and record survey data.

1.3 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. 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 and Owner for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning site work, 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 service Project site.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. 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. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 5. Verify field dimensions.
 - 6. Test surfaces where the surface dryness is in question with a current moisture-indicating device.
 - 7. Where required by other Sections, arrange and coordinate inspection by Owner.
 - 8. Coordinate testing and inspection as specified in Section 01 4523.
- D. 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.
- E. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions and the responsibility for any corrective work required due to faulty base surfaces or improper conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and 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 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 01 3100 Project Management and Coordination. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Owner 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 Architect 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 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 Owner.

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 Owner. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner 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.
 - 5. Install materials, products and equipment such that manufacturer's labels do not appear on exposed surfaces of the finished work, except in unfinished portions of the building such as mechanical equipment rooms.
 - 6. Install materials, products and equipment so they are readily accessible for operation, maintenance and repair. Minor deviations from Drawings may be made to accomplish required accessibility, but changes involving extra cost shall not be made without prior written approval.
- 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: Do not use tools or equipment that produces harmful 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 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 01 7700 "Closeout Procedures" for repairing or removing and replacing defective Work.
- K. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

- A. Owner-Furnished Owner-Installed Products:
1. Products indicated as "O.F.O.I." (Owner Furnished, Owner Installed) will be furnished and installed by the Owner. Mechanical and electrical service lines and support systems for such products, where indicated, shall be included in the Contract Sum. Final connections from service lines to the equipment will be provided by the Owner, unless otherwise indicated.
 2. Refer to Section 011000 Summary for requirements and procedures for "Owner-Furnished Products."
- B. Site Access: Provide access to Project site for Owner's construction forces.
- C. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
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 forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Dispose of waste materials at frequency as required to minimize odor or decay.
 3. Place waste materials in containers provided for this purpose.
 4. 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.
 5. Provide sufficient quantity of waste containers on Site and on each floor of building and in each work area for collection of waste materials, rubbish and debris.
 - a. Refer to Section 01 7419 Construction Waste Management for additional requirements for waste containers for recycling of waste materials.
 6. Lower waste materials from building in a controlled manner; do not drop or throw materials from heights. Use of chute is acceptable.

7. 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:
 1. Contractor shall remove Contractor waste and surplus materials without interference with others at least once per week or more often if waste and surplus materials interfere with the work of others or present a fire or safety hazard.
 2. Burying or burning waste materials on-site is not permitted. Washing waste materials down sewers or into waterways is not permitted.
 3. Refer to Section 01 7419 Construction Waste Management for additional requirements for waste disposal and recycling.
- 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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- K. Cost of Progress Cleaning:
 1. Cost of providing containers, placing waste materials in containers and disposing of waste in containers is the responsibility of the Contractor.
 2. Cost of placing waste materials in containers is the responsibility of Contractor creating the waste materials.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 9113 General Commissioning Requirements.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 01 4000 Quality Requirements.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Contractor is responsible for protection and safekeeping of his materials, products, and equipment stored on the premises or incorporated into the construction until his contract is complete and accepted by the Owner.
- B. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes at no cost to the Owner. Comply with requirements in Section 01 7329 Cutting and Patching.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 7300

SECTION 01 7329 - CUTTING AND PATCHING**PART 1 - GENERAL****1.1 SUMMARY**

- A. This Section includes procedural requirements for cutting and patching.
- B. Contractor is responsible for all cutting, fitting and patching required for alteration Work or to correct or modify newly installed construction, including but not limited to:
 - 1. Coordination between all trades.
 - 2. Performing sequential excavation and backfill.
 - 3. Completing the Work or making its several parts fit together properly or integrate with other Work.
 - 4. Uncovering portions of the Work to provide for installation of ill-timed Work.
 - 5. Removing and replacing defective Work.
 - 6. Removing and replacing Work not conforming to requirements of Contract Documents.
 - 7. Removing samples of installed Work as specified for testing.
 - 8. Providing routine penetrations of non-structural surfaces for installation of materials such as piping and electrical conduit.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
 - 1. Prior to 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 affected by cutting and patching operations.
 - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Cutting and Patching Plan: Submit a plan describing procedures at least 15 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - a. For cutting and patching of newly installed construction, employ the original installer or fabricator for weather-exposed or moisture-resistant elements, and sight exposed finished surfaces.
 - b. Include workmen qualifications for cutting and patching of weather-exposed or moisture-resistant elements, and sight exposed finished surfaces of existing construction being altered.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Enclosure Elements: Indicate measures regarding the integrity or effectiveness of weather-exposed or moisture-resistant elements and systems.
8. Alternatives to Cutting and Patching: Include a description of alternatives to cutting and patching.
9. Notices: Notify Owner and separate contractor when cutting and patching affects newly installed construction not performed under this Project; include evidence of notification and written permission.
10. Architect's Approval: Obtain approval of cutting and patching plan before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

- A. 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.
 1. A structural element includes any load-bearing, lateral force-resistant member, and wind or seismic movement resisting construction.
 2. Take precautions and exercise care to ensure Work is removed neatly and without movement or settlement to remainder of building. Contractor will be held liable for any damage, movement, settlement caused thereby or resulting therefrom.
- B. 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. Examples of operating elements include, but are not limited to, the following:

1. Primary operational systems and equipment.
 2. Fire separation assemblies.
 3. Air or smoke barriers.
 4. Fire-suppression systems.
 5. Plumbing piping systems.
 6. Mechanical systems piping and ducts.
 7. Control systems.
 8. Communication systems.
 9. Fire-detection and -alarm systems.
 10. Conveying systems.
 11. Electrical wiring systems.
 12. Operating systems of special construction in Division 13 Sections.
- C. 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. Examples of miscellaneous elements include, but are not limited to, the following:
1. Water, moisture, or vapor barriers.
 2. Membranes and flashings.
 3. Exterior curtain-wall construction.
 4. Sprayed fire-resistive material.
 5. Equipment supports.
 6. Piping, ductwork, vessels, and equipment.
 7. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces 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.
- E. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.
- F. Qualifications: Workmen to have minimum three (3) years' experience in working with materials being cut and patched.

1.6 WARRANTY

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

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 in Section 01 8113 "Sustainable Design Requirements."
- B. In-Place Materials: Use materials identical to in-place materials.
 1. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 2. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.
- C. Materials used for sealing openings shall have a fire rating equal to or greater than the rating of the floor, ceiling or partition and shall comply with applicable codes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. 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.
- C. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. 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 prevent interruption to occupied areas.

3.3 PERFORMANCE

- A. 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.
 2. Restore Work and surfaces with new products in accordance with requirements of the Contract Documents.
- B. 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. Employ original Installer for cutting and patching of newly installed construction; 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 as small as possible, neatly to 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.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate 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 eliminate evidence of patching and refinishing.
 - a. Refinish entire surfaces as necessary to provide an even new finish.
 - b. For continuous surfaces, refinish to nearest intersection.
 - c. For assemblies, entirely refinish.
 - d. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - e. 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. Patch subfloors under removed partitions, fixed equipment, etc. by cutting back, applying underlayment, concrete fill or other acceptable leveling fill as necessary to provide subfloor that is level with adjacent existing subfloors and properly prepare to receive finish flooring.
 - b. In renovated rooms/areas to receive new floor finishes, remove existing finish flooring and related materials and prepare subfloor by cutting back, applying concrete fill or other acceptable leveling fill as necessary to provide subfloor that is level and properly prepared to receive new floor finish as required by Room Finish Schedule and material manufacturers written recommendations.
 - c. In renovated rooms/areas to receive new wall finishes, those portions of existing walls that remain shall have their surfaces patched, cut back, or brought forward as necessary, and prepared as required to receive the new finishes per Room Finish Schedule.

- d. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for the 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.
 - e. In rooms or areas where patching is required on one wall only, that entire wall is to be refinished to match the existing finish and color, including existing painted doors, door frames and window frames if they occur in that wall.
 - f. In rooms or areas where patching is required on two or more walls, all walls, including painted doors, door frames and painted window frames, are to be refinished.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - a. In rooms or areas where patching is required in an existing plaster or gypsum wallboard ceiling, the entire ceiling is to be repainted. In rooms where patching is required in existing acoustic tile ceilings, patch ceilings with matching type and pattern of acoustic tile, clean all remaining tile and apply one coat of white latex paint by roller over all tile surfaces. Clean all exposed metal suspension system.
 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.
 6. Openings created as a result of removal of materials must be patched to match adjacent construction as to materials and finishes, unless otherwise indicated.
 - a. Contractor responsible for cutting and patching shall also be responsible for furnishing and installing lintels where openings are cut through existing masonry or concrete walls. Refer to Lintel Schedule in Section 055000 Metal Fabrications for sizing of lintels, unless lintels are shown on Drawings.
 7. Where existing equipment is removed and new equipment is installed in the existing opening, the Contractor installing the new equipment shall close up the unused portion of the opening with materials matching adjacent construction.
 8. When new rubber or vinyl stair treads, risers and landings, are installed at existing stairs, paint all exposed steel.
 9. Paint all exposed insulated or non-insulated pipes and ducts in finished rooms or areas.
 10. Where existing equipment or assemblies are removed, the Contractor removing the equipment shall patch and repair the floor, walls and ceiling.
- D. Roofing:
1. Before commencing with cutting and patching of roofing, consult with the Owner regarding the existence of an outstanding roofing warranty. If such a warranty exists, obtain written approval of the methods to be used from the roofing manufacturer who issued the warranty so as not to affect the value of the warranty.
 2. Locate and identify any air intakes, operable windows, entrances and louvers at existing buildings that could be affected by roofing work. Propose provisions for minimizing odor caused by roofing operations to Owner, including sequence and work at weekend/off hours, and obtain Owners approval.
 3. If necessary, cutting and patching of roofing to be performed by roofing manufacturer authorized personnel only.
 4. Cut, patch, repair and extend roofing and insulation as follows:

- a. Where disturbed or damaged by alteration Work or activities related to same.
 - b. Where new Work connects to existing construction.
5. Roof areas penetrated for alterations shall be protected against damage and leakage by the Contractor performing the Work. Roof openings shall not be left uncovered or unprotected overnight or during any periods of rainy or inclement weather.
 6. Remove loose aggregate, if applicable, and store away from work area.
 7. Work shall be performed in a manner to provide for permanent water-tight splice or repair.
 8. Roof repair and alteration Work and materials shall match existing roofing materials and construction.
 9. Upon completion and inspection of splice or repair Work, remove debris from the roof and replace the aggregate as required.
 10. Protect undisturbed existing and newly repaired roofing subject to traffic and damage.

3.4 CLEANING

- A. Clean areas and spaces where cutting and patching are performed.
- B. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 7329

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**PART 1 – GENERAL****1.1 SUMMARY**

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Recycling nonhazardous demolition and construction waste.
 - 2. Disposing of nonhazardous demolition and construction waste.
- B. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.
- C. Where more restrictive than regulatory requirements, Contractor shall comply with LEED criteria specified in Section 01 8113.

1.2 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- C. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- D. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- E. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- F. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- G. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- H. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- I. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- J. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- K. Return: To give back reusable items or unused products to vendors for credit.

- L. Reuse: To reuse a construction waste material in some manner on the project site.
- M. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- N. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.
- O. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- P. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- Q. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- R. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- S. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.3 PERFORMANCE REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as feasible.
- D. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements, based on compliance with City of Pasadena Construction and Demolition Waste Management Ordinance PMC Chapter 8.62.
 - 1. Identify authorized hauler and certified recycling facility prior to start of the work.
- E. Goal: Comply with Section 018113 and as required by local agency, whichever is most restrictive. Achieve end-of-Project rates for salvage/recycling as specified in 018113 or as required by AHJ. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials where feasible.

1.4 ACTION SUBMITTALS

- A. Waste Management Plan: Prepare and submit plan within 7 days of date established for the Notice to Proceed.

1.5 INFORMATIONAL SUBMITTALS

- A. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices, including copies of documents as provided as part of compliance with AHJ program.

- B. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
- C. 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.

1.6 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Provide experienced staff member, with a record of successful waste management coordination of projects with similar requirements
- B. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- C. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- D. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- E. Waste Management Conference: Conduct conference at Project site and review methods and procedures related to waste management.

1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis where required by LEED submittal. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan. Comply with submittal and permit approval process as required by City of Pasadena.
- B. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. When required by LEED submittal, use LEED approved forms, and include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Identify salvaged or demolished materials that are intended for donation or sale and obtain Owners approval.
 - 3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
 - 6. Cost/Revenue Analysis: Where required by LEED submittal, indicate total cost of waste disposal as if there was no waste management plan and net additional cost or

net savings resulting from implementing waste management plan. Document on LEED submittal approved forms.

PART 2 - PRODUCTS - (Not Used)

PART 3 – EXECUTION

3.1 PLAN IMPLEMENTATION

- A. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work (where indicated): Salvage items for reuse and handle as specified in Section 02 4100 and 02 4119 and as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use (where indicated): Salvage items for reuse and handle as specified in Section 02 4100 and 02 4119 and as follows:
 - 1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 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.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.
- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters panelboards, circuit breakers, and other devices by type.
- 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL
- A. General: Recycle in accordance with specified AHJ program and as required by LEED criteria.
- 3.4 RECYCLING DEMOLITION WASTE
- A. Prepare demolition waste for recycling as defined in approved Waste Management Plan.
- 3.5 RECYCLING CONSTRUCTION WASTE
- A. Prepare demolition waste for recycling as defined in approved Waste Management Plan.
- 3.6 DISPOSAL OF WASTE
- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Disposal: Transport waste materials and dispose of at designated spoil areas on Owner's property.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.
- 3.7 PRESENCE OF HAZARDOUS MATERIALS
- A. Hazardous and Toxic Wastes: Comply with Section 02 4100 and 02 4119.

END OF SECTION 01 7419

SECTION 01 7700 - CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

- A. This 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. Punch List procedures.
 - 4. Warranties.
 - 5. Final cleaning.
 - 6. Repair of the Work.

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items (Punch List): Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

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

1.5 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 in request.
 - 1. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 2. 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.

3. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 4. Deliver certificates of inspection confirming compliance with applicable codes and regulations for the following:
 - a. Elevators.
 - b. Plumbing and drainage.
 - c. Heating, ventilating and air conditioning.
 - d. Fire protection.
 - e. Electrical.
 5. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 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 Owner's signature for receipt of submittals.
 6. Submit test/adjust/balance records.
 7. Submit changeover information related to Owner's occupancy, use, security, operation, and maintenance.
 8. Submit sustainable design submittals required not previously submitted in Section 01 8113 "Sustainable Design Requirements," and in individual Sections.
- 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. Submit demonstration and training documentation specified in Section 01 7900 Demonstration and Training.
 6. Advise Owner of changeover in heat and other utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Complete final cleaning requirements, including touchup painting.
 9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection for 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, Architect will schedule inspection or notify Contractor of unfulfilled requirements. Architect and Owner will conduct inspection. Based on inspection Architect and Owner will notify Contractor of items, either on Contractor's list or additional items identified by Architect and Owner, that must be completed or corrected before certificate will be issued. If authorized by Owner, Contractor shall prepare the Certificate of Substantial Completion after inspection

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

1.6 FINAL COMPLETION

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining date of Final Completion, complete all items listed in the Contract Documents and the following:
1. Submit a final Application for Payment according to Section 01 2900 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. The 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 and requirements specified in the General Conditions of the Contract for Construction.
 4. Pest-Control: Submit pest-control final inspection report and warranty.
 5. Submit final completion photographic documentation.
 6. Project Record Documents: Submit documentation specified below for "Project Record Documents."
 7. Return all documents and items provided by Owner, including keys, key access cards, parking passes, and similar items.
- B. Procedures Prior to Final Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Final Completion. List items below that are incomplete at time of request.
1. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training documentation.
 2. Project Record Documents: Prepare Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and digital recording, damage or settlement surveys, property surveys, and similar final record information.
- C. 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 and Owner will conduct inspection. Based on inspection Architect and Owner will notify Contractor of items, either on Contractor's list or additional items identified by Architect and Owner, that must be completed or corrected before certificate will be issued. If authorized by Owner, Contractor shall 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. Contractor shall take immediate action to complete all remaining work deemed necessary by Owner, Owners designated inspector, AHJ, and Architect.
 2. If Contractor does not complete remaining work, Owner will take actions as defined in the Contract Documents, including assessing value of incomplete work and deducting from final payment.
 3. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 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. Organize in a clear and logical structure, formatted as approved by Owner and Architect, and presented in a single electronic format.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties to Owner for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, 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 the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) 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.
 - 4. Warranty Electronic File: In addition to printed warranty binders, provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single indexed electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - a. Submit on digital media acceptable to Owner.
- D. 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: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: 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 neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. 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.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent or related to equipment operation.
 - k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Replace parts subject to unusual operating conditions.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. 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 NADCA ACR and as specified in Division 23. Provide written report on completion of cleaning.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Comply with pest control requirements in Section 01 5000 Temporary Facilities and Controls. Prepare a written report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.
- E. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 7419 Construction Waste Management and Disposal.

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 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 01 7700

SECTION 01 7823 - OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

- A. Manual Content Submittal: Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of

- receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.
2. Submit all closeout documents using Caltech's Closeout Folder Structure and Naming Convention.

- E. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 COORDINATION

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

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.

8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
 1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
 1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

1.10 PRODUCT MAINTENANCE MANUAL

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Section format to follow that of the Project Manual(s). Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

1.11 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 1. Standard printed maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.

- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of maintenance manuals.

PART 2 - PRODUCTS - Not Used**PART 3 - EXECUTION - Not Used****END OF SECTION 01 7823**

SECTION 01 7839 - PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This 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.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF copy of scanned record progress prints and 2 PDF copies of digital file plot.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal – PDF Format:
 - 1) Submit PDF copy of scanned Record prints, bookmarked, and matching original sheet index, annotated for added sheets.
 - 2) Submit three (3) set(s) of prints from PDF file.
 - 3) Print each drawing, whether or not changes and additional information were recorded.
 - c. Final Submittal Digital Data Format:
 - 1) Submit record digital data files, formatted and named as specified in this Section.
 - 2) Submit three (3) set(s) of paper plots from record digital data file.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
 - 4) Submit all closeout documents using Caltech's Closeout Folder Structure and Naming Convention.
- B. Record Specifications: Submit 3 copies of Project's Specifications, including Addenda and Contract modifications, formatted as:
 - 1. Scanned PDF copy of marked-up paper copy of Specifications.
- C. Record Product Data: Submit 3 copies of each Product Data submittal formatted as:
 - 1. Scanned PDF copy of marked-up paper copy of Product Data.

2. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.
 3. Where Record Product Data is required as part of Operation and Maintenance Manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.
- D. Miscellaneous Record Submittals: See this Section and other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Format as PDF from native file format.
1. Submit 3 paper copies of each submittal from PDF file.
 2. Submit PDF of each submittal
- E. Certification: With each application for payment, provide written certification that Project Record Documents are current at time application is submitted.
- F. Reports: Submit written report, 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.

1.3 RECORD DRAWINGS

- A. Record Progress Prints: During mobilization and construction, maintain one (1) 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 Progress 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 understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Cross-reference record prints to corresponding archive 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 below first floor.
 - d. Locations and depths of underground utilities referenced to permanent surface improvements.
 - 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 referenced to visible and accessible features of the structure.
 - j. Changes made by Addendum.

- k. Changes made by Change Order or Construction Change Directive.
 - l. Changes made following Architect's written orders.
 - m. Details not on the original Contract Drawings.
 - n. Field records for variable and concealed conditions.
 - o. Record information on the Work that is shown only schematically.
- 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings. 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, ASI's, RFIs, Change Order numbers, and similar identification, where applicable.
- B. Record Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Progress Prints and Record Digital Data files with Architect. When complete, prepare a full set of digital data files of the Contract Drawings, as follows:
- 1. Format: Provide Owner with Architect and Trade Partner digital files in AutoCAD.
 - 2. File Preparation Format (2D): AutoCAD DWG or DXF, as requested by Owner, Microsoft Windows Operating System.
 - 3. File Preparation Format: Annotated PDF electronic file with comment function enabled.
 - 4. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
 - 5. Refer instances of uncertainty to Architect for resolution.
 - 6. In addition to AutoCAD file, provide 3 copies of scanned Record Progress Set
 - a. Submit PDF copy, bookmarked, and matching original sheet index, annotated for added sheets.
 - b. Print each drawing, whether or not changes and additional information were recorded.

1.4 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 Addenda, Construction Change Directive numbers, alternate numbers, ASI's, RFIs, Change Order numbers, and similar identification, where applicable.
 - 6. Reference Record Product Data and Record Drawings where applicable.
- B. Format: Submit Record Specifications as:

1. Scanned PDF copy of marked-up paper copy of Specifications, with bookmarks.

1.5 RECORD PRODUCT DATA

- A. Recording: Maintain one (1) 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, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit record Product Data
 1. Scanned PDF copy of marked-up paper copy of Product Data, with bookmarks.
 2. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.6 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous recordkeeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference. Miscellaneous Record submittals include:
 1. Structural and engineering calculations.
 2. Site Geotechnical reports
 3. Topographical Surveys
 4. Air Balance Reports
 5. Commissioning reports and logs, including final equipment set points.
 6. RFIs
 7. Submittals.
 8. System Services Spreadsheet
- B. Format: Submit miscellaneous record submittals as
 1. Scanned PDF copy of marked-up paper copy of Miscellaneous Record Submittals, with bookmarks.
 2. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.7 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents and Samples: Store Record Progress Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Progress Record Documents for construction purposes. Maintain Record Progress Documents in good order and in a clean, dry, legible condition, protected from

deterioration and loss. Provide access to Project Record Progress Documents for Architect and Owner's reference during normal working hours.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 7839

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Instruction in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training Documentation.
 - 4. Preparation of demonstration and training videos.

1.2 ACTION SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products coordinated with instructor led training. Video recording of live instructional modules is required as specified in this section.
 - 2. Based on training as specified in applicable sections, provide list of training sessions for Owner review and approval.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For instructor and videographer.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Documentation including video recording of training session: Submit two copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of entity providing the video.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date of training and video recording.
 - 2. At completion of training, submit complete training manual(s) for Owner's use training manual documentation, including training session and manufacturers videos, in PDF

electronic file format on DVD or labeled flash drive. Provide indexed Table of Contents identifying all training materials.

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: An entity experienced in photographing construction projects and producing training materials.
- D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

1.7 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for operation, adjustment and maintenance of each system and equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. Use the operating and maintenance manuals required by the Contract Documents as the basis for instruction, including a full detailed review of them manual's contents including explanation of all aspects of operation and maintenance. Prepare and include additional data when the need for additional data becomes apparent during the training sessions. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.

2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operations manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.

5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual organized in coordination with requirements in Section 01 7823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Where training is specified in respective sections, Architect and Engineer will furnish an instructor for applicable system or building element to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times after all final inspections, tests, and repairs have been completed. For equipment that requires seasonal operation, provide similar instruction for each season.
 - 1. Schedule training with Owner with at least 14 days' advance notice.
 - 2. Schedule training during Contractor's normal week and daily hours. The Owner shall have the responsibility of scheduling Owner's shift work personnel accordingly.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final

operation and maintenance data submittals. Use conference facilities as required for audiovisual presentations.

1. Provide manufacturers videos as integral part of instruction.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Provide qualified staff to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Digital Video: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.
1. Submit video recordings on DVD or thumb drive.
 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training recording that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
1. Film training session(s) shall be minimum 30 minute duration, in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
 - 1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Based on audio pre-testing, ensure recording levels and quality are clearly audible and understandable. Include description of items being viewed in narration.
- F. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 7900

SECTION 01 8113 - SUSTAINABLE DESIGN REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) **Gold** certification based on USGBC's LEED v4 BD+C. On a credit-by-credit basis, "LEED Version 4.1 for Building Design and Construction" will supersede the version 4 language and requirements. Refer to the LEED Detailed Checklist, Section 01 8113A.
1. Specific requirements for LEED are also included in other Sections.
 2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
 3. Comply with the LEED Detailed Checklist in Section 01 8113A.
 - a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on aspects of Project that are not part of the Work of the Contract.
 4. Definitions included in the "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) Reference Guide, "LEED Version 4.1 for Building Design and Construction" (LEED v4.1 BD+C) Reference Guide, and online amendments apply to this Section.
- B. Related Requirements:
1. Section 01 3233, "Photographic Documentation."
 2. Section 01 3300, "Submittal Procedures."
 3. Section 01 5000, "Temporary Facilities and Controls" for temporary heating and cooling requirements.
 4. Section 01 5719, "Temporary Environment Controls"
 5. Section 01 5723, Temporary Storm Water Pollution Control
 6. Section 01 5419, "Construction Waste Management and Disposal."
 7. Section 01 7823, "Operation and Maintenance Data."
 8. Section 01 9100, "General Commissioning Requirements."
 9. Divisions 02 through 49 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.2 DEFINITIONS

- A. Bio-Based Materials: Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall be tested using ASTM D 6866 and be legally harvested, as defined by the exporting and receiving country.
- B. CDPH Standard Method v1.1 or v1.2: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v1.1–2010, for the emissions testing

and requirements of products and materials complying with LEED v4 and v1.2-2017, for the emissions testing and requirements of products and materials complying with LEED v4.1.

- C. Chain-of-Custody (COC): A procedure that tracks a product from the point of harvest or extraction to its end use, including all successive stage of processing, transformation, manufacturing, a distribution.
- D. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.
- E. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.
- F. Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain.
- G. Environmental Product Declaration (EPD): An independently verified report based on life-cycle assessment studies that have been conducted according to a set of common rules for each product category and peer-reviewed.
- H. Extended Producer Responsibility (EPR): Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life.
- I. Health Product Declaration Open Standard (HPD): A standard format for reporting product content and associated health information for building products and materials.
- J. Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction."
- K. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other USGBC approved programs.
- L. Material Cost: The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but excluding field equipment and field labor costs.
- M. Materials Reuse: Reuse includes salvaged, refurbished, or reused products.
- N. Multi-Attribute Optimization: Third party certified products that demonstrate impact reduction below industry average in at least three of the following six categories: global warming potential; stratospheric ozone depletion; acidification; eutrophication; tropospheric ozone creation; nonrenewable resource depletion.
- O. Recycled Content: Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.
- P. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.
- Q. Volatile Organic Compounds (VOC) Emissions Test: Refer to CDPH Standard Method v1.1 or v1.2 definitions.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Work of this project includes completed building and application for LEED certification. Work is not complete until Owner has accepted USGBC's final review of LEED certification.
1. Provide documentation required by LEED and LEED review.
- B. Provide materials and procedures necessary to obtain LEED prerequisites and credits required in this Section. Other Sections may specify requirements that contribute to LEED prerequisites and credits. Refer to other sections for additional materials and procedures necessary to obtain LEED prerequisites and credits.
- C. Respond to questions and requests for additional information from Architect and the USGBC regarding LEED credits until the USGBC has made its determination on the project's LEED certification application.
- D. LEED Online Submittals: Upload LEED documentation submittal data directly to USGBC project "LEED Online" website. Complete online forms at least monthly and as necessary to document LEED credits for submittals required in this Section.
- E. LEED Conference: Schedule and conduct a conference at a time convenient to Owner and Architect within 21 days prior to commencement of the work. Advise Architect, Owner's Commissioning Authority, and Owner's Project Manager of scheduled meeting dates.
1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Owner's Project Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: LEED goals for the project, Contractor's action plans, and discussion of targeted LEED Prerequisites and Credits.
 3. Minutes: Record and distribute minutes to attendees and other entities with responsibilities for obtaining LEED Credits.

1.4 ACTION SUBMITTALS

- A. General: Submit additional LEED submittals required by other Specification Sections.
1. Submit each LEED submittal simultaneously with applicable product submittal.
- B. LEED Documentation Submittals:

1. General:
 - a. Project submittals must be accompanied by a completed LEED Material Submittal Form 018113B. Submittal packages must also include highlighted documentation supporting the sustainability claims made on the LEED Material Submittal Form.
 - 1) Provide location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material.
 - 2) Provide cost of each product or raw material.
 2. SS, Heat-Island Reduction: Product data for roofing membrane, provide the SRI for low slope roofing material listed as minimum 82 or a 3 year aged SRI of 64. Provide the SRI for sloped roofing material listed as minimum 39 or a 3 year aged SRI of 32.
 3. EA, Building-Level Energy Metering: Product data for meters, sensors, and data collection system used to provide continuous metering of building energy-consumption performance.
 4. MR, Construction and Demolition Waste Management: Comply with submittal requirements of Section 017419 "Construction Waste Management and Disposal."
 5. MR, Building Product Disclosure and Optimization, Environmental Product Declarations:
 - a. General: Comply with LEED v4.1 requirements, below. Achieve one or more of the options below, for a maximum of 2 points.
 - b. Option 1: Environmental Product Declaration (EPD), (1 point). Use at least 20 different permanently installed products sourced from at least five different manufacturers that meet one of the disclosure criteria below:
 - 1) Life-cycle assessment and environmental product declarations.
 - a) Products with a publicly available, critically reviewed life-cycle assessment (LCA) conforming to ISO 14044 that have at least a cradle to gate scope are valued as one whole product for the purposes of credit achievement calculation.
 - b) Product-specific Type III EPD. Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071. Products with product-specific internal EPDs which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope are valued as one whole product for the purposes of credit achievement calculation.
 - c) Industry-wide Type III EPD. Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. Products with industry-wide EPDs, which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope are valued as one whole product for the purposes of credit achievement calculation.
 - 2) Environmental Product Declarations which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
 - a) Product-specific Type III EPD. Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator are valued as 1.5 products for the purposes of credit achievement calculation.

- 3) USGBC approved program – Products that comply with other USGBC approved environmental product declaration frameworks.
- c. Option 2: Multi-Attribute Optimization, (1 point). Use products that comply with one of the criteria below for 10%, by cost, of the total value of permanently installed products in the project, or use at least 10 permanently installed products sourced from at least three different manufacturers. Products will be valued as below:
- 1) Life Cycle Impact Reduction Action Plan (value at 50% by cost or ½ product). The manufacturer has produced a product specific LCA using EN 15804 or ISO 21930 for the product and has provided a publicly available action plan to mitigate or reduce life cycle impacts. The action plan must be product- specific using the specified PCR functional unit, be critically reviewed, and must include the following information:
 - a) Description of the LCA conducted including the dataset, software or platform used by manufacturer to complete the analysis.
 - b) Identification of the largest life cycle impact areas identified in the analysis and a narrative description of the impact areas targeted for reduction in the action plan.
 - c) Description of specific steps anticipated in implementation of the action plan. Include proposed changes in formulation or manufacturing processes that are planned as part of impact reduction strategy.
 - d) Specific dates and a full timeline for completion of all the steps described in the action plan.
 - 2) Life Cycle Impact Reductions in Embodied Carbon. Products that have demonstrated environmental impact reductions for the specified functional unit based on a current third-party EPD or verified LCA that conforms to the comparability requirements of ISO 14025 and ISO 21930. The comparative analysis must include the following information:
 - a) The comparative analysis must show impact reduction in the global warming potential (GWP) impact category and must include a narrative describing how reductions in impacts were achieved. The published comparisons must be third-party verified (value at 100% by cost or 1 product).
 - b) The comparative analysis must show impact reduction(s) of at least 10% in the global warming potential (GWP) impact category and must include a narrative describing how the impact reductions were achieved. The published comparisons must be third-party verified (value at 150% by cost or 1.5 products).
 - c) The comparative analysis must show impact reduction(s) of at least 20% in the global warming potential (GWP) impact category and demonstrate at least 5% reduction in two additional impact categories. A narrative describing how the impact reductions were achieved is required. The published comparisons must be third-party verified (value at 200% by cost or 2 products). Impact categories:
 - global warming potential (greenhouse gases), in CO₂e;
 - depletion of the stratospheric ozone layer, in kg CFC-11e;
 - acidification of land and water sources, in moles H⁺ or kg SO₂e;
 - eutrophication, in kg nitrogen equivalent or kg phosphate equivalent;

- formation of tropospheric ozone, in kg NO_x, kg O₃ eq, or kg ethene; and
 - depletion of nonrenewable energy resources, in MJ using CML / depletion of fossil fuels in TRACI.
- 3) USGBC approved program. Products that comply with other USGBC approved multi-attribute frameworks. For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing cost (or number of products), up to a maximum of 200% of cost, or 2 products.
6. MR, Building Product Disclosure and Optimization, Sourcing of Raw Materials:
- a. General: Comply with LEED v4.1 requirements, below.
- b. Use products sourced from at least three different manufacturers that meet at least one of the responsible sourcing and extraction criteria below for at least 20%, by cost, of the total value of permanently installed building products in the project (1 point). Use products sourced from at least five different manufacturers that meet at least one of the responsible sourcing and extraction criteria below for at least 40%, by cost, of the total value of permanently installed building products in the project (2 points).
- 1) Extended producer responsibility. Products purchased from a manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility. Products meeting extended producer responsibility criteria are valued at 50% of their cost for the purposes of credit achievement calculation.
- 2) Bio-based materials. Bio-based raw materials other than wood must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Exclude hide products, such as leather and other animal skin material.
- a) Bio-based products that meet the criteria above: value at 50% of cost multiplied by the biobased content of the product for the purposes of credit achievement calculation.
- b) Bio-based products that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard: value at 100% of cost multiplied by the biobased content of the product for the purposes of credit achievement calculation.
- 3) Wood products. Wood products must be certified by the Forest Stewardship Council or USGBC-approved equivalent. Products meeting wood products criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
- 4) Materials reuse. Reuse includes salvaged, refurbished, or reused products. Products meeting materials reuse criteria are valued at 200% of their cost for the purposes of credit achievement calculation.
- 5) Recycled content. Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
- a) Recycled content is the sum of post-consumer recycled content plus one-half the pre-consumer recycled content, based on weight.
- b) The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

- 6) USGBC approved program. Other USGBC approved programs meeting responsible sourcing and extraction criteria.
 - c. For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing cost (or number of products), up to a maximum of 200% of cost, or 2 products.
7. MR, Building Product Disclosure and Optimization, Material Ingredients:
- a. General: Comply with LEED v4.1 requirements, below.
 - b. Option 1: Material Ingredient Reporting (1 point). Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm). (10 different permanently installed products from at least three different manufacturers for LEED BD+C Core and Shell and LEED BD+C Warehouses & Distribution Centers)
 - 1) Manufacturer Inventory. The manufacturer has published complete content inventory for the product following these guidelines:
 - a) A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).
 - b) Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:
 - b.1) Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)
 - b.2) The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS). The hazard screen must be applied to each trade secret ingredient and the inventory lists the hazard category for each of the health hazards included in Part 3 of GHS (e.g. "GHS Category 2 Carcinogen")
 - 2) Health Product Declaration. The end use product has a published and complete Health Product Declaration with full disclosure of known hazards in compliance with the Health Product Declaration open Standard.
 - 3) Cradle to Cradle. Product has Material Health Certificate or is Cradle to Cradle Certified™ under standard version 3 or later with a Material Health achievement level at the Bronze level or higher.
 - 4) Declare. The Declare product label must meet the following requirements:
 - a) Declare labels designated as Red List Free or Declared.
 - b) Declare labels designated as LBC Compliant that demonstrate content inventory to 0.1% (1000 ppm).
 - 5) Living Product Challenge. The included Declare product label must demonstrate content inventory to 0.1% (1000 ppm).
 - 6) ANSI/BIFMA e3 Furniture Sustainability Standard. The documentation from the assessor or scorecard from BIFMA must demonstrate the product earned at least 3 points under 7.5.1.3 Advanced Level in e3-2014 or 3 points under 7.4.1.3 Advanced Level in e3-2012.

- 7) Product Lens Certification
 - 8) Facts – NSF/ANSI 336: Sustainability Assessment for Commercial Furnishings Fabric at any certification level.
 - 9) USGBC approved program. Other USGBC approved programs meeting the material ingredient reporting criteria.
 - 10) Any compliant reports above with third-party verification that includes the verification of content inventory are worth 1.5 products for credit achievement calculations. AND/OR
- c. Option 2: Material Ingredient Optimization (1 point). Use permanently installed products from at least three different manufacturers that document their material ingredient optimization using the paths below. Choose either 10 compliant products, or select products that constitute at least 10%, by cost, of the total value of permanently installed products in the project. Material Ingredient Screening and Optimization Action Plan (value at 50% by cost or ½ product)
- 1) The manufacturer has screened the product to at least 1,000 ppm and has provided a publicly available inventory meeting the requirements of Option 1 and completed a detailed action plan to mitigate or reduce known hazards using the principles of green chemistry. The action plan must be product- specific (not company, manufacturer or brand), and must include the following information:
 - a) Description of the screening or assessment platform used by manufacturer to complete the material ingredient screening and analysis.
 - b) Identification of the specific green chemistry principles targeted for implementation in the action plan.
 - c) Description of specific steps anticipated in implementation of the action plan. Include proposed changes in formulation or manufacturing processes that are planned as part of green chemistry optimization strategy.
 - d) Specific dates and a full timeline for completion of all the steps described in the action plan.
 - 2) Advanced Inventory & Assessment (value at 100% by cost or 1 product). The end use product meets the requirements of any of the following:
 - a) Manufacturer Inventory or Health Product Declaration: The product has demonstrated a chemical inventory to at least 0.01% by weight (100 ppm) with no GreenScreen LT-1 hazards or GHS Category 1 hazards. The HPD or Manufacturer Inventory must be third party verified.
 - b) Manufacturer Inventory or HPD: The product has demonstrated a chemical inventory to at least 0.01% by weight (100ppm) and at least 75% by weight of product is assessed using GreenScreen Benchmark assessment. The remaining 25% by weight of product has been inventoried. The GreenScreen assessment must be publicly available. The HPD or Manufacturer Inventory must be third-party verified.
 - c) Declare labels designated as Red List Free that are third-party verified or Living Product Challenge certified products that include a Red List Free Declare label.
 - d) Cradle to Cradle. Product has Material Health Certificate or is Cradle to Cradle Certified™ under standard version 3 or later with a

Material Health achievement level at the Bronze level or higher.

- 3) Material Ingredient Optimization (value at 150% by cost or 1.5 products). The end use product has demonstrated a product inventory and assessment of ingredients using any of the following programs:
 - a) Manufacturer Inventory or HPD: The product has demonstrated a chemical inventory to at least 0.01% by weight (100ppm) and at least 95% by weight of product is assessed using GreenScreen Benchmark assessment. No Benchmark 1 hazards (BM-1) are present in the end use product. The remaining 5% by weight of product not assessed has been inventoried and screened using GreenScreen List Translator and no GreenScreen LT-1 hazards are present in the end use product. The documents must be third party verified.
 - b) Cradle to Cradle. Product has Material Health Certificate or is Cradle to Cradle Certified™ under standard version 3 or later with a Material Health achievement level at the Silver level or higher.
 - c) Living Product Challenge. Products certified to the Living Product Challenge which includes achievement of Imperative 09: Transparent Material Health.

- 4) International Alternative Compliance Path – REACH Optimization (value at 100% of cost or 1 product)
 - a) End use products and materials have fully inventoried chemical ingredients to 100 ppm and assess each substance against the Authorization List – Annex XIV, the Restriction list – Annex XVII and the SVHC candidate list, (the version in effect June 2013,) proving that no such substance is included in the product. If the product contains no ingredients listed on the REACH Authorization, Restriction, and Candidate list.
 - b) Global Green Tag International: product has a certified Product Health Declaration (PhD) report. Value at 100% or 1 product.

- 5) USGBC approved program.
 - a) Products that comply with USGBC approved building product optimization criteria for material ingredient optimization and/or advanced inventory & assessment pathways.

- d. For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing cost (or number of products), up to a maximum of 200% of cost, or 2 products.

8. EQ, Indoor Air Quality: Comply with submittal requirements of Section 01 5719, "Temporary Environment Controls."
9. EQ, Low-Emitting Materials: Product data, indicating VOC content and emissions testing documents showing compliance with requirements for low-emitting materials, for the following materials:
 - a. General:
 - b. Use materials on the building interior (everything within the waterproofing membrane) that meet the low-emitting criteria below. Points are awarded as

follows:

- 1) 2 product categories (1 point)
- 2) 3 product categories (2 points)
- 3) 4 product categories (3 points)
- 4) 5 product categories (3 points + exemplary performance)
 - a) Achieve Exemplary Performance by reaching 90 percent threshold in at least three product categories above.
- 5) Achieve additional 1 point if only 1 or 2 points are achieved and a 90% threshold is met in at least 3 product categories

c. Material valuations:

- 1) Paints and Coatings (including primers): At least 75% of all paints and coatings, by volume or surface area, meet the VOC emissions evaluation AND 100% meet the VOC content evaluation. The paints and coatings product category includes all interior paints and coatings applied on site.
- 2) Adhesives and Sealants: At least 75% of all adhesives and sealants, by volume or surface area, meet the VOC emissions evaluation AND 100% meet the VOC content evaluation. The adhesives and sealants product category includes all interior adhesives and sealants applied on site.
- 3) Flooring: At least 90% of all flooring, by cost or surface area, meets the VOC emissions evaluation OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), wall base, underlayments, and other floor coverings. Subflooring is excluded.
- 4) Wall Panels: At least 75% of all wall panels, by cost or surface area, meet the VOC emissions evaluation, OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded.
- 5) Ceilings: At least 90% of all ceilings, by cost or surface area, meet the VOC emissions evaluation, OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The ceilings product category includes all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights. Overhead structural elements (exposed, finished, and unfinished) are excluded.
- 6) Insulation: At least 75% of all insulation, by cost or surface area, meets the VOC emissions evaluation. The insulation material category includes all thermal and acoustic boards, batts, rolls, blankets, sound attention fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation. Insulation for HVAC ducts and plumbing piping are excluded.
- 7) Composite Wood: At least 75% of all composite wood, by cost or surface area, meets the Formaldehyde emissions evaluation OR salvaged and reused materials criteria. The composite wood product category includes all particleboard, medium density fiberboard, hardwood veneer plywood, and structural composite wood not included in the flooring, ceiling, wall panels, or furniture material categories.

d. Low-Emitting Criteria

- 1) Inherently non-emitting sources. Product is an inherently non-emitting source of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood) and has no integral organic-based surface coatings, binders, or sealants.
- 2) Salvaged and reused materials. Product is more than 1 year old at the time of use. If finishes are applied to the product on-site, the finishes must meet the VOC emissions evaluation AND VOC content evaluation requirements.

e. VOC Emissions Evaluation

- 1) Option 1: Product has been tested according to California Department of Public Health (CDPH) Standard Method v1.2–2017 and complies with the VOC limits in Table 4-1 of the method. Additionally, the range of total VOCs after 14 days (336 hours) was measured as specified in the CDPH Standard Method v1.2 and is reported (TVOC ranges: 0.5 mg/m³ or less, between 0.5 and 5 mg/m³, or 5 mg/m³ or more). Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use. Products used in school classrooms must be evaluated using the classroom scenario, products used in other spaces must be evaluated using the default private office scenario. The statement of product compliance must include the exposure scenario(s) used, the amount of wet-applied product applied in mass per surface area (if applicable), the range of total VOCs, and follow guidelines in CDPH Standard Method v1.2-2017, Section 8. Organizations that certify manufacturers' claims must be accredited under ISO Guide 17065.
- 2) Option 2: Product has been tested according to EN 16516:2017 and complies with the LCI values from Table 1 of the German AgBB Testing and Evaluation Scheme (2015) and a formaldehyde limit of 10 micrograms per cubic meter. Additionally, the range of total VOCs after 28 days was measured as specified in EN 16516 and reported (TVOC ranges: 0.5 mg/m³ or less, between 0.5 and 5 mg/m³, or 5 mg/m³ or more). Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use. The statement of product compliance must include the amount of wet-applied product applied in mass per surface area (if applicable) and the range of total VOCs. Organizations that certify manufacturers' claims must be accredited under ISO Guide 17065.

f. VOC Content Evaluation

- 1) Product meets the VOC content limits outlined in one of the applicable standards and for projects in North America, methylene chloride and perchloroethylene may not be intentionally added. Statement of product compliance must be made by the manufacturer. Any testing must follow the test method specified in the applicable regulation. If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.
 - a) Paints and coatings:
 - b) a.1) California Air Resource Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings
 - c) a.2) South Coast Air Quality Management District (SCAQMD) Rule

- 1113, effective February 5, 2016
 - d) a.3) European Decopaint Directive (2004/42/EC)
 - e) a.4) Hong Kong Air pollution control (VOC) Regulation for regulated architectural paints (January 2010)
- 2) Adhesives and sealants:
- a) a.1) SCAQMD Rule 1168, October 6, 2017
 - b) a.2) Canadian VOC Concentration Limits for Architectural Coatings (SOR/2009-264)
 - c) a.3) Hong Kong Air Pollution Control (VOC) Regulation for regulated adhesives and regulated sealants (April 2012)
 - d) a.4) Free of solvents, as defined in TRGS 610 (January 2011)
- g. Formaldehyde Emissions Evaluation. Product meets one of the following:
- 1) EPA TSCA Title VI or California Air Resources Board (CARB) ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or
 - 2) EPA TSCA Title VI or CARB ATCM formaldehyde requirements for no added formaldehyde resins (NAF).
 - 3) Tested per EN 717-1:2014 for formaldehyde emissions and complies with emissions class E1. Structural composite wood product made with moisture resistant adhesives meeting ASTM 2559, no surface treatments with added urea-formaldehyde resins or coatings, and certified according to one of the following industry standards:
 - a) Plywood: compliant in accordance with Voluntary Product Standard - Structural Plywood (PS 1-09), Voluntary Product Standard – Performance Standard for Wood-Based Structural-Use Panels (PS 2- 10), or one of the standards considered by CARB to be equivalent to PS 1 or PS 2: (AS/NZS 2269, EN 636 3S (including CE label), Canadian Standards Association CSA O121 for Douglas fir plywood, CSA O151 for Canadian softwood plywood, for CSA O153 Poplar plywood, or CSAO325 for Construction sheathing).
 - b) Oriented strand board: specified with the Exposure 1 or Exterior bond classification in accordance with Voluntary Product Standard – Performance Standard for Wood-Based Structural-Use Panels (PS 2- 10)
 - c) Structural composite lumber: compliant in accordance with Standard Specification for Evaluation of Structural Composite Lumber Products (ASTM D 5456-13)
 - d) Glued laminated timber: compliant in accordance with Structural Glued Laminated Timber (ANSI A190.1-2012)
 - e) I-joists compliant in accordance with Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists (ASTM D 5055-13)
 - f) Cross-laminated timber: compliant in accordance with Standard for Performance-Rated Cross-Laminated Timber (PRG 320-15)
 - g) Finger-jointed lumber labeled “Heat Resistant Adhesive (HRA)” in accordance with the American Softwood Lumber Standard (DOC PS- 20 2015)
- 4) Furniture Emissions Evaluation

- a) Product has been tested in accordance with ANSI/BIFMA Standard Method M7.1–2011 (R2016) and complies with ANSI/BIFMA e3-2014e Furniture Sustainability Standard, Sections 7.6.1 (for half credit, by cost) OR 7.6.2 (for full credit, by cost). If 75% of the furniture also complies with Section 7.6.3 in addition to 7.6.2, the category counts for exemplary level (90%). Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use. Seating products must be evaluated using the seating scenario. Classroom furniture must be evaluated using the standard school classroom scenario. Other products should be evaluated using the open plan or private office scenario, as appropriate. The open plan scenario is more stringent. Statements of product compliance must include the exposure scenario(s). Organizations that certify manufacturers' claims must be accredited under ISO Guide 17065.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost and shop labor for materials used for Project. Costs exclude site labor, overhead, and profit. Include breakout of costs for the following categories of items:
 - 1. Wood construction materials.
 - 2. Furniture.
 - 3. Passive plumbing materials.
 - 4. Passive mechanical (HVAC) materials.
 - 5. Passive electrical materials.
 - 6. Earthwork and exterior improvements, hard costs.
- C. LEED Action Plan Components: Provide preliminary submittals within 14 days of date established for the Notice to Proceed indicating how the following requirements will be met:
 - 1. SS, Prerequisite Construction Activity Pollution Prevention plan, complying with EPA Construction General Permit or local equivalent.
 - 2. Coordination with EA, Fundamental Commissioning and Verification and Enhanced Commissioning Credits, complying with Section 01 9113 "General Commissioning Requirements".
 - 3. MR Prerequisite, Construction and Demolition Waste Management Planning document complying with Section 01 7419 "Construction Waste Management and Disposal."
 - 4. MR, Building Product Disclosure and Optimization tracking form for Environmental Product Declaration, Sourcing of Raw Materials, and Material Ingredients Credits.
 - 5. EQ, Low-Emitting Materials tracking form.
 - 6. EQ, Indoor air quality plan, complying with Section 01 5719, "Temporary Environment Controls". "LEED Progress Reports" Paragraph below requires the contractor to provide periodic updates indicating how certain LEED requirements are being met. This action can provide reassurance that Contractor understands and is processing the LEED requirements throughout the construction period.

1.6 QUALITY ASSURANCE

- A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 – PRODUCTS**2.1 MATERIALS, GENERAL**

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated. Contractor to determine a combination of credit options best suited for achieving credits required.
1. Exclusions: Special equipment, such as elevators, escalators, process equipment, and fire suppression systems, is excluded from the credit calculations. Also excluded are products purchased for temporary use on the project, like formwork for concrete.
 2. Provide materials or as specified as basis-of-design in separate specification sections.

2.2 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

- A. MR, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Option 1, EPDs. Provide products the disclosure criteria as detailed in this Section and in USGBC LEED BPDO Calculator.
1. Life-Cycle Assessment
 2. Environmental Product Declarations
 3. Other USGBC approved program
- B. MR, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Option 2, Multi-Attribute Optimization. Use products that comply with the criteria detailed in this Section and in USGBC LEED BPDO Calculator.
1. Life-Cycle Impact Reduction Action Plan
 2. Life Cycle Impact Reductions in Embodied Carbon
 3. Other USGBC approved program
- C. MR, Building Product Disclosure and Optimization, Sourcing of Raw Materials: Use products that meet at least one of the responsible sourcing and extraction criteria detailed in this Section. Responsibly sourced material criteria include:
1. Extended producer responsibility program.
 2. Bio-based materials.
 3. Certified Wood: Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
 - a. Rough carpentry.
 - b. Miscellaneous carpentry.
 - c. Heavy timber construction.
 - d. Wood decking.
 - e. Metal-plate-connected wood trusses.
 - f. Structural glued-laminated timber.
 - g. Finish carpentry.
 - h. Architectural woodwork.
 - i. Wood paneling.
 - j. Wood veneer wall covering.
 - k. Wood flooring.

- l. Wood lockers.
 - m. Wood cabinets.
 - n. Furniture.
- 4. Recycled content.
 - a. Exceptions: Do not include fire protection, operational plumbing, operational mechanical, and operational electrical components, and specialty items, such as elevators and equipment, in the calculation.
- D. MR, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.
 - 1. Use products that use any of the following programs to demonstrate the chemical inventory of the product to as detailed in this Section:
 - a. Manufacturer Inventory.
 - b. Health Product Declarations (HPDs).
 - c. Cradle to Cradle (C2C) certifications.
 - d. Declare product labels.
 - e. Living Product Challenge
 - f. ANSI/BIFMA e3 Furniture Sustainability Standard.
 - g. Other USGBC approved program
- E. MR, Building Product Disclosure and Optimization, Material Ingredients: Option 2, Material Ingredient Optimization.
 - 1. Use products that document their material ingredient optimization using the paths below and detailed in this Section:
 - a. Material Ingredient Screening and Optimization Action Plan
 - b. Manufacturer Inventory or Health Product Declaration
 - c. GreenScreen benchmarks.
 - d. Declare labels designated as Red List Free
 - e. Cradle to Cradle certifications.
 - f. REACH optimizations.

2.3 LOW-EMITTING MATERIALS

- A. All products shall comply with California VOC emissions requirements, irrespective of location used. Calculations for LEED credits are based on products used inside the weatherproofing system.
- B. EQ, Low-Emitting Materials, General Emissions Requirements: Products must demonstrate they have been tested and determined compliant in accordance with California Department of Public Health (CDHP) Standard Method v1.2-2017, using the applicable exposure scenario. Manufacturer's documentation demonstrating compliance must state the range of total VOCs (tVOC) after 14 days measured as specified in the CDPH Standard Method v1.2 as follows:
 - 1. 0.5mg/m³ or less,
 - 2. between 0.5 and 5.0 mg/m³ or,
 - 3. 5 mg/m³ or more.
- C.

Product Type:	Allowable VOC Content (g/L):
Bond Breaker	350
Clear wood finishes - Varnish	275
Clear wood finishes – Sanding Sealer	275
Clear wood finishes - Lacquer	275
Colorant – Architectural Coatings, excluding IM coatings	50
Colorant – Solvent Based IM	600
Colorant - Waterborne IM	50
Concrete – Curing compounds	100
Concrete – Curing compounds for roadways & bridges	350
Concrete surface retarder	50
Driveway Sealer	50
Dry-fog coatings	50
Faux finishing coatings - Clear topcoat	100
Faux finishing coatings – Decorative Coatings	350
Faux finishing coatings - Glazes	350
Faux finishing coatings - Japan	350
Faux finishing coatings – Trowel applied coatings	50
Fire-proof coatings	150
Flats	50
Floor coatings	50
Form release compounds	100
Graphic arts (sign) coatings	150
Industrial maintenance coatings	100
Industrial maintenance coatings – High temperature IM coatings	420
Industrial maintenance coatings – Non-sacrificial anti-graffiti coatings	100
Industrial maintenance coatings – Zinc rich IM primers	100
Magnesite cement coatings	450
Mastic coatings	100
Metallic pigmented coatings	150
Multi-color coatings	250
Non-flat coatings	50
Pre-treatment wash primers	420
Primers, sealers and undercoaters	100
Reactive penetrating sealers	350
Recycled coatings	250
Roof coatings	50
Roof coatings, aluminum	100
Roof primers, bituminous	350
Rust preventative coatings	100
Stone consolidant	450
Sacrificial anti-graffiti coatings	50
Shellac- Clear	730
Shellac – Pigmented	550
Specialty primers	100
Stains	100
Stains, interior	250
Swimming pool coatings – repair	340
Swimming pool coatings – other	340

Traffic Coatings	100
Waterproofing sealers	100
Waterproofing concrete/masonry sealers	100
Wood preservatives	350
Low solids coatings	120

D.

Architectural Applications:	Allowable VOC Content (g/L):
Indoor carpet adhesives	50
Carpet pad adhesives	50
Outdoor carpet adhesives	150
Wood flooring adhesives	100
Rubber floor adhesives	60
Subfloor adhesives	50
Ceramic tile adhesives	65
VCT and asphalt tile adhesives	50
Dry wall and panel adhesives	50
Cove base adhesives	50
Multipurpose construction adhesives	70
Structural glazing adhesives	100
Single ply roof membrane adhesives	250
Specialty Applications:	
PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Computer diskette manufacturing	350
Contact adhesive	80
Special purpose contact adhesive	250
Tire retread	100
Adhesive primer for traffic marking tape	150
Structural wood member adhesive	140
Sheet applied rubber lining operations specialty	850
Top and Trim adhesive	250
Substrate Specific Applications:	
Metal to metal substrate specific adhesives	30
Plastic foam substrate specific adhesives	50
Porous material (except wood) substrate specific adhesives	50
Wood substrate specific adhesives	30
Fiberglass substrate specific adhesives	80
Sealants:	
Architectural sealant	250
Marine deck sealant	760
Nonmember roof sealant	300
Roadway sealant	250
Single-ply roof membrane sealant	450
Other sealant	420
Sealant Primers:	
Architectural non-porous sealant primer	250
Architectural porous sealant primer	775

Modified bituminous sealant primer	500
Marine deck sealant primer	760
Other sealant primer	750
Other	
Other adhesives, adhesive bonding primers, adhesive primers or any other primers	250

1. Exception: The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.

2.4 INDOOR WATER USE REDUCTION

- A. WE, Indoor Water Use Reduction, Appliances: Provide ENERGY STAR or performance equivalent appliances.
- B. WE, Indoor Water Use Reduction, Plumbing Fixtures: Do not exceed water flow requirements indicated in Division 22 - PLUMBING.

PART 3 – EXECUTION

3.1 NONSMOKING BUILDING

- A. EQ, Environmental Tobacco Smoke Control: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes. Comply with Section 01 5719, "Temporary Environment Controls."

3.2 CONSTRUCTION WASTE MANAGEMENT

- A. MR, Construction and Demolition Waste Management: Comply with Section 01 7419 "Construction Waste Management and Disposal."

3.3 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

- A. EQ, Construction Indoor Air Quality Management Plan: Comply with Section 01 5719, "Temporary Environment Controls."

END OF SECTION 01 8113

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	110	75	16	0	38			
LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
Integrative Process	1	1	0	0	0			
Use "simple box" energy modeling analysis and water budget analysis to inform the OPR and the BOD, design documents and construction documents before the completion of schematic design.	1	1				D	LEED v4	N/A
Location and Transportation	16	8	2	0	22			
LT - LEED for Neighborhood Development Location								
Locate the project within a development certified under LEED for Neighborhood Development.	16				16	D	N/A	N/A
LT - Sensitive Land Protection								
OPTION 1: Project is located on a previously developed site (1pt) OR OPTION 2: Project meets sensitive land criteria. Locate the development footprint on land that has been previously developed or that does not meet the environmentally sensitive land criteria for prime farmland, floodplains, land that is identified as habitat, water bodies, and wetlands. Minor improvements as defined in credit language are allowable (1pt) Resource: Prime Farmland http://websoilsurvey.nrcs.usda.gov/app/ Habitat: Natural Heritage Program and/or state fish and wildlife agencies (or a local equivalent outside the U.S.) Habitat: Land that is identified as habitat for the following: - Species listed as threatened or endangered under the U.S. Endangered Species Act or the state's endangered species act - Species or ecological communities classified by NatureServe as GH (possibly extinct), G1 (critically imperiled), or G2 (imperiled), or - Species listed as threatened or endangered species under local equivalent standards (for projects outside the U.S.) that are not covered by NatureServe data. Water bodies: Areas on or within 100 feet (30 meters) of a water body, except for minor improvements.	1	1				D	LEED v4	Option 1
LT - High Priority Site								
OPTION 1: Locate the project on an infill location in a historic district (1 pt) OPTION 2: Locate the project on a government-identified priority site (1 pt) OPTION 3: Locate on a brownfield where soil or groundwater contamination has been identified and perform remediation (2 pts) <u>Exemplary Performance Opportunity:</u> Pursue Option 2 and 3 in addition to Option 1. Otherwise, only one option is allowed.	2				2	D	N/A	N/A
LT - Surrounding Density and Diverse Uses								
OPTION 1: Locate on a site whose surrounding existing density within 1/4-mile radius meets required values (2-3 pts). AND/OR OPTION 2: Locate on a site within 1/2-mile walking distance of at least 4-7 (1 pt) or 8 (2 pts) publicly available diverse uses.	5	5				D	LEED v4	Options 1&2
LT - Access to Quality Transit								

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LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
<p>Locate a functional entry within 1/4-mile walking distance of a bus/streetcar/rideshare stop or 1/2-mile walking distance of a bus rapid transit, train, commuter, or ferry stop, meeting minimum weekday and weekend service numbers.</p> <p>UPGRADE TO LEED V4.1 One way transit routes are allowable in v4.1.</p> <p>LEED v4.1 Min Requirements: (1 pt) 72 wkdy trips, 30 wknd trips (2 pt) 100 wkdy trips, 70 wknd trips (3 pt) 144 wkdy trips, 108 wknd trips (4 pt) 250 wkdy trips, 160 wknd trips (5 pt) 360 wkdy trips, 216 wknd trips Only trips in one direction are counted towards the threshold.</p> <p><u>Exemplary Performance Opportunity:</u> Double the highest transit service point threshold (except for Schools projects using Option 2).</p>	5		1		4	D	LEED v4.1	N/A
LT - Bicycle Facilities								
<p>- Locate an entry within 200 yards of a bicycle network which connects to at least 10 diverse uses, a school or employment center (if 50% or more of project area is residential), or a rapid transit stop (destinations must be within 3-mile radius from project boundary).</p> <p>- Provide short-term bike parking for 2.5% all peak visitors (4 spots minimum; within 100 ft of bldg entrance).</p> <p>- Provide long-term bike parking for 5% FTE (4 spots minimum; within 100 ft of bldg entrance). Provide storage for 30% of occupants for residential project.</p> <p>- Provide a shower for each 100 FTE, and one additional shower for each 150 FTE thereafter.</p> <p>Case 1: Commercial/Institutional (1 pt) Case 2: Residential (1 pt) Case 3: Mixed-use(1pt)</p> <p>Definition of Bicycle Network - A continuous network consisting of any combination of the following 1) off street bicycle paths or trails at least 8 feet (2.5 meters) wide for a two-way path and at least 5 feet (1.5 meters) wide for a one-way path 2) physically designated on-street bicycle lanes at least 5 feet (1.5 meters) wide 3) streets designed for a target speed of 25 mph (40 kmh).</p>	1	1				D	LEED v4	N/A
LT - Reduced Parking Footprint								

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LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
UPGRADE TO LEED v4.1 - Requirements OPTION 1: No Off-Street Parking (1 pt). Do not provide off-street parking. OR OPTION 2: Reduce Parking (1 pt). Do not exceed the minimum local code requirements for parking capacity. Provide parking capacity that is a 30% reduction below the base ratios recommended by the Parking Consultants Council, as shown in the Institute of Transportation Engineers' Transportation Planning Handbook, 4th edition, Table 11-12. OR OPTION 3: Carshare (1 pt). Provide dedicated parking for carshare vehicles. Provide at least one vehicle parking space for every 100 occupants, rounded up. If the project has fewer than 100 occupants, provide one carshare vehicle parking space. Existing carshare vehicles located in nearby on- or off-street parking areas do not contribute to credit achievement. OR OPTION 4: Unbundling Parking (1 pt) Sell parking separately from all property sales or leases. Implement a daily parking fee at a cost equal to or greater than the daily cost of municipal public transit. <u>Exemplary Performance Opportunity</u>	1	1				D	LEED v4.1	Option 1
LT - Green Vehicle								
LEED v4: Designate 5% of all parking used by the project to dedicated parking for green vehicles (ACEEE minimum rating of 45) or provide discounted parking rate of at least 20% for green vehicles. AND OPTION 1: Install electric vehicle supply equipment for at least 2% of all parking spaces. OR OPTION 2: Install liquid or gas alternative fuel fueling facilities or battery switching station for at least 2% of all parking spaces. OR LEED V4.1: LT - Electric Vehicles OPTION 1: Electric Vehicle Charging (1 point) Install electrical vehicle supply equipment (EVSE) in 2% of all parking spaces used by the project or at least two spaces, whichever is greater. Clearly identify and reserve these spaces for the sole use by plug-in electric vehicles. OPTION 2: Electric Vehicle Charging Infrastructure (1 point) Make 6% of all parking spaces or at least 6 spaces EV Ready, whichever is greater.	1		1			D	LEED v4.1	Option 1
Sustainable Sites	10	9	1	0	0			
SS - Construction Activity Pollution Prevention								
Create and implement an Erosion and Sedimentation Control Plan (ESC) for all construction activities associated with the project. Plan must comply with requirements of the 2012 US EPA Construction General Permit (CGP) or local equivalent. The ESC is a collection of measures designed to reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation. The ESC plan includes erosion and sedimentation control measures and activities to be implemented and phased throughout construction. The EPA's CGP outlines the provisions necessary to comply with Phase I and Phase II of the National Pollutant Discharge Elimination System (NPDES) program. A SWPPP, Stormwater Pollution Prevention Plan, is a requirement of the EPA Construction General Permit. https://leeduser.buildinggreen.com/credit/NC-v4/SSp1 https://www.epa.gov/sites/production/files/2016-09/documents/cgp2012_finalpermitpart1-9-updatedurl.pdf	0	0				C		

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LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
SS - Site Assessment								
<p>Complete and document a site survey or assessment which includes topography, hydrology, climate, vegetation, soils, human use, and human health effects.</p> <p>Topography. Contour mapping, unique topographic features, slope stability risks. Hydrology. Flood hazard areas, delineated wetlands, lakes, streams, shorelines, rainwater collection and reuse opportunities, TR-55 initial water storage capacity of the site (or local equivalent for projects outside the U.S.). Climate. Solar exposure, heat island effect potential, seasonal sun angles, prevailing winds, monthly precipitation and temperature ranges. Vegetation. Primary vegetation types, greenfield area, significant tree mapping, threatened or endangered species, unique habitat, invasive plant species. Soils. Natural Resources Conservation Service soils delineation, U.S. Department of Agriculture prime farmland, healthy soils, previous development, disturbed soils (local equivalent standards may be used for projects outside the U.S.). Human use. Views, adjacent transportation infrastructure, adjacent properties, construction materials with existing recycle or reuse potential. Human health effects. Proximity of vulnerable populations, adjacent physical activity opportunities, proximity to major sources of air pollution.</p> <p>CE - topography, hydrology, climate LA - vegetation, soils AR - human use, and human health effects</p>	1	1				D	LEED v4	N/A
SS - Site Development - Protect or Restore Habitat								
<p>Preserve and protect 40% of greenfield area on site AND OPTION 1: restore 30% of previously developed areas of the site with native or adapted vegetation. If project's FAR is at least 1.5, vegetated roof may be counted. AND Restore all disturbed or compacted soils which will be vegetated (2 pts). OR OPTION 2: Provide financial support equivalent to at least \$0.40 per square foot for the total site area (including bldg footprint) to a nationally or locally recognized land trust or conservation organization (1 pt).</p> <p>TEAM TO REVIEW V4.1 REQUIREMENTS v4.1 Option 2 is \$0.20 per sf</p> <p>Potential option if low on credits. Team to look into the organization that is funded needs to be accredited by National Land Trust Organization</p> <p><u>Exemplary Performance Opportunity:</u> Option 1: Double the 30% restoration from the base ratios. Option 2: Double the financial donation requirement (provide at least \$0.80/sf)</p>	2	2				D	LEED v4	Option 1
SS - Open Space								
<p>Provide outdoor open space greater than or equal to 30% of total site area. Minimum 25% of this must be vegetated (turf grass does not count as vegetation) or have overhead vegetated canopy. This space must be physically accessible and be one or more of the following: pedestrian-oriented paving/turf for outdoor social activities, recreation-oriented paving/turf for physical activity, garden space with diversity of vegetation providing year-round visual interest, garden space dedicated to community gardens/urban food production, preserved or created habitat meeting SS Credit Site Development - Protect or Restore Habitat. Vegetated roof with physical access may contribute toward the vegetation requirement if FAR is at least 1.5.</p>	1	1				D	LEED v4	N/A
SS - Rainwater Management								

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LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
<p>LEED v4.1: Manage on-site the runoff from the developed site for the 80th percentile of the regional or local rainfall events using low-impact development (LID) and green infrastructure (GI). 80th percentile (1pt) 85th percentile (2pt) 90th percentile (3pt) See www.USGBC.org/credits for Zero Lot Line point valuations.</p> <p>LEED v4: OPTION 1 (select path): Path 1: Manage on-site the runoff from the developed site for the 95th percentile of the regional or local rainfall events using low-impact development (LID) and green infrastructure (GI) (2 pts). Path 2: Achieve Path 1 for the 98th percentile (3 pts). Path 3: For zero lot line projects, achieve Path 1 for 85th percentile (3 pts). OR</p> <p>OPTION 2: For projects that are part of multi-tenant complex, implement onsite management of annual increase in runoff volume from natural land cover conditions to postdeveloped condition (3 pts).</p> <p>Exemplary Performance Opportunity: Manage 100% of rainwater that falls within the project boundary.</p> <p>Green Infrastructure (GI) - a soil and vegetation-based approach to wet weather management that promote infiltration, evapotranspiration, and capture and reuse of stormwater. Low-Impact Development (LID) - eg: minimizing land disturbance, preserving vegetation, minimizing impervious cover, rain gardens, vegetated swales and buffers, permeable pavement, rainwater harvesting, soil amendments.</p>	3	2	1			D	LEED v4	Option 1 - Path 3
SS - Heat Island Reduction								
<p>OPTION 1: Use nonroof and roof strategies in combination to meet calculation thresholds. Strategies include shade trees, vegetated planters, shading structures, high SR paving, open grid pavement, high-reflectance roof, vegetated roof (2 pts). OR OPTION 2: 75% of parking under cover (1 pt). Exemplary Performance Opportunity: Achieve both Options 1 and 2. Locate 100% of parking under cover.</p> <p>Low Slope SRI (3 year aged) equal to 64 or greater (or initial SRI of 82 or greater)</p>	2	2				D	LEED v4	Option 1
SS - Light Pollution Reduction								

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LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
Meet requirements for uplight and light trespass at the lighting boundary and requirements for internally illuminated exterior signage. <u>Uplight</u> OPTION 1: BUG (backlight-uplight-glare) rating method. Do not exceed the luminaire uplight ratings, based on the specific light source installed in the luminaire. See table for max. uplight ratings in credit language. OR OPTION 2: Use the calculation method. Do not exceed percentages (provided in the credit language) of the total lumens emitted above horizontal. Max percentages of total lumens emitted above horizontal vary with lighting zone. AND <u>Light Trespass</u> OPTION 1: BUG rating method. Do not exceed the luminaire backlight and glare ratings, based on the specific light source installed in the luminaire. This is based on the mounting location and distance from the lighting boundary. See table for allowable backlight ratings. OR OPTION 2: Calculation method. Do not exceed the vertical illuminances (provided in the credit language) measured at the lighting boundary.	1	1				D	LEED v4	N/A
Water Efficiency								
WEp- Outdoor Water Use Reduction								
PREREQUISITE Landscaping within the project boundary must meet one of the following: OPTION 1: Requires no permanent irrigation system OPTION 2: Reduced Irrigation by 30% from calculated baseline through plant species selection and irrigation system efficiency.	0	0					LEED v4	Option 2
WE - Outdoor Water Use Reduction								
OPTION 1: No Irrigation Required (2 pts) OPTION 2: Reduced Irrigation by 50% (1 pt) or 100% (2 pts) from calculated baseline. Strategies beyond the prereq 30% may be any combination of efficiency, alternative water sources, and smart scheduling technologies. Strategies that achieve 100% reduction requires use of alternative water sources, such as non-potable, recycled, or reclaimed water.	2	2				D	LEED v4	Option 2
WEp- Indoor Water Use Reduction								
PREREQUISITE Install fixtures and fittings to reduce water consumption by 20% from calculated baseline. Select WaterSense labeled fixtures for any fixture type that is eligible for the WaterSense label. Install equipment, appliances, and processes which meet prescriptive requirements.	0	0				D	LEED v4	N/A
WE - Indoor Water Use Reduction								

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	110	75	16	0	38			
LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
CREDIT Achieve calculated savings from baseline: 25% - 1 pt 30% - 2 pts 35% - 3 pts 40% - 4 pts 45% - 5 pts 50% - 6 pts Exemplary Performance Opportunity: Achieve 55% water use reduction	6	2	1		3	D	LEED v4	N/A
WEp- Building-Level Water Metering								
Install permanent water meters that measure total potable water use for the building and associated grounds. Commit to sharing data with USGBC for 5 years post-certification. Commitment Letter needed by Owner. Same letter can be used for Building-Level Energy Metering	0	0				D	LEED v4	N/A
WE - Cooling Tower Water Use								
For cooling towers and evaporative condensers, conduct a one-time potable water analysis in order to optimize cooling tower cycles.	2	2				D	LEED v4	N/A
WE - Water Metering								
Install meters for two or more of the following water subsystems: irrigation (@ > 80% landscaped area) indoor plumbing fixtures and fittings (@ > 80% of fixtures and fittings) - domestic hot water (@ > 80% DHW heating capacity incld. tanks and on-demand heaters) - boiler > 100,000 gallons/yr or > 500,000 BtuH/yr reclaimed water	1	1				D	LEED v4	N/A
Energy and Atmosphere								
EAp - Fundamental Commissioning and Verification								
Commission mechanical, electrical, plumbing, and renewable energy assemblies. OPR, BOD and design review to include exterior enclosure.	0	0				C	LEED v4	N/A
EAp - Minimum Energy Performance								

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	110	75	16	0	38			
LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
PREREQUISITE OPTION 1: Whole-building energy simulation. Demonstrate a 5% reduction (3% for major renovation) in proposed building performance over the calculated baseline building based on ASHRAE/IESNA Standard 90.1-2010. OR OPTION 2: Comply with mandatory and prescriptive provisions of ANSI/ASHRAE/IESNA Standard 90.1-2010: HVAC and service water heating requirements in Chapter 4 for appropriate ASHRAE 50% Advanced Energy Design Guide & climate zone. OR OPTION 3: Comply with mandatory and prescriptive provisions of ANSI/ASHRAE/IESNA Standard 90.1-2010, Sections 1, 2, and 3. Project must be less than 100,000 SF; does not apply to healthcare, warehouse, laboratory projects.	0	0				D	LEED v4	Option 1
EA - Optimize Energy Performance								
CREDIT OPTION 1: Demonstrate an improvement in proposed building performance over the calculated baseline for New Construction (NC) and Major Renovation (MR) by: 6% (NC) or 4% (MR) for 1 point 8% (NC) or 6% (MR) for 2 points 10% (NC) or 8% (MR) for 3 points 12% (NC) or 10% (MR) for 4 points 14% (NC) or 12% (MR) for 5 points 16% (NC) or 14% (MR) for 6 points 18% (NC) or 16% (MR) for 7 points 20% (NC) or 18% (MR) for 8 points 22% (NC) or 20% (MR) for 9 points 24% (NC) or 22% (MR) for 10 points 26% (NC) or 24% (MR) for 11 points 29% (NC) or 27% (MR) for 12 points 32% (NC) or 30% (MR) for 13 points 35% (NC) or 33% (MR) for 14 points 38% (NC) or 36% (MR) for 15 points 42% (NC) or 40% (MR) for 16 points 46% (NC) or 44% (MR) for 17 points 50% (NC) or 48% (MR) for 18 points OR OPTION 2: Implement and document compliance with applicable recommendations and standards in Chapter 4 of the ASHRAE 50% Advanced Energy Design Guide (1-6 points) <u>Exemplary Performance Opportunity:</u> Option 1. New construction, major renovation, and core and shell projects: Achieve at least 54% energy savings.	18	12	6			D	LEED v4	Option 1
EAp - Building-Level Energy Metering								
Install building-level energy meters or submeters that can be aggregated, to provide building-level data representing total building energy consumption. The meters must be permanent. Commit to sharing data with USGBC for 5 years post-certification. Minimum of one-month intervals of data required. Commitment Letter needed by Owner. Same letter can be used for Building-Level Water Metering https://www.usgbc.org/node/2613018?return=/credits/new-construction/v4/energy-%26amp%3B-atmosphere	0	0				D	LEED v4	N/A
EAp - Fundamental Refrigerant Management								

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LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
Do not use CFC-based refrigerants in new systems. When reusing existing HVAC&R equipment, complete a comprehensive CFC phase-out conversion before project completion. This prerequisite applies to equipment containing 0.5 pounds or more of refrigerant.	0	0				D	LEED v4	N/A
EA - Enhanced Commissioning								
OPTION 1 Path 1: Provide enhanced commission scope for mechanical, electrical, plumbing, and renewable energy systems (3 pts). OR Path 2: Achieve Path 1 and develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of energy- and water-consuming systems (4 pts). AND/OR OPTION 2: Complete commissioning process for thermal envelope (2 pts)	6	6				C	LEED v4	Options 1&2
EA - Advanced Energy Metering								
Install advanced energy metering for all whole-building energy sources and individual energy end uses that represent 10% or more of total annual consumption. Metering equipment must be permanently installed, record at intervals of 1 hour or less, and transmit data to a remote location. Electricity consumption and demand must be recorded. Data collection system must use a LAN, BAS, wireless network, or comparable system. System must be capable of reporting hourly, daily, monthly, and annual energy use. Data must be remotely accessible and stored for at least 36 months. https://www.usgbc.org/credits/new-construction-schools-new-construction-retail-new-construction-healthcare-data-centers--2	1	1				D	LEED v4	N/A
EA - Demand Response								
Participate in an existing demand response program (2 pts). If not available, provide infrastructure and coordination to take advantage of future demand response programs or dynamic, real-time pricing programs (1 pt).	2				2	C	N/A	N/A
EA - Renewable Energy Production								
Use renewable energy systems to offset building energy costs: 1% - 1 pt 5% - 2 pts 10% - 3 pts On-site system On-site third-party system ownership Community System <u>Exemplary Performance Opportunity:</u> Renewable energy must account for 15% of total energy. For Core and Shell projects, the threshold is 10%. *The cost of usable energy produced by renewables divided by the total building annual	3	3				D	LEED v4	N/A
EA - Enhanced Refrigerant Management								
OPTION 1: No use of refrigerants OR OPTION 2: Select refrigerants for HVAC&R equipment that comply with the refrigeration calculation which sets a maximum threshold for the combined contributions to ozone depletion and climate change.	1	1				D	LEED v4	Option 2
EA - Green Power and Carbon Offsets								

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LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
Engage in a contract for green power, RECs, or carbon offsets, for a minimum 5 years. The contract must specify the provision of a portion of the project's energy: At least 50% - 1 pt 100% - 2 pts Submit with construction credits.	2		2			C	LEED v4	N/A
Materials and Resources								
MRp - Storage and Collection of Recyclables								
Provide areas for collection and storage of materials for recycling. Establish a collection system which includes, at a minimum: paper, corrugated cardboard, glass, plastic, metals, batteries, mercury-containing lamps and electronic waste. Space must be created for 2 of the following 3 hard-to-recycle materials: dedicated storage for batteries, mercury-containing lamps, and/or e-waste	0	0				D	LEED v4	N/A
MRp - Construction and Demolition Waste Management Planning								
Develop and implement a construction and demolition waste management plan and provide a final report detailing all major waste streams generated. Note: ADC does not qualify as diversion from disposal.	0	0				C	LEED v4	N/A
MR - Building Life-Cycle Impact Reduction								
LEED v4.1 Summary: Refer to www.USGBC.org/credits See USGBC site for Option 1-3. OPTION 4: Whole-bldg Life-Cycle Assessment - for new construction, conduct a life-cycle assessment of the project's structure and enclosure. Demonstrate reductions compared with a baseline building, in the 6 following impact categories: global warming potential (must be included), ozone depletion, acidification of land and water, eutrophication, formation of tropospheric ozone, and depletion of nonrenewable resources. Path 1: Conduct a LCA of project's structure and enclosure (1 pt). Path 2: Conduct a LCA of the project's structure and enclosure that demonstrates a minimum of 5% reduction, compared with a baseline building in at least 3 of the 6 impact categories listed below, one of which must be global warming potential (2 pts). Path 3: Conduct a LCA of the project's structure and enclosure that demonstrates a minimum of 10% reduction, compared with a baseline building, in at least 3 of the 6 impact categories listed below, one of which must be global warming potential (3 pts). Path 4: Meet requirements of Path 3 and incorporate building reuse and/or salvage materials into the project's structure and enclosure for the proposed design. Demonstrate reductions compared with a baseline building of at least 20% reduction for global warming potential and demonstrate at least 10% reduction in 2 additional impact categories listed below (4 pts).	5	1	2		2	D	LEED v4.1	Option 4
MR - BPDO - Environmental Product Declarations								

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LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points					Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
	Available	Yes	Maybe	Less Likely	No			
<p>LEED v4.1 Summary: Refer to www.USGBC.org/credits and Spec 018113 Option 1. Environmental Product Declaration (EPD) (1 pt) Use at least 20 different permanently installed products sourced from at least 5 different manufacturers that meet one of the disclosure criteria below.</p> <p>1. Life-cycle assessment and environmental product declarations. Products with reviewed LCA (valued as 1 whole product).</p> <p>Product-specific Type III EPD - internally reviewed LCA (1 whole product).</p> <p>Industry-wide Type III EPD - third-party certification, (1 whole product).</p> <p>2. Environmental Product Declarations and have at least a cradle to gate scope. - Product-specific Type III EPD - third-party certification (valued as 1.5 products).</p> <p>3. USGBC approved program – Products that comply with other USGBC approved environmental product declaration frameworks. AND/OR</p> <p>Option 2. Multi-Attribute Optimization (1 pt) Use products that comply with one of the criteria below for 10%, by cost, of the total value of permanently installed products in the project, or use at least 10 permanently installed products sourced from at least 3 different manufacturers.</p> <p>1. Life Cycle Impact Reduction Action Plan (value at 50% by cost or ½ product).</p> <p>2. Life Cycle Impact Reductions in Embodied Carbon. Products that have demonstrated environmental impact reductions for the specified functional unit based on a current third-party EPD or verified LCA that conforms to the comparability requirements. See credit language for valuations.</p> <p>3. USGBC approved program -- Products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing cost (or number of products), up to a maximum of 200% of cost, or 2 products.</p>	2	2				C	LEED v4.1	Options 1&2
MR - BPDO - Sourcing of Raw Materials								
<p>LEED v4.1 Summary: Refer to www.USGBC.org/credits and Spec 018113 For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing cost (or number of products), up to a maximum of 200% of cost, or 2 products.</p> <p>OPTION 1: Use products sourced from at least 3 different manufacturers that meet at least one of the responsible sourcing and extraction criteria below for at least 20%, by cost, of the total value of permanently installed building products in the project (1 pt). OR</p> <p>OPTION 2: Use products sourced from at least 5 different manufacturers that meet at least one of the responsible sourcing and extraction criteria below for at least 40%, by cost, of the total value of permanently installed building products in the project (2 pts).</p> <p>Responsible SourcingCriteria:</p> <p>1. Extended producer responsibility (valued at 50% of cost)</p> <p>2a. Bio-based products, other than wood or animal hide, that is tested and legally harvested (valued at 50% of cost multiplied by the biobased content of the product)</p> <p>2b. Bio-based products that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard (valued at 100% of cost multiplied by the biobased content)</p> <p>3. Wood products certified by the Forest Stewardship Council or USGBC-approved equivalent (valued at 100% of cost)</p> <p>4. Materials reuse. Reuse includes salvaged, refurbished, or reused products (valued at 200% of their cost)</p> <p>Recycled content (valued at 100% of cost)</p>	2	1	1			C	LEED v4.1	Options 1&2

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	Available	Yes	Maybe	Less Likely	No			
MR - BPDO - Material Ingredients								
<p>LEED v4.1 Summary: Refer to www.USGBC.org/credits and Spec 018113 Option 1. Material Ingredient Reporting (1 pt) Use 20 different permanently installed products from at least 5 different manufacturers that use any of the following programs: Manufacturer Inventory Health Product Declaration Cradle to Cradle Declare label designated as Red List Free or Declared Living Product Challenge ANSI/BIFMA e3 Furniture Sustainability Standard Product Lens Certification Facts – Sustainability Assessment for Commercial Furnishings Fabric USGBC approved program Any compliant reports above with third-party verification that includes the verification of content inventory are worth 1.5 products for credit achievement calculations. AND/OR</p> <p>Option 2: Material Ingredient Optimization (1 pt) Use permanently installed products from at least 3 different manufacturers that document their material ingredient optimization using the paths below. Choose either 10 compliant products, or select products that constitute at least 10%, by cost, of the total value of permanently installed products in the project. 1. Material Ingredient Screening and Optimization Action Plan (valued at 50% by cost or 1/2 product) Advanced Inventory & Assessment (valued at 100% by cost or 1 product) Material Ingredient Optimization (valued at 150% by cost or 1.5 products) 4. International Alternative Compliance Path – REACH Optimization (valued at 100% of cost or 1 product) USGBC approved program.</p> <p>Products sourced within 100 miles of the project site are valued at twice their base contributing cost (or number of products), up to a maximum of 200% of cost, or 2 products.</p>	2	1	1			C	LEED v4.1	Options 1&2
MR - Construction and Demolition Waste Management								
<p>OPTION 1: Path 1: Divert at least 50% of total construction and demolition material; must contain at least 3 material streams (1 pt). OR Path 2: Divert at least 75% with at least 4 material streams (2 pts). OR OPTION 2: Do not generate more than 2.5 pounds of construction waste per square foot of building's floor area (2 pts). Exclude excavated soil and land clearing debris as well as materials reused on site</p> <p>Alternative daily cover (ADC) is excluded from diverted waste calculations but is included in total construction waste calculations.</p> <p><u>Exemplary Performance Opportunity:</u> Achieve both Option 1 (either Path 1 or Path 2) and Option 2</p>	2	2				C		
Indoor Environmental Quality								
EQp - Minimum Indoor Air Quality Performance	16	12	0	0	4			

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	Available	Yes	Maybe	Less Likely	No			
<p>Meet requirements for ventilation and monitoring. <u>Ventilation</u>: Mechanically Ventillated Spaces: OPTION 1: ASHRAE Standard 62.1-2010 OPTION 2: (For International Projects) CEN Standards EN 15251-2007, EN 13779-2007</p> <p><u>Monitoring</u>: VAV System Constant Volume</p> <p>Identify if building is in a designated non-attainment area for PM2.5 by going to the EPA website: https://www.epa.gov/green-book/green-book-pm-25-2012-area-information</p> <p>Areas within each state are "designated" as either meeting (attaining) PM standards or not meeting them. In some cases, an entire state may attain a standard. Those areas that exceed the standards are known as "non-attainment areas." Non-attainment areas for PM and the other criteria air pollutants are listed in the Green Book.</p>	0	0				D	LEED v4	N/A
EQp - Environmental Tobacco Smoke Control								
Prohibit smoking in the building and within 25 feet of entries, outdoor air intakes, and operable windows. Signage must be posted within 10 feet of all building entrances indicating the no-smoking policy.	0	0				D	LEED v4	N/A
EQ - Enhanced Indoor Air Quality Strategies								
<p>OPTION 1: Enhanced IAQ Strategies - comply with the following requirements (1 pt): - Entryway systems 10' long at exterior entrances.</p> <p>- Interior cross-contamination prevention: exhaust spaces where hazardous gases/chemicals may be present: garages, housekeeping and laundry areas, copying, printing rooms, etc.</p> <p>Filtration MERV 13 or higher, replace all before occupancy.</p> <p>- Natural ventilation calculations: demonstrate system employs appropriate strategies in CIBSE Applications Manual AM10.</p> <p>- Mixed-mode design calculations: demonstrate system complies with CIBSE Applications Manual 13-2000. AND/OR</p> <p>OPTION 2: Additional Enhanced IAQ Strategies: comply with the following requirements, select 1 (1 pt): Exterior contamination prevention analysis</p> <p>Increased ventilation</p> <p>Carbon dioxide monitoring</p> <p>Additional source control and monitoring</p> <p>Natural ventilation room-by-room calculations</p>	2	2				D	LEED v4	Options 1&2
EQ - Low-Emitting Materials								

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	Available	Yes	Maybe	Less Likely	No			
Meet emissions and VOC content threshold requirements for 2-5 categories: Interior paints and coatings applied on site Interior adhesives and sealants applied on site Flooring Composite wood Ceilings, walls, thermal and acoustic insulation Furniture 2 product categories (1pt) 3 product categories (2 pts) product categories (3pts) product categories (3 points + Exemplary Performance) EQ - Construction Indoor Air Quality Management Plan	3	3				C	LEED v4.1	N/A
Develop and implement an IAQ management plan for the construction and preoccupancy phases of the building. EQ - Indoor Air Quality Assessment	1	1				C	LEED v4	N/A
OPTION 1: Flush-out - follow requirements for flush-out before or during occupancy (1 pt). OR OPTION 2: Air Testing - after construction ends, but before occupancy (2 pts). Criteria below and review LEED credit language and guidance: 1. At least one testing zone per Air Handling Unit – preferably in a location that is getting exposure to a main return air path if possible. 2. Any areas sensitive to VOC's due to furnishings or finishes should have one sample area – for Kaiser's program I don't know what that would be – maybe an exam room. 3. Usually the cost is about \$15k, which would imply 6 testing locations, if you have an industrial hygienist on the projects or if Kaiser is doing that themselves via Infection Control or an equivalent you may want to run the locations by them. EQ - Thermal Comfort	2	2				C	LEED v4	Option 2
OPTION 1: design HVAC systems and envelope to meet ASHRAE 55-2010. OR OPTION 2: Design HVAC systems and envelope to meet ISO 7730: 2005 or CEN Standard EN 15251:2007. Provide individual thermal comfort controls for at least 50% of individual occupant spaces. Provide group thermal comfort controls for all shared multioccupant spaces. EQ - Interior Lighting	1	1				D	LEED v4	Option 1
OPTION 1: Provide individual lighting control for at least 90% of individual occupant spaces with at least 3 lighting levels or scenes (on, off, midlevel). Provide multizone control for all shared multioccupant spaces, separate control of presentation wall lighting, locate switches or manual controls in the same space with controlled luminaires (1 pt). AND/OR OPTION 2: Choose four strategies from list of options addressing efficient hardware, surface reflectance, and illuminance (1 pt). EQ - Daylight	2	2				D	LEED v4	Options 1&2

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	Available	Yes	Maybe	Less Likely	No			
Provide manual or automatic glare-control devices for all regularly occupied spaces AND OPTION 1: Simulation - Spatial Daylight Autonomy and Annual Sunlight Exposure (2-3 pts). OR OPTION 2: Simulation - Illuminance Calculations (1-2 pts). OR OPTION 3: Measurement (2-3 pt)	3				3	D	N/A	N/A
EQ - Quality Views								
Achieve direct line of sight to the outdoors via vision glazing for 75% of all regularly occupied floor area. 75% of all regularly occupied area must also have at least 2 of the following types of views: multiple lines of site in different directions; views that include flora/fauna/sky, movement, and objects at least 25 ft from glazing; unobstructed views located within distance of 3x head height of vision glass; and views with view factor of 3 or greater. <u>Exemplary Performance Opportunity:</u> Meet the requirements for 90% of all regularly occupied area. (BD+C NC) <i>For other requirements for Warehouses and Distribution Centers or Healthcare, refer to the USGBC Credit Library.</i>	1				1	D	N/A	N/A
EQ - Acoustic Performance								
Comply with design criteria for HVAC noise levels listed in ASHRAE 2011 Applications Handbook, Table 6. Calculate or measure sound levels. Meet applicable prescriptive sound transmission class (STC) ratings and reverberation time requirements. For all large conference rooms seating more than 50 persons, evaluate whether sound reinforcement and AV playback capabilities are needed. CONVERT TO v4.1	1	1				D	LEED v4.1	N/A
Innovation								
Combination of innovation, pilot, and exemplary performance strategies TBD by project team. Exemplary performance points are limited to 2.	6	5	0	0	4			
Pilot Credit: Procurement of Low Carbon Construction Materials					1	D		
Innovation: Well Features - Feature 87 Beauty and Design					1	D		
Innovation: Design for Active Occupants					1	D		
Innovation: Modular Building Resource Reduction								
Exemplary Performance: Indoor Water Use Reduction (+55% reduction)						D		
Exemplary Performance: Optimized Energy Performance (+54% reduction)					1	D		
Exemplary Performance: Enhanced Indoor Air Quality Strategies (Option 1 and 2 and an additional IAQ strategy)						D		
Exemplary Performance: Renewable Energy Production (15% by cost min)					1	D		
LEED Accredited Professional		1				C		
Regional Priority								
Achieve four of the six credits https://www.usgbc.org/rpc	4	3	0	0	1			
Regional Priority: Surrounding Density and Diverse Uses						D		
Regional Priority: Outdoor Water Use Reduction	1	1				D		
Regional Priority: Indoor Water Use Reduction	1				1	D		
Regional Priority: Optimize Energy Performance	1	1				D		
Regional Priority: Renewable Energy Production	1				1	D		
Daylight						D		
Regional Priority: Rainwater Management		1				D		
Cooling Tower Water Use						D		
Access to Quality Transit						D		

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LEED v4 and LEED v4.1 Credit Summaries (For full credit language go to www.usgbc.org/credits)	Points							
	Available	Yes	Maybe	Less Likely	No	Dsgn/ Cnst	LEED v4 credits can be substituted w/ LEED v4.1	Option Pursued
Reduced Parking Footprint			1			D		
Sensitive Land Protection						D		
Site Development - Protect or Restore Habitat						D		
Enhanced Indoor Air Quality Strategies						D		
Bicycle Facilities						D		
Green Vehicles						D		

California Institute of Technology
LEED Material Submittal Form

General Contractor: ~~xxxx~~
Address: _____
Phone: _____
GC Project Number: _____
Design Team Project Number: _____

Project Address: _____ **Submittal #** _____

This project is pursuing LEEDv4/LEEDv4.1 certification. This form must be completed for each building material (i.e. drywall, insulation, paint, etc.) that you will be furnishing to the project. **Material Cost must match your invoiced Schedule of Values breakdown.**
Write "N/A" in any field below if it does not apply to a material and a "?" if you are unable to determine the information requested.

<p>Sub-Contractor: _____</p> <p>Contact: _____</p> <p>Date: _____</p>	<p>Spec Section: _____</p> <p>Material/Product Name: _____</p> <p>Manufacturer: _____</p>
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1. **Material Cost** (includes shop drawings, shop fabrication, shipping, delivery and tax. These costs must be listed in Schedule of Values): \$

2. **Regional Materials**¹:
 Percentage of material Harvested **AND** Manufactured within a 100-mile radius (as the crow flies) of the project site: _____%
 Location of Harvest: City / State _____ Miles from the project site _____
 Location of Manufacture: City / State _____ Miles from the project site _____
Submit manufacturer documentation stating the Location of Harvest AND the Location of Manufacture. Regional materials are worth 2x material cost/value.

3. **Environmental Product Declaration (EPD)**
 Choose one:
 Product-specific EPD Industry-wide EPD
 Product-specific declaration None available
Submit backup documentation for the option selected.

4. **Leadership Extraction**
Recycled Content²:
 Percentage of Post-Consumer Content: _____% Percentage of Pre-Consumer Content: _____%
Submit manufacturer documentation stating the percentage of recycled content.
FSC Certified Wood Content⁴: _____% of New Wood in Material (by Weight) _____% FSC Content of New Wood
 FSC Chain-of-Custody Certificate Number: _____
Submit a copy of the actual subcontractor invoice that includes a line-item list of wood products, FSC label, dollar value and FSC CoC number.

5. **Material Ingredient Reporting**
 Choose one:
 Health Product Declaration (HPD) Cradle to Cradle (minimum v2 Basic level or v3 Bronze level)
 None available
Submit backup documentation for the option selected.

6. **Material Ingredient Optimization**
 Choose one:
 ~~GreenScreen~~ v1.2 Benchmark None available
 Cradle to Cradle (specify: v2 Gold / v2 Platinum / v3 Silver / v3 Gold / v3 Platinum)
Submit backup documentation for the option selected.

7. **VOC Content**

For all paints, coatings, adhesives and sealants:

VOC Limit (Per LEED Guidelines) _____ grams/liter VOC Content _____ grams/liter

Product Volume _____ liters Product Surface Area _____ sq. ft.

Complies with the California Department of Public Health (CPDH) Standard Method v1.1-2010 (LEED v4) and v1.2-2017 (LEED v4.1) for the appropriate exposure scenario

Submit manufacturer documentation stating the VOC content of the product and compliance in accordance with the California Department of Public Health (CPDH) Standard Method v1.1-2010 (LEED v4) and v1.2-2017 (LEED v4.1) for the applicable exposure scenario.

For all flooring, ceilings, walls, thermal and acoustic insulation:

Complies with the California Department of Public Health (CPDH) Standard Method v1.1-2010 (LEED v4) and v1.2-2017 (LEED v4.1) for the appropriate exposure scenario

Submit documentation demonstrating compliance in accordance with the California Department of Public Health (CPDH) Standard Method v1.1-2010 (LEED v4) and v1.2-2017 (LEED v4.1) for the applicable exposure scenario.

For all composite wood products:

Choose one:

Contains formaldehyde resins that comply with the California Air Resources Board ACTM 2007 for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins

Contains no added formaldehyde resins

Submit documentation demonstrating compliance in accordance with the California Air Resources Board ACTM 2007 for the applicable exposure scenario.

CONTRACTOR CERTIFICATION:

I, _____ a duly authorized representative of _____ hereby certify that the material information contained herein is an accurate representation of the material qualifications to be provided by us, as components of the final building construction. Furthermore, I understand that any change in qualifications during the purchasing period will require prior written approval from the Construction Manager and Owner.

SIGNATURE OF AUTHORIZED REPRESENTATIVE: _____ DATE: _____

SECTION 01 9113 - GENERAL COMMISSIONING REQUIREMENTS**PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. General requirements shall adhere to Caltech's Commissioning Guideline for coordinating and scheduling commissioning activities.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of commissioning process test equipment, instrumentation, and tools.
5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
6. Commissioning tests and commissioning test demonstration.
7. Adjusting, verifying, and documenting identified systems and assemblies.
8. The mention of a subcontractor is not meant to usurp the Contractor's responsibility to assign the work. The commissioning team is assigned tasks to be completed to demonstrate completion and operation of the systems. The tasks described in this Section will be performed by the commissioning team. Contractor shall ensure the responsible subcontractor performs the assigned commissioning tasks.
9. Asset Management.
10. Commissioning Plan provided under separate cover.

B. Related Requirements:

1. Section 01 1000 "Summary" for Commissioning Authority responsibilities.
2. Section 01 3200 "Construction Progress Documentation" for inclusion of Cx-related activities in the Construction Progress Documentation.
3. Section 01 3300 "Submittal Procedures" for submittal procedure requirements for commissioning process.
4. Section 01 7700 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
5. Section 01 7823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal requirements.
6. Section 01 7900 "Demonstration and Training" for Owner Training requirements.
7. Section 22 0800 "Commissioning of Plumbing" for technical commissioning requirements for plumbing.
8. Section 23 0800 "Commissioning of HVAC" for technical commissioning requirements for HVAC.
9. Section 26 0800 "Commissioning of Electrical Systems" for technical commissioning requirements for electrical systems.

1.2 REFERENCES

- A. 2019 California Energy Code
- B. 2019 California Energy Code and Building Energy Efficiency Standards Reference Appendices
- C. 2019 Building Energy Efficiency Standards Nonresidential Compliance Manual
- D. ASQ/ANSI Quality Standards Z1.4

- E. Caltech Asset Data Commissioning User Manual

1.3 DESCRIPTION

- A. Commissioning Process: A quality-focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that all of the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements (OPR).
- B. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.
- C. Commissioning activities supplement field quality and testing procedures described in relevant technical sections.

1.4 DEFINITIONS

- A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.
- B. Basis-of-Design Document: A document prepared by Architect that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.
- C. Commissioning Authority: An entity engaged by Owner, and identified in Section 01 1000 "Summary," to evaluate Commissioning-Process Work.
- D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation of commissioning requirements.
- E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities. The scope of the commissioning process is defined in Section 01 1000 "Summary."
- F. Construction-Phase Commissioning-Process Completion: The stage of completion and acceptance of commissioning process when resolution of deficient conditions and issues discovered during commissioning process and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date construction-phase commissioning- process completion is achieved. See Section 017700 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
 - 1. Commissioning process is complete when the Work specified of this Section and related Sections has been completed and approved, including, but not limited to, the following:
 - a. Completion of tests and acceptance of test results.
 - b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
 - c. Comply with requirements in Section 01 7900 "Demonstration and Training."

- d. Completion and acceptance of submittals and reports.
 - e. Verification of asset as-built data entry and field labeling of assets.
- G. **Asset Data Commissioning:** The process of collecting, standardizing and conforming operational building and equipment data from construction documents into a database format that can be loaded to Caltech's Integrated Work Management System (IWMS). See Caltech Asset Data Commissioning User Manual for requirements.
- H. **Performance Period:** A period that is intended to demonstrate that all equipment and assemblies can operate as integrated systems under automatic control without any issues or interventions required.
- I. **Owner's Project Requirements:** A document that details the functional requirements of a project and the expectations of how it will be used and operated, including Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. This document is prepared either by the Owner or for the Owner by the Architect or Commissioning Authority.
- J. **Owner's Witness:** Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.
- K. **"Systems," "Assemblies," "Subsystems," "Equipment," "Assets", and "Components":** Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.
- L. **Test:** Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.
- M. **Sampling Procedures and Tables for Inspection by Attributes:** As defined in ASQ/ANSI QUALITY STANDARDS Z1.4.

1.5 COMMISSIONING TEAM

- A. **Members Appointed by Contractor:**
- 1. **Commissioning Coordinator:** A person or entity employed by Contractor to manage, schedule, and coordinate commissioning process.
 - 2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning process.
 - 3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning process.
 - 4. Appointed team members shall have the authority to act on behalf of the entity they represent.
- B. **Members Appointed by Owner:**
- 1. Commissioning Authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning process.
 - 2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning process.

1.6 RESPONSIBILITIES

- A. Services for the Owner and Commissioning Authority are not provided for in this Contract. That is, the Contractor is not responsible for providing their services. Their responsibilities are listed here to clarify the commissioning process.
- B. Contractor
1. The Contractor is fully responsible to the Owner for all Subcontractor and Manufactures & Suppliers listed responsibilities in the specifications. Separate responsibility listings are given in this Section for clarity purposes.
 2. The Contractor shall work with Commissioning agent to compile a feasible schedule incorporating the necessary testing and validation throughout the construction master schedule.
 3. The Contractor shall assign an individual to manage commissioning activities of the Contractor, and subcontractors.
 4. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.
 5. The Contractor shall ensure that each installing subcontractor shall assign representatives with expertise and authority to act on behalf of the subcontractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 - a. Participate in commissioning coordination meetings.
 - b. Conduct training sessions in accordance with approved training plans.
 - c. Verify that Work is complete, and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
 - d. Evaluate commissioning issues and commissioning observations identified in the Commissioning Issues Log, field reports, test reports or other commissioning documents. In collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - e. Review and comment on commissioning documentation.
 - f. Participate in meetings to coordinate Systems Functional Performance Testing.
 - g. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Commissioning Authority for incorporation into the commissioning plan.
 - h. Provide information to the Commissioning Authority for developing commissioning plan.
 - i. Participate in Owner training sessions.
 - j. Provide technicians who are familiar with the construction and operation of installed systems and who shall execute specific test procedures to conduct Functional Performance Testing of installed systems.
 - k. Perform asset data entry according to Caltech Asset Data Commissioning User Manual.
 6. Contractors providing and/or installing equipment and systems included in the 'Scope of Work' above are required to participate fully in the Commissioning Process.
 7. Participating Contractors shall include all costs to complete the commissioning requirements in their contract price including all costs for Sub-Contractors, vendors and suppliers.
 8. Participating Contractors shall ensure acceptable representation, with the means and authority to prepare, coordinate and execute the Commissioning Process as described in the contract documents.
 9. Contractors shall participate in the resolution of system deficiencies identified during the commissioning process, according to the contract documents.

10. Each Contractor participating in the Commissioning Process will each designate a single- point contact.
 11. Ensure that the Contractor Commissioning Documents are being maintained, well organized and current as required in item the 'Commissioning Documentation' paragraph of this specification.
- C. Subcontractors
1. Each Subcontractor shall provide qualified field technicians who are trained and familiar with installation, operation and troubleshooting of systems and equipment being commissioned for participation in the commissioning activities outlined in this document.
 2. These same technicians shall be made available to assist the Owner in resolving commissioning issues and for repeat and follow-up commissioning tasks as required.
- D. Manufactures and Suppliers
1. Provide requested submittal data, including detailed start-up and checkout procedures and specific responsibilities of the Owner to keep warranties in force for all commissioned equipment or assemblies.
 2. Assist in equipment or assembly testing per agreements with Subcontractors.
 3. Include all special tools and instruments, when only available from vendor, specific to a piece of equipment, required for testing equipment according to these Contract Documents in the base bid price to the Subcontractors.
 4. Review test procedures for equipment installed by factory representatives.
 5. Provide expert qualified staff for equipment training per agreements with Subcontractors.
- E. Commissioning Authority
1. Revise, as necessary, the construction phase commissioning plan developed during design, including scope and schedule.
 2. The Commissioning Authority may assist with problem-solving nonconformance or deficiencies, but ultimately that responsibility resides with the Contractor.
 3. Coordinate the commissioning work and with the Contractor to ensure that commissioning activities are being scheduled into the master schedule.
 4. Plan and conduct commissioning meetings including the planning and kick-off meetings as needed and distribute minutes.
 5. Develop a Master Equipment List of commissioned equipment in a computerized spreadsheet in a grouped and organized format.
 6. Track the status of each piece of equipment in the Master Equipment List.
 7. Request and review additional information required to perform commissioning tasks, including O&M materials, start-up, or checkout procedures.
 8. Review submittals applicable to systems being commissioned for compliance with commissioning requirements.
 9. Review bulletins, requests for information, and change orders for impact on commissioning and Owner's objectives.
 10. Develop Pre-Functional Checklists and the Functional Test Plan.
 11. Document completion of the Subcontractor-completed Pre-Functional Checklists by reviewing completed checklists and by selected site observation.
 12. Witness and document execution of the Functional Test Plan, as performed by the installing Subcontractors.
 13. Review and comment, if necessary, on the Contractor's training plan.
 14. During the Warranty Period, coordinate and supervise required deferred testing and update documentation for the Commissioning Report.

15. Manage the Asset Data Commissioning process

F. Architect of Record

1. Review the Commissioning Plan.
2. Attend the commissioning kick-off meetings and selected commissioning team meetings.
3. The Engineer or Record shall attend the controls integration meetings.
4. Perform normal submittal review, construction observation, O&M manual review.
5. Review the coordination Drawings.
6. Assist, along with the Owner, in clarifying the operation and control of commissioned equipment in areas where the Specifications, control Drawings or equipment documentation is not sufficient for writing detailed testing procedures.
7. Witness selected testing.
8. Coordinate resolution of system deficiencies and warranty issues identified during commissioning.
9. Provide design basis and design narratives documentation for the Systems Manual.
10. Review Systems Manual.
11. During the Warranty Period, coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning activities.

G. Owner

1. Furnish a copy of all Construction Documents, addenda, requests for information, change orders and approved submittals and Shop Drawings related to commissioned equipment to the Commissioning Authority.
- 2.
3. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the Commissioning Plan.
4. Participate in issue resolution, as necessary.
5. Provide final approval for the completion of the commissioning work.

1.7 COMMUNICATION

- A. No communications (verbal or written) from the Commissioning Authority shall be deemed to constitute direction that modifies the terms of any contract.

1.8 SUBMITTALS

- A. Comply with requirements in Section 01 3300 "Submittal Procedures" for submittal procedure general requirements for commissioning process.
- B. Commissioning Plan Information:
1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors performing the various commissioning requirements.
 2. Schedule of commissioning activities, integrated with the Construction Schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for the Construction Schedule general requirements for commissioning process.
 3. Contractor personnel and subcontractors participating in each test.
 4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.
- C. Commissioning schedule.

- D. Two-week look-ahead schedules.
- E. Certificate of Construction-Phase Commissioning Process Completion
- F. Documentation Required in Other Sections
 - 1. Where individual testing, adjusting, or related services are required in the project specifications and not specifically required by this commissioning requirements specification, the specified services shall be provided and copies of documentation, as required by those specifications shall be submitted.

1.9 COMMISSIONING DOCUMENTATION

- A. Commissioning Plan
 - 1. A document prepared by Commissioning Authority that outlines the commissioning process, including schedule, allocation of resources, team members, roles & responsibilities, and documentation requirements.
- B. Commissioning Issues Log
 - 1. A document prepared, maintained, and updated by the Commissioning Authority.
 - 2. Describes Commissioning Issues identified during the Commissioning process.
 - 3. These issues include, but are not limited to, those that are at variance with the Contract Documents or Owner's requirements.
 - 4. The Commissioning Issues Log will identify and track issues as they are encountered, progress toward resolution, and document how the issue was resolved.
- C. Commissioning Meeting Agendas and Minutes
 - 1. Prepared by the Commissioning Authority for each schedule Commissioning Meeting.
 - 2. The agenda will present items to be discussed by the Commissioning Team during the meeting. Agenda to be submitted prior to the meeting to the owner.
 - 3. Action items identified during the meeting will have a responsible party assigned to address the item with a due date.
 - 4. These discussions will be captured by the Commissioning Authority, documented in the Meeting Minutes, and distributed to the Commissioning Team issued by the next business day.
 - 5. Any exceptions taken to the meeting minutes must be provided in written within one week of the issuance of the minutes.
 - 6. Action items that are not addressed by the due date noted in the meeting minutes shall be considered a non-conforming item and added to the Commissioning Issues Log.
 - 7. Once the minute are issued, they shall become part of Project Record.
- D. Master Equipment List
 - 1. Prepared, maintained, and updated by the Commissioning Authority that tracks the status of each piece of equipment in the equipment list matrix for: receipt of the submittal, asset data entry, Pre-Functional Checklists, startup, Functional Performance Testing, O&M manual submission, and Owner training.
- E. Pre-Functional Checklists
 - 1. No equipment shall be installed prior to approval of the related submittal.

2. The Commissioning Authority will generate Pre-Functional Checklists once the related equipment submittal has been made by the Contractor and approved.
3. The installing Subcontractor(s) shall complete Pre-Functional Checklists for each piece of equipment.
4. No sampling strategies shall be applied for completion of Pre-Functional Checklists. 100% of commissioned equipment shall have a contractor-complete Pre-Functional Checklist submitted upon completion.
5. All Pre-Functional Checklists will be maintained as digital documents held on a cloud-based platform maintained by the Commissioning Authority that will be accessible by the Contractor.

F. Startup Reports

1. Startup shall not be performed on any piece of equipment prior to submittal and approval of the related completed Pre-Functional Checklists and proposed Startup Reports.
2. The Contractor shall develop Startup Reports by combining, or adding to, the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor for each piece of equipment requiring startup.
3. The report shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
4. The report shall be prepared and submitted by the Contractor immediately after the related equipment submittal(s) has been approved.
5. For all direct digital controls, prepare a Point to Point Report that verifies each point is communicating, reporting, and controlling properly. Submit all results in writing, including: system name, sensor/point name, measured value, DDC value, and Correction Factor.

G. Functional Test Plan

1. The CxA develops the Functional Test Plan, shall be approved by the owner and is based upon the sequence of operations laid out in the contract documents, approved submittals, and with review and input from the rest of the Commissioning Team.
2. The relevant contractors shall review the plan for consistency with the current contract document requirements and actual field conditions. Any issues or discrepancies found shall be reported in writing within 14 days or receipt.

H. Training Plan

1. The Owner's personnel shall be trained on the systems being commissioned, in accordance with the Contract Documents, to operate and maintain the building systems and assemblies. The Training Plan shall be approved by the owner and is considered an essential element in designing, preparing, and delivering the training to the participants.

I. Commissioning Report

1. At Construction-Phase Commissioning Completion, the Commissioning Authority prepares a report that include the following:
 - a. Pre-Functional Checklists
 - b. Startup Reports
 - c. Commissioning Issues Log

- d. Commissioning issue narrative discussing resolution of issues
- e. Correspondence or other documents related to resolution of issues
- f. Other reports required by commissioning process.
- g. Report shall include commissioning work of Contractor.
- h. Report shall certify Asset Data Commissioning process is verified and complete.

J. Systems Manual

- 1. The Commissioning Authority will gather required information and compile the Systems Manual. The Systems Manual will include, but is not limited to, the following:
 - a. Design Narrative, including system narratives, schematics, single-line diagrams, flow diagrams, equipment schedules, and changes made throughout the Project.
 - b. Reference to Final Commissioning Plan.
 - c. Reference to Final Commissioning Report.
 - d. Approved Operation and Maintenance Data as submitted by the Contractor.

1.10 FUNCTIONAL PERFORMANCE TESTING

A. In general, Systems Functional Performance Testing will be scheduled only after the following prerequisites, at a minimum, have been met:

- 1. Pre-Functional Checklists have been completed, submitted, and approved.
- 2. Startup Reports have been completed, submitted, and approved.
- 3. Controls Point to Point Checkouts have been completed, submitted, and approved.
- 4. The control system shall be sufficiently tested and approved by the Commissioning Authority before it is used to verify performance of other components or systems.
- 5. Testing, Adjusting, and Balancing work shall be complete, and the Final Report has been submitted and approved.
- 6. All issues, or other non-compliance items, that may affect system performance have been resolved.

B. The test procedure forms developed by the Commissioning Authority will include, but not be limited to, the following information:

- 1. System and equipment or component name(s)
- 2. Equipment location and ID number
- 3. Unique test ID number, and reference to unique Pre-Functional Checklists and startup documentation, and ID numbers for the piece of equipment
- 4. Date
- 5. Project name
- 6. Participating parties
- 7. A reference to the specific sequence of operations or other specified parameters being verified
- 8. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
- 9. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
- 10. A section for comments.
- 11. Digital signature and date blocks for all witnesses and participants.

C. All Functional Performance Tests will be maintained as digital documents held on a cloud-based platform maintained by the Commissioning Authority that will be accessible by the Contractor.

1.11 PERFORMANCE PERIOD

- A. The Performance Period will begin once all associated functional tests have been completed and approved.
- B. This activity should be included in the project's schedule after completion of functional tests and shown as complete prior to Substantial Completion.
- C. Successful completion of the Performance Period is a prerequisite to Substantial Completion.

1.12 CLOSEOUT SUBMITTALS

- A. The following submittal are required prior to completion of the construction phase commissioning process:
 - 1. Request for Certificate of Construction-Phase Commissioning Process Completion.
 - 2. Pre-Functional Checklists
 - 3. Startup Reports
 - 4. Testing, Adjusting, and Balancing Report
 - 5. Operation and Maintenance Data
 - 6. Final As-Builts Record Documents
 - 7. Training plan and agenda
 - 8. Asset As-Built Data CxA verification

1.13 SYSTEMS TO BE COMMISSIONED

- A. Specified per project.

PART 2 – PRODUCTS**2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS**

- A. Test equipment and instrumentation required to perform the commissioning process shall remain the property of Contractor unless otherwise indicated.
- B. Test equipment and instrumentation required to perform commissioning process shall comply with the following criteria:
 - 1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
 - 2. Calibrated and certified.
 - a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags shall be permanently affixed.
 - b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.
 - 3. Maintain test equipment and instrumentation.

4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

- A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.
 1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
 2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Review Commissioning Documentation.
- B. Identify any conflicts between the checklists, contract documents, and manufacture's requirements and notify the Commissioning Team.

3.2 GENERAL EXECUTION REQUIREMENTS

- A. Schedule and coordinate commissioning process with the Construction Schedule.
- B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.

3.3 EQUIPMENT ACCESS

- A. During installation, provide access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements.
- B. Access shall be coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
- C. Notify the Owner immediately in writing if required access cannot be provided.

3.4 PRE-FUNCTIONAL CHECKLISTS

- A. Pre-Functional Checklists cannot modify or conflict with the Contract Documents.
- B. Distribute Pre-Functional Checklists to installing contractors before they start work.
- C. Pre-Functional Checklists shall be completed during the installation process by qualified individuals with direct knowledge of the installation.
- D. The Contractor shall clearly list any outstanding items that were not completed successfully on the Pre-Functional Checklist or on an attached sheet.

- E. Provide Commissioning Authority with access to the Commissioning Documentation.
- F. The completed checklists and any outstanding deficiencies shall be submitted within two days of completion.
- G. Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists at the time they are identified.

3.5 STARTUP

- A. Two weeks (minimum) prior to equipment startup, the Contractor shall schedule startup and checkout with the Owner.
- B. Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.
- C. Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, at minimum.
- D. Startup Reports shall be completed during the startup process by qualified individuals with direct knowledge of the procedure.
- E. The performance of the startup shall be directed and executed by the Contractor.

3.6 POINT TO POINT CHECKOUT REPORT

- A. For Direct Digital Controls:
 - 1. Field installed sensor readings shall be verified and calibrated after installation.
 - 2. Factory calibrated sensors shall have calibration verified after installation.
 - 3. Proper device-to-controller communication and configuration shall be verified after installation.
 - 4. Submit results in writing.

3.7 DELAYED PRE-FUNCTIONAL CHECKLISTS AND STARTUP REPORTS

- A. Obtain Owner approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion.
- B. When approved, delayed construction checklists may be completed after date of Construction- Phase Commissioning Completion.
- C. Include, at a minimum, the following in a request for Certificate of Construction-Phase Commissioning Process Completion:
 - 1. Identify delayed construction checklist by construction checklist number and title.
 - 2. Provide a target schedule for completion of delayed construction checklists.
 - 3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.8 FUNCTIONAL PERFORMANCE TESTS

- A. Functional Performance Test procedures shall define the step-by-step procedures to be used to validate the performance of commissioned systems.
- B. The test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
- C. Completed test forms are the official records of the test results.
- D. Commissioning Authority will provide test forms after approval of relevant Product Data, Shop Drawings, and operation and maintenance manuals.
 - 1. Review test forms and provide comments within 14 days of receipt. Review shall address the following:
 - 2. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
- E. Applicability of the procedure to the specific software, equipment, and systems approved for installation.
- F. After Contractor has reviewed and commented on the test forms, Commissioning Authority will revise and reissue the approved revised forms.
- G. Use only approved test forms to perform testing.
- H. Commissioning Issues
 - 1. Test results that are not within the range of acceptable results are commissioning issues and shall be recorded in the Commissioning Issues Log by the Commissioning Authority.
 - 2. Commissioning Issues are tracked by the Commissioning Authority until resolution and retesting are successfully completed.
 - 3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.
 - 4. Do not correct commissioning compliance issues during test demonstrations.
 - a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than fifteen minutes. If corrections are made under this exception, note the deficient conditions on the test data form.
- I. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration.

3.9 TEST METHODS

- A. Functional Performance Testing shall be achieved by automated and manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Authority shall determine which method is most appropriate for tests that do not have a method specified.
- B. The following test methods will be considered for this Project:
 - 1. Simulated Conditions

- a. Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.

2. Overwritten Values

- a. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.

3. Simulated Signals

- a. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.

4. Altering Setpoints

- a. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.

5. Indirect Indicators

- a. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.

C. Automated Testing

- 1. Monitoring of system performance and analyzing of results shall be conducted by using the SkySpark Fault Detection and Diagnostics platform integrated with the BAS.
- 2. For zone-level BAS-integrated equipment, execution of functional tests shall be executed by overriding the system directly through SkySpark, using automated functional testing procedures. 100% of equipment shall be tested under this condition.

3.10 FUNCTIONAL PERFORMANCE TEST SAMPLE RATES

- A. The sampling rate for manual tests is [100] percent.
- B. The sampling rate for test demonstrations is [100] percent. unless otherwise indicated.
- C. The sampling rate for automated tests is 100 percent, unless otherwise indicated.

3.11 DEFERRED TESTS

- A. Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction-Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction-Phase Commissioning Process Completion as follows:
 - 1. Identify deferred tests by number and title.
 - 2. Provide a target schedule for completion of deferred tests.
- B. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
- C. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

3.12 PERFORMANCE PERIOD

- A. All equipment and assemblies capable of automatic operation shall be included in the Performance Period, unless excepted per 3.11 DEFERRED TESTS above.
- B. Successful operation includes automatic operation without manual intervention, without malfunction, without alarm caused by control action or device failure, and with smooth and stable control of systems and equipment in conformance with the contract documents.
- C. In event of failure to meet the standard of performance during any initiated performance period, it is not required that [##] calendar day period expire in order for another performance period to begin.
- D. If equipment or system operate and demonstrate continuing compliance with the requirements outlined in the construction documents for period of [##] consecutive calendar days from commencement date of performance period, the test will be considered to have passed.
- E. Equipment will not be accepted by the Owner and final payment will not be made by the Owner until acceptable performance is met.
- F. Trends taken at the specified intervals will be reviewed by the Commissioning Authority during this period as the primary form of evaluation.

3.13 TRAINING

- A. Training will not begin until functional testing and Operation and Maintenance Manuals for the related system are accepted.
- B. Training Schedule
 - 1. All training activities shall be included in the Construction Schedule.

C. Training Plan

1. The Training Plan shall include the following items:
 - a. Level of training for O&M staff, emergency response personnel, and occupants.
 - b. Outline of instructional topics related to the systems, subsystems, equipment, and assemblies. These topics shall address the design, construction, operation, and maintenance of specific systems, assemblies, and equipment.
 - c. Learning objectives and training delivery methods for each instructional topic.
 - d. The planned location of the training sessions (classroom, on site, and off site) and the minimum duration of each training session, in hours, to be completed as required in the OPR, Cx Plan, or contract documents.
 - e. Instructor's qualifications, including
 - 1) Specific experience of the systems, equipment, and/or project knowledge that relate to the instructional topics
 - 2) Experience related to the systems, subsystems, equipment, and assemblies
 - 3) Formal education and factory training
 - 4) Skills related to the operation and maintenance of systems, subsystems, equipment, and assemblies
 - f. Training materials requirements to be employed during the instructional process.
 - g. Training report, records, and recording requirements.

3.14 COMMISSIONING MEETINGS

- A. The Commissioning Authority will conduct periodic Commissioning Coordination Meetings of the commissioning team to review status of commissioning activities, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities. Comply with requirements in Section 01 3100 "Project Management and Coordination."

3.15 SEQUENCING

- A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:
1. Submittals
 2. Submittal asset data entry verification
 3. Operations and Maintenance Manual submission
 4. Pre-Functional Checklists
 5. Startup
 6. Testing, Adjusting, and Balancing
 7. Asset as-built data entry verification
 8. Functional Performance Testing
 9. Performance Period
 10. Owner Training
- B. Each prerequisite activity shall be completed and approved prior to beginning the subsequent activity.
- C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Owner if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

- D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.16 SCHEDULING

- A. Commence commissioning process as early in the construction period as possible.
- B. Commissioning Schedule: Integrate commissioning activities into Construction Schedule. See Section 013200 "Construction Progress Documentation."
 - 1. Include detailed commissioning activities in updated Construction Schedules and short- interval schedule submittals.
 - 2. Schedule the start date and duration for the following commissioning activities, including documentation submittal:
 - a. Commissioning-related submittals
 - b. Operation and Maintenance manual submittals
 - c. Asset data entry submittals
 - d. Pre-Functional Checklists
 - e. Startup, where required
 - f. Testing, Adjusting, and Balancing
 - g. Functional Performance Tests
 - h. Performance Period
 - i. Training
 - 3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
 - 4. Determine milestones and prerequisites for commissioning process. Show commissioning milestones, prerequisites, and dependencies in updated Construction Schedule and short- interval schedule submittals.
- C. Two-Week Look-Ahead Commissioning Schedule
 - 1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning process.
 - 2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
 - 3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.
- D. Owner's Witness Coordination
 - 1. Coordinate Owner's witness participation via Owner.
 - 2. Notify Owner of commissioning schedule changes at least five workdays in advance for activities requiring the participation of Owner's witness.

3.17 CERTIFICATE OF CONSTRUCTION-PHASE COMMISSIONING PROCESS COMPLETION

- A. When Contractor considers that construction-phase commissioning process, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare

and submit a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete commissioning process.

- B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction-phase commissioning process or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction-Phase Commissioning Process Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction-Phase Commissioning Process Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction-phase commissioning process completion.
- C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning process. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement shall be at Contractor's expense.
- D. When construction-phase commissioning process or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction-Phase Commissioning Process Completion that shall establish the date of completion of construction-phase commissioning process. Certificate of Construction-Phase Commissioning Process Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 01 9113