PCC SYLVANIA HEALTH TECHNOLOGY (HT)

BUILDING WEST SIDE RENOVATION

PROJECT MANUAL - VOLUME 1 OF 1

SPECIFICATIONS DIVISIONS 01 – 31

CONSTRUCTION DOCUMENTS: DEMOLITION AND STRUCTURAL

FEBRUARY 23, 2024

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SECTION 00 01 00 - SPECIFICATIONS TABLE OF CONTENTS

PROJECT MANUAL - VOLUME 1 OF 2

END OF TABLE OF CONTENTS

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Owner-furnished products.
3. Work by Owner.
4. Construction Manager use of site and premises.
5. Work restrictions.
6. Owner Occupancy.
7. Specification and Drawing conventions.

1.3 DEFINITIONS

A. Contractor: Throughout the Specifications the term Contractor shall mean the Construction Manager. The Construction Manager shall designate in writing a representative who shall have express authority to bind the Construction Manager with respect to all matters under this Contract.

B. Notice to Proceed (NTP): Throughout the Specifications the terms Notice to Proceed or NTP shall mean date of Owner acceptance of either Early Work Amendment or Guaranteed Maximum Price (GMP) Amendment, whichever comes first, as required by the Owner and Construction Manager as Constructor Agreement.

1.4 PROJECT

A. Project Name: PCC Health Technology (HT) Building West Side Renovation.

B. Owner's Name: Portland Community College (PCC), 1200 SW 49th Ave, Portland, OR 97219.

C. Architect: Woofter Bolch Architecture, 107 SE Washington St #228, Portland, OR 97214, (503) 724-0111..

D. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. This project is a major remodel to the existing health technology (HT) building on the PCC Sylvania campus. The original building was constructed in a sequence of phases over multiple years, and the building is divided into three distinct sectors which are infrastructurally and programmatically separated. These sectors are structurally connected and act together as a whole. This project will renovate the west and south side of the building, completing a full upgrade of the facility which began with the renovation of the east side (completed in summer of 2023). The west side work includes a major interior renovation at level 1, including the creation of an all-user locker room, fitness studios, and exercise science spaces. The project also includes repurposing the existing natatorium space in south sector. A new 2nd floor structure will be added within the existing double-height natatorium volume to create two levels of new classroom and meeting spaces. New

stairs and an elevator will be added in the south side. The work will also incorporate building systems improvements to address deferred maintenance. deferred maintenance work will improve and replace existing mechanical, electrical and roofing systems in the west and south sectors. Exterior improvements will include replacement of existing glazing systems in the south sector, new entrance locations in the south sector, and addition of new exterior openings on the west facade. site work will include new sidewalk and landscape improvements in the existing mechanical yard.

1.5 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products: As indicated.

1. There is a significant number of salvaged components for reuse on the Project or for return to the Owner. For Selective Demolition Schedule for items for reuse, refer to Section 02 41 19 “Selective Interior Demolition.”

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 CONSTRUCTION MANAGER USE OF SITE AND PREMISES

A. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

2. Do not obstruct roadways, sidewalks, or other public ways without permit.

3. Coordinate with Owner for required access during construction.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours as set forth by the City of Portland and the Owner.

1.9 OWNER OCCUPANCY

A. Owner will only occupy the building outside of the areas of Work. Refer to Drawings for extents.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner site requirements.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Construction Manager unless specifically stated otherwise.

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

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

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations and Acronyms: See Drawings for standard and general abbreviations and acronyms.

3. Keynoting: See Drawings for Keynoting definitions. Materials and products are identified by reference acronyms, unless indicated otherwise.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 31 00 - PROJECT MANAGEMENT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Project communications.
2. Preconstruction meeting.
3. Progress meetings.
4. Construction progress schedule.
5. Requests For Information (RFI).
6. Coordination drawings.
7. Coordination meetings.

B. Related Requirements:

1. Section 01 33 00 “Submittals”.
2. Section 01 70 00 “Execution Requirements”: Additional coordination requirements.
3. Section 01 74 19 “Construction Waste Management”: Review of Waste Management Plan.
4. Section 01 78 00 “Closeout Submittals”: Project record documents.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 PROJECT COMMUNICATION

A. Communication will be through Owner’s electronic project information management platform. This includes, but is not limited to, uploading project documentation and routing project and payment information through the Owner’s defined processes.

B. Field Observation Log:

1. All issues independent of their origin and their resolution shall be tracked and addressed in a Field Observation Log maintained by the Construction Manager. Construction Manager is responsible for maintaining a log of all written field observations and or correction s by the Owner, including but not limited to the Owner’s Project Manager (PM), Architect and their consultants, envelope and roof consultants, and third-party consultants. This may include items from site visits and field reports, Owner observations, punch lists, etc. Log shall be reviewed weekly and incorporated into the meeting notes. Observations shall remain open until closed by Owner.

2. The Owner's designated Representative will track all written issues that are being raised by Owner stakeholders. The Owner issues will be incorporated in the Field Observation Log by the Construction Manager as required.

3.2 PRECONSTRUCTION MEETING

A. Construction Manager shall schedule a meeting 2 weeks prior commencing construction.

B. Attendance Required:

1. Owner.
2. Architect.
3. Construction Manager.
4. Major subcontractors.

C. Agenda:

1. Execution of Owner-Construction Manager Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, Schedule of Values, and progress schedule.
5. Designation of personnel representing the parties to Contract and Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal requests, Change Orders, Requests for Information, and Contract closeout procedures.
7. Scheduling.
8. Permits.
9. Project Safety and Site Security.
10. Waste Management Plan.

D. Construction Manager shall record minutes and distribute copies within two days after meeting to Owner, Architect, other meeting participants, and those affected by decisions made.

3.3 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Construction Manager's representative, major subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

D. Agenda:

1. Review minutes of previous meetings.
2. Review "Safety Plan" and address incidents and accidents that may have occurred.
3. Review of Work progress.
4. Field observations, problems, and decisions.
5. Identification of problems which impede planned progress.

6. Review of submittals schedule and status of submittals.
7. Review of Request for Information (RFI) Log.
8. Review pending Bulletins, COs, CCs, and PRs.
9. Maintenance of progress schedule.
10. Corrective measures to regain projected schedules.
11. 3 Week look-ahead construction schedule.
12. Construction Manager Quality Control.
13. Maintenance of quality and work standards.
14. Effect of proposed changes on progress schedule and coordination.
15. Waste Management Plan.
16. Other business relating to Work.

E. Field Observation Log: Construction Manager shall track all issues, independent of origin and resolution, in a Field Observation Log. Field Observation Log shall be updated and attached to mutes for distribution for each Progress Meeting.

F. Construction Manager shall record minutes and distribute electronic copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made. Provide hard copies at following project meeting.

3.4 CONSTRUCTION PROGRESS SCHEDULE

A. Refer to Section 01 32 16 “Construction Progress Schedule”.

B. Submit updated schedule with each Application for Payment.

3.5 REQUESTS FOR INFORMATION (RFI)

A. During the Construction Phase the Construction Manager shall utilize the Request for Information (RFI) process to request clarification or interpretation based on the following criteria:

1. Conflict within the drawings and/or the specifications
2. Insufficient or unclear information in the drawings or specification.
3. Unanticipated field conditions.
4. Conflict between field conditions and the Contract Documents.
5. If any of the issues above arise and are resolved in the field, they shall be documented through the RFI process.

B. The Construction Manager shall NOT use the RFI process for the following uses:

1. To change the contract amount or schedule.
2. To authorize work that will change the contract amount or schedule.
3. Request to substitute materials.
4. To propose a change in the contract amount or schedule.
5. To request information readily available in the Contract Documents.

C. Requests for Information (RFI) shall contain the following elements:

1. Project name and location.
2. Primary respondent and secondary respondents if applicable.

3. Date of issue and allow space for revision dates.
4. Name and Company of author.
5. RFI Number (sequential).
6. Subject: provide adequate detail (e.g. "Entry Door at Unit 255").
7. Required Date of Response.
8. Reference specific drawings/details and specific specification sections/paragraphs.
9. Description of conflict or information needed.
10. Author's recommended course of action.
11. Potential for Cost or Schedule Impact:
    a. Include construction status of affected area and photo if applicable.
    b. Indicate if involved materials are on site or have been ordered.
    c. Indicate if recommended course of action will require demolition, cutting and patching, etc.
12. Author's attached documents if applicable.
13. Space for respondent’s response.
14. Space to note respondent’s attached documents.

D. The Construction Manager shall maintain a log of RFI's that notes the following (this may be integrated into web-based construction administration document control if applicable). The log shall include:
1. Number.
2. Subject.
3. Author.
4. In Whose Court.
5. Date of Issue.
6. Date Due.
7. Date of closure.

E. Upon the request of the Owner, the Construction Manager shall be prepared to utilize web-based construction administration document control for the RFI process.

F. RFI's shall be submitted digitally via web-based construction administration software if applicable.

3.6 COORDINATION DRAWINGS

A. Construction Manager shall be responsible for the preparation of coordination drawings as warranted by the Work.

3.7 COORDINATION MEETINGS

A. The Construction Manager shall facilitate coordination meetings between the Construction Manager, subcontractors and the Architect.

B. The Construction Manager shall prepare an agenda for each coordination session and prepare meeting minutes recording attendees, decisions made, and action items.

C. The Construction Manager shall distribute the minutes electronically within two working days.

END OF SECTION

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SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Preliminary schedule.
2. Construction progress schedule, bar chart type.

1.3 REFERENCES

A. AGC (CPSM) - Construction Planning and Scheduling Manual; Associated General Contractors of America; 2004.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM, O'Brien, McGraw-Hill Book Company; 2006.

1.4 SUBMITTALS

A. Upon the execution of the Guaranteed Maximum Price Amendment, the Construction Manager shall submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

1.5 QUALITY ASSURANCE

A. Scheduler: Construction Manager's personnel or specialist Consultant specializing in CPM scheduling with one (1) year minimum experience in scheduling construction work of a complexity comparable to this Project and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.6 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Sheet Size: Multiples of 8-1/2 x 11 inches.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.2 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

D. Indicate delivery dates for owner-furnished products.

E. Provide legend for symbols and abbreviations used.

3.3 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first workday of each week.

3.4 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.5 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.6 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Construction Manager's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01 33 00 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Submittal Procedures.
2. Submittals Schedule.
3. Proposed Products List.
4. Shop Drawings.
5. Samples.
6. Manufacturer's Instructions.
7. Manufacturer's Certificates.
8. Manufacturer's Field Report.
9. Construction Photographs.

B. Related Requirements:

1. Section 01 31 00 “Project Management Requirements” for Project communications requirements.
2. Section 01 60 00 “Product Requirements”.
3. Section 01 78 00 “Closeout Submittals”.

1.3 SUBMITTAL PROCEDURES

A. Assign each submittal a submittal number comprised of a sequential numerical number, the CSI Specification Section number and number of the specific submission. Subsequent resubmissions are followed by sequential numeric suffix. Example: 5- 088000-1-2 = Fifth submittal overall, the first submittal of Section 08 80 00, second re- submittal.

B. All submittals that are submitted digitally shall be accompanied by a digital transmittal.

C. Identify Project, Construction Manager, subcontractor or supplier; pertinent Drawing sheet and detail number(s), and Specification Section number, as appropriate.

D. Construction Manager's Review:

1. the Construction Manager shall perform a thorough review of the initial submittal and any subsequent resubmittals for completeness of all required information. This will include but will not be limited to; needed dimensions, material designations, finish choices, coordination with other work, coordination with related Change Orders (CO), Architect's Supplemental Instructions (ASI), and Requests For Information (RFI), warranties, tests, and certifications.
2. Once a thorough review by the Construction Manager is complete, the Contract shall affix their marked and initialed stamp according to the findings of their review.

3. If the submittal does not have sufficient information, is incomplete, or is sufficiently incorrect to warrant a resubmittal, the Construction Manager shall return the submittal directly to the subcontractor for corrections.

4. The Construction Manager shall only pass complete and thoroughly reviewed and stamped submittals on to the Architect. Any submittal that is incomplete or not thoroughly reviewed and stamped by the Construction Manager shall be returned un-reviewed.

E. Schedule submittals to expedite Project, and deliver to Architect and Owner. Coordinate submission of related items.

F. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.

G. Provide space for Construction Manager and Architect review stamps.

H. Revise and resubmit submittals as required, identify all changes made since previous submittal.

I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

J. The Construction Manager shall maintain a log of Submittals. (this may be integrated into web-based construction administration document control if applicable). The log shall include:

1. Number of Submittal
2. Subject
3. Reviewer(s)
4. Date of Issue
5. Date Due
6. Date Returned by Reviewer

1.4 SUBMITTALS SCHEDULE

A. General: After development and acceptance of fully developed Construction Schedule, prepare complete schedule of work-related submittals. This schedule shall include deferred submittals. Submit this Submittals Schedule, correlated with listing of principal subcontractors, as required by General Conditions, and with "listing of products" or "procurement schedule" as specified in "Products and Substitutions" paragraphs of Section 01 60 00 “Product Requirements” and elsewhere in Contract Documents.

B. Form: Prepare Submittals Schedule in chronological order of submittals. Indicate following:

1. Category of submittal (review or records).
2. Note clearly if submittal is for deferred permitting.
3. Name of subcontractor.
4. Generic description of Work covered.
5. Related Section numbers.
6. Activity or event number on Construction Schedule.
7. Scheduled date for first submittal.
8. Re-submittal and final release or approval by Architect.

1.5 PROPOSED PRODUCTS LIST (SUBMITTAL FOR REVIEW)

A. Within thirty (30) days after date of Notice to Proceed, submit complete list of major proposed products to Architect and Owner, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.6 SHOP DRAWINGS (SUBMITTAL FOR REVIEW)

A. Shop Drawings:

1. Include dimensions, identification of specific products and materials which are included in Work, compliance with specified standard and notations of coordination requirements with other work.

2. Provide special notation of dimensions established by field measurement.

3. High-light, encircle or otherwise indicate deviations from Contract Documents on Shop Drawings.

4. Clearly note on drawing if this a deferred permit submittal. If it is, include the project building permit number and provide space on the sheet for comments and approval stamps from the building department.

B. Shop Drawings Procedure:

1. Construction Manager shall submit, after Construction Manager's review, one digital copy in PDF format to Architect. If the Construction Manager has not reviewed and stamped the shop drawings prior to submitting to the Architect; they shall be deemed unacceptable and not reviewed by the Architect.

2. When shop drawings require review by multiple parties, Construction Manager shall distribute for simultaneous review in the same digital format.

3. Construction Manager shall make all corrections, including all necessary corrections relating to artistic effect, required by Architect, and then print and distribute copies to respective trades, Owner and Architect.

C. Shop Drawing Step Summary:

1. Construction Manager reviews and stamps prints.

2. Construction Manager sends Architect one digital copy and other reviewers 1 digital copy when required.

3. Architect reviews, notes and returns marked up digital copy to Construction Manager.

4. Construction Manager makes necessary corrections.

5. Construction Manager prints accepted final mark up and distributes 1 digital copy to each reviewer. Refer also to Section 01 78 00 “Closeout Submittals” for Record Drawings.

D. Architect Review of such Drawings or schedules shall not relieve Construction Manager from responsibility for deviations from Drawings or specifications unless Construction Manager had, in writing, called Architect's attention to such deviation at time of submission, nor shall it relieve Construction Manager from responsibility for errors of any sort in Shop Drawings or schedules.

1.7 PRODUCT DATA (SUBMITTAL FOR REVIEW)

A. Submit 1 digital copy in PDF format via e-mail.

B. Mark submittal to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.

C. Architect's or Consultant's reviews and review stamps may be applied digitally and reviews submittals returned to Contractor digitally.

D. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01 78 00 - Closeout Submittals (O&M Manuals).

E. When specific LEED related data is noted for specific products (e.g. specific VOC limitations) confirmation of that specific requirement shall be included in the product data submittal.

1.8 SAMPLES (SUBMITTAL FOR REVIEW)

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from full range of manufacturer's standard colors, textures, and patterns for Architect's selection.

C. Include identification on each sample, with full Project information.

D. Submit number of samples specified in individual Specifications Sections; one of which will be retained by Architect. When there are two architectural firms involved, provide a minimum of one sample for each plus additional samples as required.

E. Reviewed samples which may be used in Work are indicated in individual Specification Sections.

1.9 MANUFACTURER'S INSTRUCTIONS (SUBMITTAL FOR RECORDS)

A. When specified in individual specification Sections, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing. Submit 1 digital copy in PDF format via e-mail for Architect's and consultant's records.

B. Identify conflicts between manufacturer's instructions and Contract Documents.

1.10 MANUFACTURER'S CERTIFICATES (SUBMITTAL FOR RECORDS)

A. When specified in individual Specification Sections, submit manufacturer's certificate to Architect/Engineer for review. Submit 1 digital copy in PDF format via e-mail for Architect's and consultant's records

B. Indicate material or product conforms to or exceeds specific requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.11 MANUFACTURER'S FIELD REPORT (SUBMITTAL FOR RECORDS)

A. When specified in individual Specification Sections, submit Manufacturer's Field Report to Architect for review. Submit 1 digital copy in PDF format via e-mail for Architect's and Consultant's records.

B. Manufacturer's Field Report shall include the name and company of the Manufacturer's Representative, time and date of the site visit, weather conditions, progress point of the work, overview of the site visit scope, any deficiencies noted and remedial instructions given to Construction Manager including any instructions given that are contradictory to manufacturer's written instructions.

1.12 CONSTRUCTION PHOTOGRAPHS (SUBMITTAL FOR RECORDS)

A. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable by Architect.

B. Take photographs each month.

C. Views:

1. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.

D. Images: Full Color.

1. Identify each view in lower right hand corner or bottom edge. Identify name of Project, contract number, phase, orientation of view, date (include in digital file name) and time of view.

2. Distribute submittals digitally in PDF or JPEG format.

1.13 CONSTRUCTION MANAGER PLANS (SUBMITTAL FOR REVIEW/ RECORDS)

A. Submit all Plans in digital pdf format via email.

B. Construction Manager’s Quality Control Plan.

C. Construction Manager's Waste Management Plan and related reports.

D. Construction Manager’s Indoor Air Quality Plan and related reports.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

3.1 SUBMITTAL REVIEW TIME ALLOCATION

	Architects First Review	Construction Manager's Revision as Required	Architects Second Review
Shop Drawings Simple Review	10 Working Days	5 Working Days	5 Working Days
Shop Drawings Multiple Review	20 Working Days	10 Working Days	10 Working Days
Product Data	10 Working Days	5 Working Days	5 Working Days
Samples	10 Working Days	5 Working Days	5 Working Days

3.2 SUBMITTAL REVIEW -ADDITIONAL TIME

A. Additional time for Owner’s review of products that are outside of Owner’s 2020 Design Standards will be required. Time necessary defined in Contract.

END OF SECTION

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Temporary telephone service.
2. Temporary sanitary facilities.
3. Temporary Controls: Barriers, enclosures, and fencing.
4. Security requirements.
5. Vehicular access and parking.
6. Waste removal facilities and services.
7. Project identification sign.
8. Field offices.

1.3 COMMUNICATIONS SERVICES

A. Provide, maintain and pay for cellular and land-line telephone services, internet service and facsimile service to field office at time of project mobilization.

1.4 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.5 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.6 FENCING

A. Provide 6-foot-high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.7 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and

to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

B. Provide temporary weather tight enclosures for site storage of weather-sensitive products and items. Enclosures shall accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access openings with locks.

1.8 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft. Scope of required security measures to be determined by Owner and Construction Manager before start of construction work.

1.9 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.10 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

A. Provide Project identification signage as indicated.

1. Refer to the Drawings for design and construction of Project identification signage.

2. Include Project firms' names, addresses, and logos, including Owner, Owner's Representative, Construction Manager, Architect, prime Engineers.

3. Include a color image of the Project as provided by the Architect.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

1.12 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate Field Offices a within or nearby the Project site.

PART 2 - PRODUCTS

- NOT USED -

PART 3 - EXECUTION

- NOT USED -

END OF SECTION

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SECTION 01 56 39 - TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Owner places a high value on its trees and recognizes the aesthetic, environmental and educational benefitstrees provide to the campus environment. The intent of these specifications is to provide standards for the evaluation, preservation, removal, mitigation or replacement of trees as part of the land development and building construction process.

B. This Section includes requirements for protection of trees (including temporary fencing), plants and groundcovers to remain and prevent damage directly to plants above and below grade and to prevent damage of any kind that inhibits plant growth (e.g. soil compaction, contamination). The tree protection regulations keep the foliage crown, branch structure and trunk clear from direct contact and injury by equipment, materials or disturbances; preserve roots and soil in an intact and non-compacted state; and visibly identify the root protection zone in which no soil disturbance is permitted, and other activities are restricted. Maintaining these protections through development will lessen undesirable consequences that may result from uninformed or careless acts, preserve both trees and property values, and reduce risks associated with damaged or destabilized trees.

1.2 DEFINITIONS

A. Dripline: Outer perimeter of branches of any tree or plant.

B. Protection Zone: All the area within a boundary 5 feet beyond the dripline of any tree or plant, or as established by the Owner's Representative or Landscape Architect.

C. Ground Cover: Includes, but is not limited to, shrubs and grass.

D. Specimen Shrub: Individual shrubs or small trees identified by the Owner's Representative or Landscape Architect as a specimen plant to be protected.

E. Plant Appraisal: Guide for Plant Appraisal, current edition, Council of Tree and Landscape Appraisers (CTLA). Consulting Arborist: an arborist certified by the International Society of Arboriculture (ISA) or the American Society of Consulting Arborists (ASCA), as indicated.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 30 00 "Submittals":

1. Existing Plant Report, as described in Article 1.4.B, below.

2. Qualifications for the Consulting Arborist:

a. Owner shall submit Consulting Arborist qualifications to Landscape Architect. Landscape Architect shall coordinate review of qualifications with Owner's Representative, PCC Grounds, and other PCC stakeholders as identified by Owner's Representative.

3. Qualifications for Plant Protection Subcontractors, as described in Paragraph 1.4.C, below.

1.4 QUALITY ASSURANCE

A. Consulting Arborist

1. The Owner will retain a Consulting Arborist registered with the American Society of Consulting Arborists (ASCA).

2. The Contractor shall notify the Owner's Representative and Landscape Architect of all issues related to tree and plant protection as they arise and shall arrange for the Consulting Arborist to be on site any time plant protection zones will be impacted by construction activities, as described in the Contract Documents and in the Preconstruction Walkthrough Report. The Construction Manager shall comply with Arborist's recommendations for tree and plant protection and continued tree health when work occurs within the root zones of trees and plants scheduled to remain.

B. Preconstruction Site Walkthrough and Existing Plant Report.

1. Prior to the start of any construction activities, the Construction Manager shall conduct a walkthrough of the construction site with the following stakeholders in attendance: Owner's Representative, a representative from PCC Grounds, the Architect, the Landscape Architect, the Consulting Arborist, the Excavation subcontractor, and the Landscape subcontractor. Other trades (e.g., masons, painters, drywall installers) may also be required to attend as directed by the Owner's Representative. The walkthrough shall identify all trees and other plant material to be protected, plants and planting areas which require special protection, and Areas of Concern, plants and planting areas for which protection is desired but which may be impacted by construction activities.

2. Existing Plant Report: Construction Manager shall document the walkthrough with photos, an annotated site plan and a written report. The location and orientation at which each of the photos was taken shall be clearly marked on the annotated site plan. The report shall include the following:

   a. Photos and locations of each individual tree and specimen shrub to be protected.

   b. Photos and locations of general planting areas to be protected.

   c. Photos and locations of trees and/or planting areas which require special protection, including a written description for how the protection will be provided in these areas.

   d. Photos and a description of Areas of Concern: trees and/or planting areas for which protection is desired, but which may be affected by construction activities such as (but not limited to) excavation for footings, underground utilities,

   e. construction staging, and paving. The description shall include potential impacts to trees and/or planting areas and potential strategies for minimizing or mitigating the impact to existing plants.

   f. Preconstruction soil test and report that includes chemical, physical mineral, and paste analyses. Soil test shall be conducted as specified for soil preparation in Division 32 “Site Improvements” Sections.

3. Soil samples shall be taken before any construction activity has taken place.

4. Construction Manager shall provide a minimum of three soil samples and a maximum of 6 soil samples for soil testing. Locations for soil samples shall be as shown on the Drawings, or, if not shown on the Drawings, as directed by Owner's Representative, Landscape Architect, or Consulting Arborist during the preconstruction walkthrough. Soil sample locations shall be noted on the annotated site plan.

5. Biological testing for specimen plants may be included in the soil test and report if directed by Owner's Representative or Landscape Architect.

6. Written documentation, drawings, and supporting documentation for any protection, stabilization, or impact mitigation measures proposed by the Construction Manager which deviate from the requirements of this Section.

7. Revisions during Construction: Construction Manager shall amend and submit for approval any portions of the Existing Plant Report which are affected by changes during construction which have been approved by the Owner's Representative or Landscape Architect.

C. Plant Protection Subcontractors:

1. Construction Manager shall provide subcontractors qualified to perform tree and plant protection activities including, but not limited to, the measures described in Paragraph 3.2.B, below.

2. Subcontractor for General Tree and Plant Care: Subcontractor shall be on site during any work performed in plant protection zone and shall follow the direction of the Consulting Arborist. The subcontractor shall be an OLCB Licensed Landscape Contractor with a minimum of five years' experience in tree and plant care.

3. Subcontractor for specialized Tree Care: Subcontractor shall be available on call for specialized tree care work as directed by the Consulting Arborist. Subcontractor shall be an ISA Certified Arborist with at least five years' experience performing similar work.

D. Subcontractor Training:

1. Construction Manager shall provide training in the plant protection requirements for all subcontractors upon the initial mobilization of each subcontracting group to the project site. Employees of subcontractors new to the project site shall receive training in plant protection as part of the initial job site check in.

2. Construction Manager shall provide periodic supplemental training in plant protection requirements for subcontractors. Training may be included as part of regularly scheduled weekly or monthly meetings. Frequency shall be as follows:

a. Exterior trades including, but not limited to, excavation, concrete, masonry, drywall, painting, utilities, and landscape: Monthly, or as directed by Owner's Representative.

b. Interior trades: Every three months.

E. Construction Site Walkthroughs:

1. Periodic Site Walkthroughs shall take place throughout the construction process to assess the compliance of tree and plant protection, as specified in Paragraphs 3.1.B.4 and 5 below.

1.5 PROJECT CONDITIONS

A. Performance Requirements: Prevent damage to trees and plants within plant protection zones due to construction activities including, but not limited to, the following:

1. Soil contamination, erosion or compaction.

2. Excessive wetting, ponding of stormwater or construction run-off.

3. Excavation, trenching, or alteration of grades.

4. Stockpiling of soil, debris, or materials.

5. Unauthorized cutting, breaking, skinning, and bruising of any part of trees and plants, including roots, bark, trunks, limbs, branches, and foliage.

B. Project Conditions: Install protection during initial mobilization at the site and maintain until Substantial Completion.

1. Driving, parking, or use of other construction equipment: Not permitted within protection zone of trees, plants and sensitive natural areas or lawn without Owner's Representative's, Consulting Arborist's, or Landscape Architect's written permission.

2. Storage or stockpiling of material or debris: Not permitted within protection zone of trees and plants.

3. Where the Owner's Representative permits construction traffic, parking or materials storage on prepared lawn or planting areas outside of designated Plant Protection Zones, provide planks, plywood, hog fuel, or similar protection; prevent rutting and compaction of soil. Matting for vehicle and work protection shall be heavy duty matting designed for vehicle loading over tree roots, Altumamats as manufactured by Altumamats, Inc. Franklin, PA 16323 or approved equal. The Owner's Representative shall approve the appropriate level of protection.

4. Do not proceed with any construction activities in Plant Protection Zones until Owner's Representative and Consulting Arborist have been contacted and are on site.

PART 2 - PRODUCTS

2.1 FENCING

A. Plant Protection Fencing shall be a minimum 6-foot-high chain link fence panels.

1. Fencing installed in landscape areas: fence panels shall be secured to "U" or "T" posts driven into the ground.

2. Fencing installed on paving or other impenetrable surfaces: fence panels shall be mounted on movable core drilled concrete blocks of sufficient size to hold the fence erect and linked together.

3. Plant Protection Fencing shall have clearly visible signage which states: "Plant Protection Zone, No Unauthorized Construction Activity Permitted". The signs shall be laminated or otherwise weatherproof, minimum of 12 by 18 inches and printed in bold text to be easily read from 20 feet, located every 40 feet, typical, or four per fence for a single tree.

4. The fence shall be installed before any ground disturbing activities including clearing and grading, or before any construction starts. Fencing shall remain in place until final inspection.

2.2 SOIL COMPACTION PROTECTION

A. Hog Fuel: Cedar or fir hog fuel, available from Mt. Scott Fuel Company 503-774-3241, or approved equal.

B. Vehicle Loading Mats: Altumamats as manufactured by Altumamats, Inc. Franklin, PA 16323, or approved equal.

PART 3 - EXECUTION

3.1 EXISTING TREES AND PLANTS

A. Existing Conditions shall be documented in the approved Existing Plant Report prior to the start of any Construction Activity.

B. Plant Protection Zones and Fencing:

1. Construction Manager shall exercise the utmost care to protect existing trees and plants designated to remain, including providing training and periodic updates for subcontractors per Paragraph 1.4.D, above.

2. Construction Manager shall install plant protection fencing per the approved Existing Plant Report and as indicated on the Tree and Plant Protection Drawings. Fencing shall be placed at least 5 feet beyond dripline unless otherwise directed by Consulting Arborist or Landscape Architect to prevent damage to branches and foliage or compaction of soil over roots. Prevent entry into protected areas except as authorized in writing by the Landscape Architect, Consulting Arborist, or Owner's landscape maintenance personnel. Fencing shall

not be moved or adjusted without authorization by Consulting Arborist or Landscape Architect.

3. Water trees and plants as necessary to maintain existing condition throughout Contract period until Substantial Completion.

4. Plant Protection Zones and Fencing shall be reviewed monthly by the Owner's Representative. If the Owner's Representative finds unauthorized changes to the Plant Protection Zones or Fencing, the affected areas shall be reviewed by the Consulting Arborist. The Contractor shall immediately address and correct any problems identified by the Consulting Arborist. The Owner's Representative and the Consulting Arborist will document any problems or unauthorized changes as part of the monthly review.

5. Owner will conduct inspections during project activity to determine compliance and confirm that tree protection zones are being maintained and root protection methods are effective. No person may refuse entry or access to site to any authorized Owner representative who provides proper credentials and requests entry for the purpose of conducting a Tree Protection inspection. In addition, no person may obstruct, hamper or interfere with any such representative while in the process of carrying out their duties. Owner’s staff will document any issues they find and submit them to the Owner's Representative and Landscape Architect.

C. Work within Plant Protection Zones:

1. Review conditions with Consulting Arborist prior to performing any work within Plant Protection Zones. Comply with Arborist's instructions for work affecting trees and plants within the Plant Protection Zone.

2. Pruning or cutting roots, branches and foliage: work to be performed by qualified subcontractor as directed by Consulting Arborist. Pruning and cutting shall be performed with sharp instruments intended for the purpose; do not break or chop.

3. Excavating and Trenching within Driplines: Permitted where indicated and at other specifically approved locations. Provide additional protection as recommended by the Consulting Arborist at no additional cost to the Owner. Approved excavation within the protection zone of a tree shall be by hand or by tunneling under roots with an air spade or boring. Do not cut main lateral roots or tap roots I-inch in diameter or larger without approval by Consulting Arborist. Smaller roots shall be pruned, not broken or chopped.

4. Do not allow exposed roots to be scarred or to dry out; provide temporary earth cover, or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage.

5. Maintain existing grades within protection zones of trees and plants unless otherwise indicated or approved by Owner's Representative.

6. Soil Compaction Protection shall be installed within the plant protection zone where the Consulting Arborist, Owner's Representative, or Landscape Architect determines that there is a risk of soil compaction. The type of Soil Compaction Protection shall be determined by the Consulting Arborist, Owner's Representative, or Landscape Architect, and may include Altumamates, 6- to 8-inches of hog fuel, or another type of protection. Maintain Soil Compaction Protection until final acceptance or as directed by Owner's Representative.

7. The following is prohibited within the root protection zone of each tree or outside the limits of the development impact area: ground disturbance or construction activity including vehicle or equipment access (but excluding access on existing streets or driveways), storage of equipment or materials including soil, temporary or permanent stockpiling, proposed buildings, impervious surfaces, underground utilities, excavation or fill, trenching or other work activities.

3.2 REPAIR AND RESTORATION

A. Post-construction Walkthrough:

1. Upon substantial completion and after the plant protection measures have been removed, the Owner's Representative shall conduct a post-construction walkthrough with the Construction Manager, a representative from Owner’s Grounds, Architect, Landscape Architect, Consulting Arborist, and Landscape subcontractor to review the condition of the trees and plants as described in the Existing Plant Report and with amendments approved during construction. Corrective measures and/or damages to any existing plant material, if any, will be determined as part of this walkthrough and documented by the Owner's Representative.

2. Post-Construction Soil Test: Construction Manager shall provide post-construction soil test and report that includes chemical and paste analyses. Soil test shall be conducted as specified in soil preparation in Division 32 “Site Improvements” Sections. Soil samples shall be taken from the same locations as those for the Preconstruction Soil Test and Report.

   a. Post-construction soil test shall include biological testing for all locations which included biological testing as part of the preconstruction soil test.

B. Repair and Replacement:

1. All unauthorized damage to turf, shrubs, trees, and other plant material shall be the Landscape subcontractor's sole responsibility to repair, replace, or pay restitution for damages to the Owner, as directed by Owner's Representative. If the Owner's Representative determines that the affected plants cannot be repaired, the plants shall be replaced with like plant material and size. The Landscape subcontractor shall pay restitution to the Owner if replacement plants are not available.

2. Trees and Specimen Shrubs damaged as part of unauthorized construction operations shall be evaluated by the Consulting Arborist using the CTLA Guide for Plant Appraisal, current edition, using the Cost Approach Method.

   a. If repairs are deemed possible by the Consulting Arborist, make repairs to damaged plant material promptly after damage occurs to prevent progressive deterioration. Repairs shall be performed under the direction of the Consulting Arborist by an OLCB Licensed Landscape Contractor with a minimum of five years' experience in tree and plant care, except where the Consulting Arborist determines that the repairs need to be performed by an ISA Certified Arborist.

   b. Where the Consulting Arborist determines that tree replacement is required, replace trees with a tree of the same species, variety, and caliper size, up to 3- inch caliper size. If the specified tree is not commercially available, replace with another tree of the same size as determined by the Owner's Representative or Landscape Architect. Trees larger than 2-inch caliper size shall be warrantied for 3 years. Restitution to the Owner may also be required in addition to replacement as determined in subparagraph c., below.

   c. Where the Consulting Arborist determines that neither repair nor replacement are possible, or for trees exceeding 3-inch caliper size, the Landscape subcontractor shall pay restitution to the Owner. The value of the tree shall be determined to the Trunk Fonnula Method as found in the CTLA Guide for Plant Appraisal. The Owner's Representative may also elect to use a combination of restitution and small caliper replacement trees in lieu of solely monetary restitution.

3. Non-specimen Shrubs and woody or herbaceous groundcovers damaged as part of unauthorized construction operations shall be evaluated by the Landscape Architect. Where repairs are deemed possible, make repairs to damaged plant material promptly after damage occurs to prevent progressive deterioration. Repairs shall be performed by a

OLCB Licensed Landscape subcontractor with a minimum of five years' experience in tree and plant care. Where repair is not deemed possible, replace with plants of same species, variety, and size as the damaged plant. Sizes larger than #5 container size shall be warrantied for three years. If the specified with different plants of the same size, as determined by the Owner's Representative or Landscape Architect.

4. Turf areas shall be reseeded with the campus standard lawn seed mix as specified in the planting specification.

5. Soil Repair:

   a. Plant replacement and turf repair shall include soil preparation as specified.

   b. The Post-construction soil test and report shall be compared to the preconstruction test and soil report. Where the soil has been damaged from chemical runoff, compaction of soil (including compaction of soil due to elevated water content where the compaction exceeds the critically limiting bulk density for the soil type in question), or has been biologically damaged due to construction activity, the Contractor shall provide measures to repair the soil as determined by Owner's Representative or Consulting Arborist. Soil repair measures may include, but may not be limited to, the following: providing measures as directed to reduce soil bulk density to acceptable levels to support normal plant growth; installing wall and/or foundation drainage to reduce water levels; or providing broad-spectrum mycorrhiza inoculates for the affected areas.

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SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

A. The Owner requires that this Project generate the least amount of trash and waste possible. The project's goals are to aim to recycle and/or salvage 90 percent of non- hazardous Construction and Demolition (C&D) debris by weight or volume; at a minimum, 75 percent must be recycled or salvaged, for at least three material streams. 100 percent of yard waste must be diverted from landfill disposal through reuse and recycling.

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 economically feasible.

D. Manage hazardous waste requirements per local codes and regulations.

E. Required Recycling: The following may not be disposed of in landfills or by incineration:

1. Aluminum and plastic beverage containers.
2. Corrugated cardboard.
3. Wood pallets.
4. Dimensional wood and composite wood products.
5. Land clearing debris, including brush, branches, logs, and stumps.
6. Concrete.
7. Concrete masonry units.
8. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
9. Glass.
10. Gypsum drywall and plaster.
11. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: refer to DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) for reclamation programs.
12. Paint.
13. Windows, doors, and door hardware.
14. Plumbing fixtures.
15. Mechanical and electrical equipment.
16. Fluorescent lamps (light bulbs).

F. Salvage and Reuse: Refer to drawings for the extent of materials to be salvaged, stored, and reused.

G. Construction Manager shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

H. Construction Manager shall develop and follow a Waste Management Plan designed to implement these requirements. This plan must be based on the requirements of LEED v4 BDC Prerequisite MR 2and Credit MR 5 Construction and Demolition Waste Management, state and local regulations (e.g., Metro's Enhanced Dry Waste Recovery Program, City of Portland Ordinance No. 187876), and best practice recommendations.

I. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.
2. Burying on the project site.
3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.
5. Incineration, either on- or off-site.

J. Regulatory Requirements: Construction Manager 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.

1.2 RELATED REQUIREMENTS

A. Section 01 31 00 "Project Management Requirements" for additional requirements for Pre-construction and Progress Meetings.

B. Section 01 33 00 "Submittals."

C. Section 01 60 00 "Product Requirements" for waste prevention requirements related to packaging disposal.

D. Section 01 70 00 "Execution Requirements" for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

E. Section 01 81 13 "Sustainability Requirements" for additional requirements for LEED.

1.3 REFERENCES

A. Portland community college construction and demolition waste management plan.

1.4 SUBMITTALS

A. See Section 01 33 00 "Submittals" for submittal procedures.

B. Waste Management Plan: Include the following information:

1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities. Identify diversion strategies for at least five waste materials and approximate a percentage of the overall project waste that these materials represent.
2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling. For each waste material diverted, identify whether the materials will be separated or commingled, where the materials will be taken and how the recycling facility will process the material. Any waste materials used as Alternative Daily Cover (ADC) must be accounted for in the waste diversion calculations as waste and not diverted materials.

4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
5. Materials Handling Procedures: Describe how materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled, i.e., whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

C. Waste Disposal Reports: Submit at specified intervals and at the end of construction, waste disposal reports, with details of quantities of trash and waste, means of disposal or reuse, percentage diverted, and costs; and show both totals to date and since last report.
1. Submit updated Report with each Application for Progress Payment.
2. Submit Report on a form acceptable to the Owner.
3. Landfill Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
    c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Recycled and Salvaged Materials: Include the following information for each:
    a. Identification of material, including those retrieved by installer for use on other projects.
    b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
    c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
5. Material Reused on Project: Include the following information for each:
    a. Identification of material and how it was used in the project.
    b. Amount, in tons or cubic yards.
    c. Include weight tickets as evidence of quantity.
6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

D. LEED Online Documentation: Complete LEED Credit Forms on LEED Online for Prerequisite MR 2 and Credit MR 5 and provide supporting documentation including the Construction Waste Management Plan, LEED v4 BDC Construction and Demolition Waste Management Calculator, and final waste disposal reports showing total percentage of materials recycled in tons.

PART 2 - PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. See Section 01 60 00 “Product Requirements” for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00 “Product Requirements”:

1. Relative amount of waste produced, compared to specified product.

2. Proposed disposal method for waste product.

3. Markets for recycled waste product.

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

A. See Section 01 10 00 “Summary” for list of items to be salvaged from the existing building for relocation in project or for the Owner.

B. See Section 01 30 00 “Administrative Requirements” for additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. See Section 01 50 00 “Temporary Facilities and Controls” for additional requirements related to trash/ waste collection and removal facilities and services.

D. See Section 01 60 00 “Product Requirements” for waste prevention requirements related to delivery, storage, and handling.

E. See Section 01 70 00 “Execution Requirements” for trash/waste prevention procedures related to cutting and patching, installation, protection, and cleaning.

F. See Section 01 81 13 “Sustainability Requirements” for additional LEED requirements.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, for the Owner, Architect and LEED Consultant.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Pre-bid meeting.

2. Pre-construction meeting.

3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. Provide containers as required.

2. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.

3. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
4. Locate enclosures out of the way of construction traffic.
5. Provide adequate space for pick-up and delivery and convenience to subcontractors.
6. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

3.3 APPENDICES

A. Portland Community College Construction and Demolition Waste Management Plan.

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Portland Community College

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLAN

SECTION 1: OVERVIEW

1.1 The Construction and Demolition Waste Management Plan is for use on new construction and major renovation projects. This plan is specifically designed for use and implementation on the **[PROJECT NAME]** located in **[LOCATION].** It will dictate the project's construction methods regarding demolished materials as well as waste generated from construction. This plan will be adhered to during the course of demolition and new construction.

1.2 This plan is based on the requirements of LEED v4 BD+C NC MR prerequisite 2 (MRp2) and MR credit 5 (MRc5) Construction and Demolition Waste Management, state and local regulations (ex. Metro's Enhanced Dry Waste Recovery Program, City of Portland Ordinance No. 187876), and best practice recommendations. It should be used for projects pursuing LEED certification as well as non-LEED C&D projects, to the extent possible as agreed to with the PCC PM in consultation with PCC Sustainability. The project's goals are to aim to recycle and/or salvage 90% of non-hazardous C&D debris by weight or volume; at a minimum, 75% must be recycled or salvaged. 100% of yard waste must be diverted from landfill disposal through reuse and recycling.

1.3 Waste reduction should be central to the project's goals to reduce overall building project expenses through avoided purchase/disposal costs and support the college's sustainability commitment. C&D source reduction efforts may incorporate purchasing agreements that prevent excess materials and packaging from arriving to the construction site; preserving existing buildings rather than constructing new ones; optimizing the size of new buildings; designing new buildings for adaptability to prolong their useful lives; using construction methods that allow disassembly and facilitate reuse of materials; employing alternative framing techniques; reducing interior finishes; and more. Efforts to reduce waste and reuse or repurpose C&D materials should be prioritized before recycling and disposal.

1.4 Implementation of this plan is critical to the success of the project's environmental and sustainability goals. To this end, the project goal of diverting at least **[75%]** of all construction demolition and debris waste from landfills should be achievable.

SECTION 2: PURPOSE

2.1 The purpose of the Construction and Demolition Waste Management Plan is to categorize construction waste as material from salvage, as material for recycling to a usable product, or as material to be disposed of in authorized material recovery facilities for processing. This will help reduce overall building project expenses through avoided purchase/disposal costs and reduce tipping fees and material waste, while helping to protect the environment and ensure compliance with local regulations.

SECTION 3: DEFINITIONS

3.1 Recycling is the collection, reprocessing, marketing, and use of materials that were diverted or recovered from the solid waste stream. For LEED credits MRp2 and MRc5, calculations of recycled material can be done by weight or volume, but must be consistent throughout. Exclude excavated soil and land-clearing debris from calculations. Include materials destined for alternative daily cover (ADC) in the calculations as waste (not diversion).

3.2 Recycled materials include any products or materials that are the result of demolition or are purchased for new construction and will be discarded due to over purchase, damage or contamination, or poor planning. Materials will be categorized as trash for disposal, materials for resale, or as recycled products.

3.3 Recycled Content: The percentage by weight or volume of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).

a. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
b. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

SECTION 4: RECYCLABLE MATERIALS

4.1 The following is a list of the construction and demolition waste materials that **[CONSTRUCTION MANAGER]** intends to divert where applicable and the anticipated percentages of total waste that each material stream is expected to produce. Specify whether materials will be separated or commingled and describe the diversion strategies planned for the project. Describe where the materials will be taken and how the recycling facility will process the material. Proposed list of intended recyclable materials must be approved by the PCC PM in consultation with PCC Sustainability before Waste Management Plan is considered final.

MATERIAL	ESTIMATE % OF TOTAL	DIVERSION STRATEGY	SEPARATED OR COMMINGLED	DESTINATION FOR MATERIALS
Architectural fixtures				
Asphalt Shingles				
Asphalt concrete				
Brick, tile and masonry materials				
Cabinets				
Carpet & Pad				
Cardboard & Paper (dry)				
Cement Fiber Products				
Concrete / Rebar				
Grout / Concrete Blocks / Rebar				
Doors				
Electrical fixtures, motors, switchgear and other similar equipment				
Glass				
Ferrous Metal				
Gypsum Wallboard Scrap				
HVAC equipment, duck work, control systems, switches and other similar equipment				
Insulation				
Millwork, paneling and other similar interior finishes				
Non-ferrous Metals				
Recyclables (paper, metal cans, plastic bottles and glass bottles/jars) from break rooms, kitchen spaces and the offices				
Paint				

MATERIAL	ESTIMATE % OF TOTAL	DIVERSION STRATEGY	SEPARATED OR COMMINGLED	DESTINATION FOR MATERIALS
Plywood, OSB, Particle Board				
Plastics				
Plumbing Fixtures				
Rigid Foam Insulation				
Mixed Paper (from packaging and office trailers)				
Packaging				
Plaster				
Roofing				
Soil and land clearing debris (do not include for LEED waste values)				
Untreated Lumber Wood (Lumber, Plywood, OSB, Particle Board, etc.)				
Windows				

4.2 The following is a list of Return Materials that **[CONSTRUCTION MANAGER]** intends to divert and return to the manufacturer. Proposed list of Return Materials must be approved by the PCC PM in consultation with PCC Sustainability before the Waste Management Plan is considered final.

a. All Wood Pallets & Dunnage
b. Concrete
c. Carpet
d. Styrofoam and other packaging
e. Other

SECTION 5: COLLECTION OF WASTE

5.1 Throughout the duration of the project **[CONSTRUCTION MANAGER]** will be the managing entity for all trash, debris, and recycling disposal boxes. **At minimum, four material streams must be identified for the project.** These material streams must be approved by the PCC PM in consultation with PCC Sustainability**.** Each subcontractor will be responsible for the appropriate disposal of their waste per the below guidelines. Construction demolition and waste will be collected and managed in one of two ways at the job site: 1) waste will be hauled directly off site upon its creation; 2) waste will be disposed of on site in regularly serviced collection boxes.

5.2 Guidelines with be determined by the specific hauling company for this jobsite as described below.

5.3 In order to better facilitate the collection of construction waste at the jobsite during construction, **[CONSTRUCTION MANAGER]** has acquired the services of **[HAULER]. [HAULER]** is the debris/recycling and waste management service provider who specializes in construction waste disposal. **[HAULER]** will provide the project with waste and source separated collection boxes placed in confirmed locations. Garbage, lunch waste, and unusable waste will be placed in a separate box labeled debris. Source separated boxes will be provided for clean dimensional wood, metal, cardboard, drywall, and paper. Multiple commingled containers will be placed strategically around the site for general dry waste ranging from cardboard materials to aluminum cans. As needed, **[HAULER]** will exchange empty collection boxes for full boxes in a timely manner so that containers are never overflowing.

a. Waste to be directly hauled off site by source (installing subcontractor):
    i. Paint
    ii. Sealant materials
    iii. Any materials that are hazardous or require specific disposal procedures.
b. Waste to be disposed of into identified containers on site and then removed by **[HAULER]**:
    i. Mixed Paper
    ii. Aluminum Cans
    iii. Wood
    iv. Cardboard
    v. Gypsum Board (Drywall)
    vi. Plastics
    vii. Glass
    viii. Metals

c. Waste to be disposed of in the holding area on site and diverted. Provide a site logistics map (on separate page) to confirm locations of bins for team:
    i. Concrete
d. Waste to be disposed of by **[CONSTRUCTION MANAGER]**
    i. Non-recyclable trash & debris materials

5.4 These boxes will be located in a clearly designated area on the job site. Everyone on site will be responsible for dumping waste in the correct collection box. Materials will be deposited in clean (no mud, adhesive, solvents, petroleum contamination), debris-free condition. Ensure all materials are safe for handling and storage. Disposal of waste will be monitored by **[CONSTRUCTION MANAGER]** to avoid contamination, and to ensure that the proper materials are taken to the appropriate waste management facility. **[CONSTRUCTION MANAGER]** will reinforce the collection procedures through high visibility signs identifying containers,

documentation, and during regular "tool box" safety meetings to update the team on progress. **[CONSTRUCTION MANAGER]** will also provide adequate security to prevent pilferage, ensure adequate erosion and stormwater control, and/or employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

SECTION 6: TRACKING AND MONITORING

6.1 All waste created during the project will be consistently monitored and tracked. Weight tickets (ex. detailed weight tickets from scrap metal sales) from each container taken off the site will be provided by **[TBD]** and filed according to material type. From these tickets, **[CONSTRUCTION MANAGER]** will maintain a spreadsheet or database throughout the duration of the project wherein the quantities of all construction waste will be tracked by weight (tons) and shared with approved by the PCC PM and PCC Sustainability on a monthly basis. A detailed breakdown by weight of each material type-disposed of and the facility used for disposal is required as follows :

a. Recycling; broken down by material type (refer to section 5.3.b).
b. Salvage; including reuse on site.
c. Hazardous waste disposal.
d. Universal waste (ex. batteries, CFL light bulbs).
e. General waste disposal.
f. Commingled off-site waste stream separation must provide the project specific diversion rates (by material) or a letter confirming the average annual recycling rate for the facility that is regulated by a governing authority.

Note: Exclude excavated soil and land-clearing debris from calculations. Include materials destined for alternative daily cover (ADC) in the calculations as waste (not diversion). Include wood waste converted to fuel (bio-fuel) in the calculations; other types of waste-to-energy are not considered diversion for this credit.

6.2 If the subcontractor is responsible for hauling waste off site, the subcontractor will be responsible for documenting the amount in tons, the method of diversion, the percentage diverted, and the facility utilized for diversion. For waste collected on site, the waste diversion company will submit tracking forms to **[CONSTRUCTION MANAGER]** for all waste collected in the onsite commingled and source separated collection boxes. **[CONSTRUCTION MANAGER]** will transfer this information into a spreadsheet or database where project monthly reports will be generated. These reports will quantitatively track the total tonnage of waste produced and recycled during the course of the project.

6.3 All subcontractors, their employees, and vendors will be educated and trained to ensure this plan is implemented correctly. Fines and incentives will be used to assist in this education.

*** END OF CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLAN ***

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SECTION 01 81 13 - SUSTAINABILITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to achieve the targeted LEED Gold certification under the LEED for New Construction and Major Renovations (LEED-NC) version 4 (v4) as administered by the U.S. Green Building Council (USGBC) and the Green Building Certification Institute (GBCI). Certain credits reference the LEED v4.1 requirement as an alternative compliance path for the project.

1. Other 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.

2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on design goals and other aspects of Project that are not part of the Work of the Contract.

3. Construction Manager shall be familiar with the relevant LEED requirements and submit the necessary information and instruction to all subcontractors and installers.

4. Construction Manager shall follow LEED requirements in conjunction with requirements specified in all other Sections and refer any discrepancies to the Owner's Project Manager for clarification.

5. Construction Manager shall have access to the LEED for Building Design + Construction Reference Guide, available on the USGBC website.

6. A copy of the LEED Project Checklist is attached at the end of this Section for information.

1.2 ADDITIONAL REQUIREMENTS

A. Section includes general requirements and procedures for compliance with Owner's green building requirements.

B. Products not included in Section, including furniture and furnishings, are to comply with Owner's Sustainability Guidelines for Purchasing.

C. All new construction and major renovation projects shall meet the following additional requirements:

1. Solar: New buildings that meet the criteria outlined by the State of Oregon in the "1.5% for Solar Energy in Public Building Construction Contracts" rule are required "to spend an amount equal to at least 1.5 percent of the total contract price of a public improvement contract for the construction or major renovation of a public building for the inclusion of appropriate solar energy technology in the building."

a. New solar energy shall have monitoring technology installed (meets some state or ETO requirement).

b. Hardware shall be egauge or otherwise compatible with Owner's Energy & Utility Management System.

c. Work through Owner's Sustainability to set up new meters in Owner's Energy & Utility Management System. Removal and retrofitting to reduce high-mercury lamps; transition to newer technology (LED) shall be practiced for all renovations.

2. All new electronic equipment purchased shall be Energy Star certified where certified products are available.

3. Any live meters shall be compatible with Owner's Energy and Utility Management System, coordinate with Owner's Sustainability.

1.3 DEFINITIONS

A. EA: Energy and Atmosphere.

B. ID: Innovation in Design.

C. IEQ: Indoor Environmental Quality.

D. LEED: Leadership in Energy & Environmental Design.

E. MR: Materials and Resources.

F. RP: Regional Priority.

G. SS: Sustainable Sites.

H. WE: Water Efficiency.

I. Chain-of-Custody Certificates: Certificates signed by manufacturers 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, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that the manufacturer is certified for chain of custody by an FSC-accredited certification body.

J. Bio-based Materials: Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall be tested using ASTM D6866 and be legally harvested, as defined by the exporting and receiving country.

K. CDPH Standard Method 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, v. 1.2–2017, for the emissions testing and requirements of products and materials.

L. 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.

1. Product-Specific Declaration: A product with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.

2. Product-Specific Type III EPD – Internally Reviewed: A product with an internally critically reviewed life-cycle assessment conforming to ISO 14025 and EN 15804 or ISO 21930 that has at least a cradle to gate scope.

3. Industry-Wide (Generic) EPD: A product with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

4. Product-Specific Type III EPD: A product with a third-party certification, including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

M. 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.

N. Health Product Declaration Open Standard (HPD): A standard format for reporting product content and associated health information for building products and materials.

O. Regionally Extracted, Harvested, or Recovered Materials: Materials that are extracted, harvested, or recovered and manufactured within a radius of 100 miles from the Project site. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.

P. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

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.

Q. Additional definitions are listed in “Glossary of Terms” in the USGBC Reference Guide.

1.4 MEETINGS

A. Construction Manager shall schedule and conduct LEED Certification coordination meetings. At the Owner’s Project Manager’s discretion, the LEED Certification meetings may be combined with other Project meetings. Meeting attendees shall include:

1. Construction Manager’s Project Manager.

2. Construction Manager’s LEED Coordinator.

3. All other attendees designated by the Owner.

4. Subcontractor representatives as appropriate to stage of work.

B. Meetings shall be held every four to six weeks.

C. LEED Certification goals and issues shall be discussed at the following meetings:

1. Pre-construction Kick-off.

2. Project Progress Meetings.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Owner’s Project Manager and the USGBC regarding LEED prerequisites and credits that are the responsibility of the Construction Manager, that depend on product selection or product qualities, or that depend on Construction Manager's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals.

1.6 ACTION SUBMITTALS

A. LEED submittals are to be submitted in electronic format and are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

B. Project Materials Cost Data: Deliver the necessary material and cost data required for credit calculations on the LEED Materials Buyout Information Form. Include total cost and shop labor for project materials and itemized costs of specific materials being tracked for LEED credits. Material costs exclude site labor, overhead, profit and construction equipment. Include

Divisions 03-10 and 12, Section 31 60 00 “Foundations,” Section 32 10 00 “Paving,” Section 32 30 00 “Site Improvements,” and Section 32 90 00 “Planting,” if applicable to the Project scope of work (the total materials cost is exclusive of specialties: Conveying Systems and Mechanical and Electrical components).

C. LEED Action Plans: Within 30 days of Notice to Proceed submit the following action plans to the Owner’s Representative and Owner’s Sustainability:

1. Prerequisite SS 1, Construction Activity Pollution Prevention: Erosion and Sedimentation work plan.
2. Prerequisite MR 2 and Credit MR 5, Construction and Demolition Waste Management: Construction Waste Management Plan complying with Section 01 74 19 “Construction Waste Management.” Proposed Waste Management Plan must be approved by Owner’s Representative in writing.
3. Credit IEQ 2, Low-Emitting Materials (v4.1): Low Emitting Materials Tracking Sheet indicating all adhesives, sealants, paints, coatings, composite wood, flooring, insulation, wall, and ceiling products anticipated to be used on the project.
4. Credit IEQ 3, Construction Indoor Air Quality Management Plan and Credit IEQ 4 Indoor Air Quality Assessment (v4.1) complying with Section 01 81 19 “Indoor Air Quality Management Requirements.”

D. LEED Progress Reports: On a monthly basis, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. Prerequisite SS 1, Construction Activity Pollution Prevention: Progress photographs or inspection reports taken during construction showing implemented Construction Pollution Prevention measures.
2. Prerequisite MR 2 and Credit MR 5, Construction and Demolition Waste Management: Waste reduction progress reports complying with Section 01 74 19 “Construction Waste Management.”
3. Credit MR 2, Building Product Disclosure and Optimization – Environmental Product Declarations (v4.1): EPD reports for all compliant products that have been purchased or installed.
4. Credit MR 3, Building Product Disclosure and Optimization – Sourcing of Raw Materials (v4.1): Summary of product data and materials costs collected, including:
    a. Extended producer responsibility.
    b. Bio-based materials.
    c. Certified wood products.
    d. Materials reuse.
    e. Recycled content
5. Credit MR 4, Building Product Disclosure and Optimization – Material Ingredients (v4.1): Manufacturer Inventory Reports, Health Product Declarations (HPDs), Cradle2Cradle Certificates, Declare Labels, or equivalent for all compliant products that have been purchased or installed.
6. Credit IEQ 2, Low-Emitting Materials (v4.1): Low Emitting Materials Tracking Sheet indicating progress towards targeted LEED Low-Emitting Materials Credit options.
7. Credit IEQ 3, Construction Indoor Air Quality Management Plan and Credit IEQ 4 Indoor Air Quality Assessment (v4.1) progress reports complying with Section 01 81 19 “Indoor Air Quality Management Requirements.” LEED Documentation Submittals:

E. LEED Documentation Submittals:

1. Prerequisite SS 1, Construction Activity Pollution Prevention:

   a. A minimum of 18 date-stamped photos which show the implemented measures and any corrective actions taken OR monthly inspection reports.

2. Prerequisite MR 2 and Credit MR 5, Construction and Demolition Waste Management: Comply with Section 01 74 19 "Construction Waste Management."

3. Credit MR 2 – Building Product Disclosure and Optimization – Environmental Product Declarations, Option 1, Environmental Product Declarations (EPD's) (v4.1):

   a. Manufacturers Life Cycle Analysis conforming to ISO 14044, Industry-wide (generic) EPD with third-party Type III certification (manufacturer must be listed as a participant), or Product-specific Type III EPD (internally reviewed or third-party certification).

   b. Complete LEED Material Information Form.

   c. Complete USGBC's BDC (v4.1) Building Products Calculator.

4. Credit MR 3, Building Product Disclosure and Optimization – Sourcing of Raw Materials (v4.1):

   a. Recycled Content: Cutsheet, product literature or letter from manufacturer that clearly indicates the percentage by weight of post-consumer and pre-consumer (post-industrial) recycled content.

   b. Biobased Material: Cutsheet, product literature or letter from manufacturer that clearly indicates the percentage by weight that is biobased material.

   c. FSC Certified Wood: For all wood products designated in this specification as "FSC certified," submit document of compliance with FSC standards as follows:

      1) Demonstrate that products are FSC certified by providing vendor invoices. Invoices will contain the vendor's Chain-of-Custody (COC) number and identify each FSC certified product on a line-item basis. A "vendor" is defined as the company that furnishes wood products to project contractors and/or subcontractors for onsite installation. FSC-certified products qualify for credit only when purchased from a vendor with an FSC chain-of-custody certificate that is current at the time of sale. The status of a COC certification can be verified at info.fsc.org. Invoices must contain:

         a) The vendor's Chain-of-Custody (COC) number.

         b) Separately itemize each FSC certified product on a line-item basis, clearly identifying the wood product manufacturer and type.

         c) Identify the entity being invoiced and indicate that the delivery is intended for the LEED project.

         d) FSC designation for each product as either FSC 100%, FSC Mix, or FSC Mix [NN%].

      2) If FSC wood products are modified by an architectural woodworker or millworker, the woodworker must have an FSC COC number which must appear on the project invoice. The woodworker must also install this custom wood. The woodworker must also provide a document, separate from the project invoice, detailing FSC-certified wood materials used, and total cost of wood materials used. (The woodworker does not need to provide itemized material cost calculations but must maintain calculation records for auditing

purposes by the FSC certifying body). The contract cost may include assembly labor but must exclude on-site labor.

3) Wood products without submittal of acceptable documentation will be rejected.

d. Material Reuse: Cutsheet, product literature or letter from manufacturer that clearly indicates that a material is salvaged, refurbished, or reused.

e. Extended Producer Responsibility: Cutsheet, product literature or letter from manufacturer that clearly indicates that the manufacturer participates in an extended producer responsibility program.

f. Local/ Regional Material: For any materials contributing to Credit MR 3 that are manufactured and extracted within 100 miles of the project site, submit cutsheet, product literature or letter from manufacturer indicating the location of harvest, processing and manufacturer and proximity from the project site.

g. Material cost.

h. Complete LEED Material Information Form.

i. Complete USGBC's BDC (v4.1) Building Products Calculator.

5. Credit MR 4, Building Product Disclosure and Optimization – Material Ingredients (v4.1):

a. Summary of product data collected for all materials purchased or installed that demonstrate their chemical inventory.

6. Credit IEQ 2, Low Emitting Materials (v4.1): Product data indicating VOC content and emissions testing documents showing compliance with requirements for low-emitting materials, for the following:

a. Adhesives, Sealants, Paints and Coatings:

1) Submit product MSDS, SDS or other documentation confirming the VOC content and VOC emission testing information for on-site wet applied products.

2) Submit volume of all products used in Liters or Gallons.

b. Interior Flooring, Ceilings, Wall Panels, and Insulation products:

1) Submit manufacturers General Emissions Evaluation verification in accordance with California Department of Public Health (CDPH) Standard Method v1.2–2017 or equivalent verification method.

2) Submit quantities of products used in surface area or square feet, and cost.

c. Composite Wood Products:

1) Submit manufacturers' verification or documentation confirming low formaldehyde emissions in accordance with California Air Resources Board (CARB) ATCM or EPA Toxic Substances Control Act, Formaldehyde Emission Standards for Composite Wood Products (EPA TSCA Title VI) for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) products or no added formaldehyde (NAF) resins. CARB compliance letters can be found here:

https://ww2.arb.ca.gov/resources/documents/nafulef-executive-orders

2) For structural composite wood products, provide manufacturers verification or documentation confirming that the product is certified according to one of the following industry standards:

a) Plywood: compliant with Voluntary Product Standard – Structural Plywood (PS 1-09) or Voluntary Product Standard – Performance Standard for Wood-Based Structural-Use Panels (PS 2-10).

b) Structural Composite Lumber: compliant in accordance with Standard Specification for Evaluation of Structural Composite Lumber Products (ASTM D5456-13).

c) Glued laminated timber: compliant in accordance with Structural Glued Laminated Timber (ANSI A190.1-2012).

d) I-joists: compliant in accordance with Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists (ASTM D5055-13).

e) Cross-laminated timber: compliant in accordance with Standard for Performance-Rated Cross-Laminated Timber (PRG 320-15).

f) Finger-jointed lumber: labeled “Heat Resistant Adhesive (HRA)” in accordance with the American Softwood Lumber Standard (DOC PS-20 2015).

3) Submit quantities of products used in surface area or square feet, and cost.

7. Credit IEQ 3, Construction Indoor Air Quality Management Plan and Credit IEQ 4 Indoor Air Quality Assessment (v4.1): Comply with Section 01 81 19 “Indoor Air Quality Management Requirements.”

1.7 QUALITY ASSURANCE

A. Construction Manager’s LEED Coordinator: Engage a LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator. Contractor’s LEED coordinator will submit LEED submittals to Owner’s Project Manager and LEED consultant. Construction Manager’s LEED coordinator shall, in cooperation with the LEED Consultant, lead all LEED certification meetings and shall be always present on site when work is in progress.

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.

B. Products not included, including furniture and furnishings, to comply with Owner’s Sustainability Guidelines for Purchasing.

2.2 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

A. Credit MR 2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Option 1 (v4.1).

1. Provide at least 20 permanently installed products (sourced from at least 5 different manufacturers) which meet one of the disclosure criteria:

a. Product-Specific Declaration: Valued as one product.

b. Industry-Wide (Generic) EPD: Valued as one product.

c. Product-Specific Type III EPD, internally reviewed: Valued as one product.

d. Product-Specific Type III EPD with external verification and critical review: Valued as one and one-half product.

2. Design team may specify supplemental cementitious materials (fly ash or slag) to replace Portland cement in concrete mix design at the highest rate that is structurally feasible per designer. In addition, designers may consider options for using recycled aggregate in concrete mix design. Designer to discuss intent for incorporating embodied carbon reductions in concrete mix design with Owner's Representative (for review with the Sustainability team) prior to start of Construction Document phase.

B. Credit MR 3, Building Product Disclosure and Optimization, Sourcing of Raw Materials (v4.1). Provide products that meet at least one of the responsible extraction criteria below for at least 20%, by cost, of the total value of permanently installed building products in the project:

1. Extended producer responsibility program.

2. Bio-based materials.

3. Recycled content.

a. Structural steel and rebar shall be 80% recycled content at a minimum.

4. FSC Certified Wood: For all projects, all wood should be priced as FSC-certified to analyze cost impacts of FSC wood procurement. FSC wood procurement will be analyzed for each project, with a preference for at least 50% FSC wood.

5. Local/Regional Material: Products sources (extracted, manufactured, and purchased) within 100 miles of the project site where feasible.

C. Credit MR 4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting (v4.1).

1. 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), which meet one of the following disclosure criteria:

a. Manufacturer Inventory.

b. Health Product Declarations (HPDs).

c. Cradle to Cradle (C2C) certifications.

d. Declare product labels.

e. Product Lens Certificate.

f. Global Green TAG Product Health Declaration (PHD) – issued after January 1, 2020.

g. Living Product Challenge.

h. Facts – NSF/ANSI 336.

i. ANSI/BIFMA e3 Furniture Sustainability Standard. Must comply with BIFMA v2014 credit 7.5.1.3 or BIFMA v2012 credit 7.4.1.3 for 3 points and 99% disclosure.

2.3 LOW-EMITTING MATERIALS

A. Credit IEQ 2, Low-Emitting Materials (v4.1), and VOC Emissions Evaluation: 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. 0.50 mg/ m3 or more.

B. Credit IEQ 2, Low-Emitting Materials 9v4.1), Paints and Coatings – VOC Content Evaluation: For field applications that are inside the weatherproofing system, use paints and coatings that comply with the limits for VOC content when calculated according to the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016.

C.

Product Type:	Allowable VOC Content (g/L):
Bond Breaker	350
Building Envelope Coating	50
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 – Color indicating safety coatings	480
Industrial maintenance coatings – High temperature IM coatings	420
Industrial maintenance coatings – Non-sacrificial anti-graffiti coatings	100

Product Type:	Allowable VOC Content (g/L):
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
Sacrificial anti-graffiti coatings	50
Shellac- Clear	730
Shellac – Pigmented	550
Specialty primers	100
Stains	100
Stains, interior	250
Stone consolidant	450
Swimming pool coatings – repair	340
Swimming pool coatings – other	340
Tile and Stone Sealers	100
Traffic Coatings	100
Waterproofing sealers	100
Waterproofing concrete/masonry sealers	100
Wood Conditioners	100
Wood preservatives	350
Low solids coatings	120

D. IEQc2, Low-Emitting Materials (v4.1), Paints and Coatings – VOC Emissions Evaluation: For field applications that are inside the weatherproofing system, 75 percent (by volume or surface area) of paints and coatings shall comply with the VOC Emissions Evaluation. Acceptable third party verified labels confirming CDPH compliance include but are not limited to:

1. UL Greenguard Gold.
2. MAS Certified Green.
3. Intertek Clean Air Gold.
4. SCS Indoor Advantage Gold.
5. Berkeley Analytical ClearChem.
6. Green Seal GS-11, Ed. 4.0.

E. IEQc2, Low-Emitting Materials (v4.1), Adhesives and Sealants – VOC Content Evaluation: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the limits for VOC content when calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on October 6, 2017:

Product Type:	Allowable VOC Content (g/L):
Adhesives -	
Architectural Applications:	
Building Envelope Membrane Adhesives	250
Carpet pad adhesives	50
Ceramic Glass, Porcelain, & Stone Tile Adhesive	65
Cove base adhesives	50
Dry wall and panel adhesives	50
Multipurpose construction adhesives	70
Roofing:	
Single ply roof membrane adhesives	250
All other roofing adhesives	250
Rubber floor adhesives	60
Structural glazing adhesives	100
Structural wood member adhesives	140
Subfloor adhesives	50
VCT and asphalt tile adhesives	50
Wood flooring adhesives	100
All other indoor floor covering adhesives	50
All other outdoor floor covering adhesives	50
Computer diskette manufacturing	350
Contact adhesive	80
Edge glue adhesive	250
Plastic welding cement:	
ABS welding cement	325
ABS to PVC transition cement	510
CPVC welding cement	490
PVC welding cement	510
All other plastic welding cements	250
Rubber vulcanization adhesive	250
Special purpose contact adhesive	250
Thin metal laminating adhesive	780
Tire tread adhesive	100
Top and Trim adhesive	250
Waterproof resorcinol glue	250
All other adhesives	250
Substrate Specific Applications -	
Metal	30

Product Type:	Allowable VOC Content (g/L):
Plastic foam	50
Porous material (except wood)	50
Wood	30
Fiberglass	80
Reinforced plastic composite	250
Sealants -	
Architectural Applications:	
Clear, paintable, immediately water-resistant sealant	250
Foam insulation	250
Foam sealant	250
Grout	65
Roadway sealant	250
Non-staining plumbing putty	150
Potable water sealant	100
Roofing:	
Single ply roof membrane sealant	450
All other roofing sealants	300
All other architectural sealants	250
Marine deck sealant	760
All other sealants	420
Adhesives Primer -	
Plastic	550
Pressure sensitive	250
Traffic marking tape	150
Vehicle glass	250
All other adhesives primers	250
Sealant Primers -	
Architectural Applications:	
Non-porous	250
Porous sealant primer	775
Marine deck	760
Modified bituminous	500
All other sealant primer	750

F. IEQc2, Low-Emitting Materials (v4.1), Adhesives and Sealants – VOC Emissions Evaluation: For field applications that are inside the weatherproofing system, 75 percent (by volume or surface area) of adhesives and sealants shall comply with the VOC Emissions Evaluation. Acceptable third party verified labels confirming CDPH compliance include but are not limited to:

1. UL Greenguard Gold.
2. MAS Certified Green.
3. Intertek Clean Air Gold.
4. SCS Indoor Advantage Gold.

5. Berkeley Analytical ClearChem.

G. IEQc2, Low-Emitting Materials (v4.1), Flooring – VOC Emissions Evaluation: 90 percent (by cost or surface area) of floorings shall comply with the VOC Emissions Evaluation. Acceptable third party verified labels confirming CDPH compliance include but are not limited to:

1. FloorScore.
2. CRI Green Label Plus.
3. UL Greenguard Gold.
4. SCS Indoor Advantage Gold.
5. MAS Certified Green.
6. Intertek Clean Air Gold.
7. NSF/ ANSI 332.

H. IEQc2, Low-Emitting Materials (v4.1), Composite Wood – Formaldehyde Emissions Evaluation: 75 percent (by cost or surface area) of all particleboard, medium density fiberboard (both medium density and thin), hardwood plywood with veneer, composition or combination core, shall meet EPA Toxic Substances Control Act, Formaldehyde Emission Standards for Composite Wood Products (EPA TSCA Title VI) or California Air Resources Board (CARB) ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) products or no added formaldehyde resins (NAF).

All structural composite wood panels and products shall be certified according to one of the following industry standards:

1. Plywood: compliant with Voluntary Product Standard – Structural Plywood (PS 1-09) or Voluntary Product Standard – Performance Standard for Wood-Based Structural-Use Panels (PS 2-10).
2. Structural Composite Lumber: compliant in accordance with Standard Specification for Evaluation of Structural Composite Lumber Products (ASTM D5456-13).
3. Glued laminated timber: compliant in accordance with Structural Glued Laminated Timber (ANSI A190.1-2012).
4. I-joists: compliant in accordance with Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists (ASTM D5055-13).
5. Cross-laminated timber: compliant in accordance with Standard for Performance-Rated Cross-Laminated Timber (PRG 320-15).
6. Finger-jointed lumber: labeled “Heat Resistant Adhesive (HRA)” in accordance with the American Softwood Lumber Standard (DOC PS-20 2015).

I. IEQc2, Low-Emitting Materials (v4.1), Ceilings – VOC Emissions Evaluation: 90 percent (by cost or surface area) of ceilings, by cost or surface area, comply with the requirements of the VOC Emissions Evaluation. Acceptable third party verified labels confirming CDPH compliance include but are not limited to:

1. UL Greenguard Gold.
2. SCS Indoor Advantage Gold.

J. IEQc2, Low-Emitting Materials (v4.1), Wall Panels – VOC Emissions Evaluation: 75 percent (by cost or surface area) of all wall panels, by cost or surface area, shall comply with the requirements of the VOC Emissions Evaluation. Wall panel product category included all finish wall treatments (wall coverings, wall paneling, wall, tile), surface wall structures such as gypsum or plaster, cubicle/ curtain/ partition walls, doors, frames, windows and window treatments. Acceptable third party verified labels confirming CDPH compliance include but are not limited to:

1. UL Greenguard Gold.
2. SCS Indoor Advantage Gold.

K. IEQc2, Low-Emitting Materials (v4.1), Insulation – VOC Emissions Evaluation: 75 percent (by cost or surface area) of all insulation shall comply with the requirements of the VOC Emissions Evaluation. The insulation material category includes all thermal and acoustic boards, batts, rolls, blankets, sound attention, foamed-in place, loose-fill, blown and spayed insulation. Acceptable third party verified labels confirming CDPH compliance include but are not limited to:

1. UL Greenguard Gold.
2. SCS Indoor Advantage Gold.

PART 3 - EXECUTION

3.1 NON-SMOKING SITE/ BUILDING

A. Credit IEQ3 Construction Indoor Air Quality Management Plan: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes. Install appropriate signage to communicate this to all parties on-site during construction.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. Prerequisite MR 2 and Credit MR 5: Comply with Section 01 74 19 “Construction Waste Management.”

3.3 CONSTRUCTION INDOOR AIR QUALITY PROCEDURES

A. Credit IEQ 3, Construction Indoor Air Quality Management Plan and Credit IEQ 4 Indoor Air Quality Assessment (v4.1): Comply with Section 01 81 19 “Indoor Air Quality (IAQ) Management Requirements.”

3.4 LEED MATERIAL INFORMATION TRACKING

A. For LEED credits: MR 2, MR 3, and MR 4, track LEED material and cost information using the USGBC’s BDC USGBC’s BDC (v4.1) Building Products Calculator.

B. For LEED credits: MR 2, MR 3, MR 4, and IEQc2 use the LEED Material Information Form. The Project LEED Consultant will deliver electronic copies of this form.

ATTACHMENTS

LEED Project Checklist

END OF SECTION

PCC Sylvania Health Technology Building West Renovation

LEED v4 for Building Design + Construction: New Construction: Project Checklist

Construction Phase - In progress checklist for informational purposes only, subject to changes

September 19th, 2023

East Scorecard 9/13/23

		Integrative Process	Who	Points	Ph.	Y	Y?	N?	N	Ver.	Y	Y?	N?	N	
Credit	IPc1	Integrative Process	PAE/AR/W+B	1	D	1					1				
				1		1	0		0		1	0		0	0

		Location and Transportation	Who	Points	Ph.	Y	Y?	N?	N		Y	Y?	N?	N	
Credit	LTc1	LEED for Neighborhood Development Location, ***OR:***	-	16	-	-	-		-		-	-		-	
Credit	LTc2	Sensitive Land Protection	LC	1	D	1					1				
Credit	LTc3	High Priority Site and Equitable Development	PCC/W+B	2	D		1		1	v4.1	1			1	
Credit	LTc4	Surrounding Density and Diverse Uses	LC	5	D	2			3		2			3	
Credit	LTc5	Access to Quality Transit	LC	5	D	1			4	v4.1	1			4	
Credit	LTc6	Bicycle Facilities	PCC/W+B	1	D			1		v4.1	1				
Credit	LTc7	Reduced Parking Footprint	-	1	D				1					1	
Credit	LTc8	Green Vehicles	-	1	D				1					1	
				16		4	1	1	10		6	0	0	10	0

		Sustainable Sites	Who	Points	Ph.	Y	Y?	N?	N		Y	Y?	N?	N	
Prereq	SSp1	Construction Activity Pollution Prevention	HH/FC	-	C	Y					Y				
Credit	SSc1	Site Assessment	W+B/PL/HH	1	D	1				v4.1	1				
Credit	SSc2	Site Development-Protect or Restore Habitat	-	2	D				2					2	
Credit	SSc3	Open Space	W+B/PL	1	D			1		v4.1	1				
Credit	SSc4	Rainwater Management	-	3	D				3					3	
Credit	SSc5	Heat Island Reduction	W+B/PL	2	D	2				v4.1	2				
Credit	SSc6	Light Pollution Reduction	BL	1	D	1					1				
				10		4	0	1	5		5	0	0	5	

		Water Efficiency	Who	Points	Ph.	Y	Y?	N?	N		Y	Y?	N?	N	
Prereq	WEp1	Outdoor Water Use Reduction	PL	-	D	Y					Y				
Prereq	WEp2	Indoor Water Use Reduction	AR/+B	-	D	Y					Y				
Prereq	WEp3	Building-Level Water Metering	AR/PCC	-	D	Y					Y				
Credit	WEc1	Outdoor Water Use Reduction	PL	2	D	1			1		1			1	
Credit	WEc2	Indoor Water Use Reduction	-	6	D	3		1	2					6	
Credit	WEc3	Cooling Tower Water Use	-	2	D				2					2	
Credit	WEc4	Water Metering	AR/PL	1	D	1					1				
				11		5	0	1	5		2	0	0	9	0

		Energy and Atmosphere	Who	Points		Y	Y?	N?	N		Y	Y?	N?	N	
Prereq	EAp1	Fundamental Commissioning and Verification	EBC/ TBD	-	C	Y					Y				
Prereq	EAp2	Minimum Energy Performance	PAE	-	D	Y					Y				
Prereq	EAp3	Building-Level Energy Metering	SC/PCC	-	D	Y					Y				
Prereq	EAp4	Fundamental Refrigerant Management	AR	-	D	Y					Y				
Credit	EAc1	Enhanced Commissioning	EBC/ TBD	6	C	3	2		1		5			1	
Credit	EAc2	Optimize Energy Performance	PAE	18	D	13	2		2		15			2	
Credit	EAc3	Advanced Energy Metering	-	1	D				1					1	
Credit	EAc4	Demand Response	PAE	2	C	1			1	v4.1	1			1	
Credit	EAc5	Renewable Energy Production	PAE/SC	3	D	3					3				
Credit	EAc6	Enhanced Refrigerant Management	-	1	D				1					1	
Credit	EAc7	Green Power and Carbon Offsets	PCC	2	C	2					2				
				33		22	4	0	6		26	0	0	6	

PCC Sylvania Health Technology Building West Renovation

LEED v4 for Building Design + Construction: New Construction: Project Checklist

Construction Phase - In progress checklist for informational purposes only, subject to changes

September 19th, 2023

											East Scorecard 9/13/23			
Materials and Resources			Who	Points	Ph.	Y	Y?	N?	N		Y	Y?	N?	N
Prereq	MRp1	Storage and Collection of Recyclables	W+B/PCC	-	D	Y					Y			
Prereq	MRp2	Construction and Demolition Waste Management Planning	FC	-	C	Y				v4.1	Y			
Credit	MRc1	Building Life-Cycle Impact Reduction	W+B	5	D	3			2		3			2
Credit	MRc2	Blg. Product Disclosures & Optimization-EPD	W+B/FC	2	C	1		1		v4.1	1		1	
Credit	MRc3	Blg. Product Disclosures & Optimization-Sourcing (Raw Mat.)	W+B/FC	2	C			1	1	v4.1			1	1
Credit	MRc4	Blg. Product Disclosures-Material Ingredients	W+B/FC	2	C	1		1		v4.1	1		1	
Credit	MRc5	Construction and Demolition Waste Management	FC	2	C	2				v4.1	2			
				13		**7**	**0**	**3**	**3**		**7**	**0**	**3**	**3**
Indoor Environmental Quality			Who	Points	Ph.	Y	Y?	N?	N		Y	Y?	N?	N
Prereq	EQp1	Minimum Indoor Air Quality Performance	PAE	-	D	Y					Y			
Prereq	EQp2	Environmental Tobacco Smoke Control	HA/PCC	-	D	Y					Y			
Credit	EQc1	Enhanced Indoor Air Quality Strategies	HA/PAE	2	D	2					2			
Credit	EQc2	Low-Emitting Materials	W+B/FC	3	C	3				v4.1	3			
Credit	EQc3	Construction Indoor Air Quality Management Plan	FC	1	C	1					1			
Credit	EQc4	Indoor Air Quality Assessment	FC	2	C	2				v4.1	2			
Credit	EQc5	Thermal Comfort	-	1	D				1					1
Credit	EQc6	Interior Lighting	BL	2	D		1			v4.1	2			
Credit	EQc7	Daylight	-	3	D				3					3
Credit	EQc8	Quality Views	-	1	D				1					1
Credit	EQc9	Acoustic Performance	ADS	1	D	1				v4.1	1			
				16		**9**	**1**	**0**	**5**		**11**	**0**	**0**	**5**
Innovation			Who	Points	Ph.	Y	Y?	N?	N		Y	Y?	N?	N
Credit	INc1	IN: Proposed Credits (up to 5 points)	TBD	5										
	INc1.2	IN: Pilot Credit - All-Gender Restrooms			D	1					1			
	INc1.3	IN: Design for Active Occupants			D	1					1			
	INc1.5	IN: Green Educational Outreach			C	1					1			
	INc1.4	IN: Exemplary Performance EQ Credit Enhanced IAQ Strategies			C	1					1			
	INc1.1	IN: Pilot Credit - Social Equity Within Project Team			C						1			
		Other options to evaluate:												
		IN: LEED O&M Starter Kit			C	1								
		IN: Purchasing Lamps (design related)			C			1						
		IN: Occupant Comfort Survey			C			1						
Credit	INc6	LEED Accredited Professional	LC	1	C	1					1			
			Max. 6 points	**6**		**6**	**0**	**2**	**0**		**6**	**0**	**0**	**0**
Regional Priority Credits			Who	Points		Y	Y?	N?	N		Y	Y?	N?	N
Credit	RPc1	RP: Renewable Energy Production (5%)	-	1	D	1					1			
Credit	RPc2	RP: Demand Response	-	1	C	1				v4.1	1			
Credit	RPc3	RP: Blg. Prod. Disclosures & Opt. -EPD	-	1	C	1				v4.1	1			
Credit	RPc4	RP: Blg. Prod. Disclosures & Opt. -Sourcing (Raw Mat.)	-	1	C			1		v4.1			1	
	-	*RP: Blg. Rainwater Management (3 pts)*	-		D									
	-	*RP: Indoor Water Use Reduction (40%)*	-		D									1
			Max. 4 points	**4**		**3**	**0**	**1**	**0**		**3**	**0**	**1**	**0**
		Total		**110**		**61**	**6**	**9**	**34**		**67**	**0**	**4**	**38**

Certified 40 to 49 points, Silver 50 to 59 points, Gold 60 to 79 points, Platinum 80 to 110

SECTION 01 81 19 - INDOOR AIR QUALITY (IAQ) MANAGEMENT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements governing protection of indoor air quality (IAQ), absorbent materials, and mechanical system from contamination during demolition and building flush out along with baseline indoor air quality testing prior to Owner occupancy, in compliance to LEED v4 Building Design and Construction (BDC) Credit IEQ 3 Construction IndoorAir Quality Management Plan, and LEED v4.1 BDC Credit IEQ 4 Indoor Air Quality Assessment.

B. Related Requirements:

1. Section 01 81 13 “Sustainability Requirements” for requirements for LEED certification.

1.3 REFERENCES

A. ASHRAE Standard 52.2-Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 1999.

B. SMACNA (OCC) - IAQ Guideline for Occupied Buildings under Construction; 2nd Edition, 2007, ANSI/SMACNA 008-2008 (Chapter 3).

C. EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air.

1.4 DEFINITIONS

A. Absorptive Materials Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.5 SUBMITTALS

A. See Section 01 81 13 “Sustainability Requirements” for LEED Certification Requirements.

B. Construction Indoor Air Quality Management Plan

1. IEQc3 Construction Indoor Air Quality Management Plan: An IAQ plan based upon SMACNA IAQ Guidelines. The plan shall describe in detail measures specific to this project to be taken during construction to promote adequate indoor air quality upon completion.

a. HVAC Protection: Describe steps to protect ductwork and HVAC equipment from dust and water damage.

b. Source Control: Identify sources of VOCs and appropriate measures to mitigate their impacts.

c. Pathway Interruption: Manipulate air paths to reduce contaminants of finished spaces.

d. Housekeeping: Describe cleaning and dust control procedures.

e. Scheduling: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

f. Prohibit the use of tobacco products during construction inside the building and within 25 feet of building entrances.

2. Quality Assurance and IAQ Monitoring: Describe steps to ensure compliance by Construction Manager and subcontractors.

3. Photograph Documentation - six photographs of each of the 5 SMACNA measures taken throughout construction and on submitted monthly. Identify date and SMACNA measure featured in each photograph.

C. IEQc4 Indoor Air Quality Assessment: An IAQ plan based upon ASHRAE Standard 62.1-2004. The plan describes in detail measures specific to this Project to be taken before occupancy to promote adequate indoor air quality upon completion.

1. Indoor Air Quality Flush-Out:

a. Provide a signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed, the amount of volume of air flushed, the internal temperature and relative humidity during the flushout, and confirmation that filtration media was replaced after flush-out in compliance to LEED v4.1 BDC Credit EQ 4 Indoor Air Quality Assessment requirements

2. Indoor Air Quality Testing:

a. Conduct onsite IAQ testing and provide a report with the results of the baseline IAQ testing for particulate matter and inorganic gases, and for Volatile Organic Compounds (VOC), in compliance LEED v4.1 BDC Credit EQ 4 Indoor Air Quality Assessment requirements.

D. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to absorption of odors and vapors, and indicate air handling zone, sequence of application and curing times.

E. LEED Online Documentation: Complete LEED Credit Forms on LEED Online for IEQc3 and IEQc4 and provide supporting documentation including IAQ Management Plan for during construction and post-occupancy, photo documentation of required construction practices, calculations and logs to support building flush-out or reports confirming indoor air quality testing methods and results.

PART 2 - PRODUCTS

2.1 MATERIALS

A. IEQc2 Low-Emitting Materials: See Section 01 81 13 “Sustainability Requirements” for specific requirements – emissions testing requirements and VOC limits.

B. Air Filters: MERV 8, minimum, when tested in accordance with ASHRAE 52.2, 2007.

PART 3 - EXECUTION

3.1 IEQc3: Construction Indoor Air Quality Management Plan

A. Refer to SMACNA IAQ Guideline for Occupied Buildings under Construction for avoiding unnecessary contamination due to construction procedures.

B. Building HVAC system and supply air ductwork may be used for ventilation during construction:

1. Begin construction ventilation when building is substantially enclosed.

2. Operate HVAC system with 100 percent outside air and with 1.5 air changes per hour, minimum.

3. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.

4. Do not use return air ductwork for ventilation unless absolutely necessary.

5. Where return air ducts shall be used for ventilation, install MERV 8 filters at return inlets, sealed to ducts; replace filters when they lose efficiency.

C. 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.

D. HVAC Protection:

1. Protect air handling and distribution equipment, and air supply and return ducting during demolition.

2. Adequately cover and protect exposed air inlets and outlets, openings, grilles, ducts, plenums, as required to prevent water, moisture, and other contaminant intrusion.

3. Apply protection immediately after installation of equipment and ducting.

4. Do not store construction materials or waste in mechanical or electrical rooms.

5. Prior to using return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

6. Inspect duct intakes, return air grilles, and terminal units for dust.

7. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.

8. Clean tops of doors and frames.

9. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.

10. Clean return air plenums of air handling units.

11. Remove air intake filters only after cleaning is complete.

12. Do not perform dust or dirt- producing work after starting use of return air ducts without intake filters on return air ducts.

E. Pathway Interruption:

1. Provide solid physical barriers to isolate areas of construction. Securely attach and seal at floor and structure above.

2. Openings within the designated work area shall be sealed.

3. Adequate exhaust ventilation equipment shall be installed to maintain a negative pressure differential between the work area and adjacent areas of the building.

4. Ventilation units shall be exhausted to the outside of the building.

F. Source Control:

1. Limit construction traffic and motor idling in the vicinity of air intake louvers when the HVAC systems are activated. Restrict motor vehicles to the loading dock area, well removed from air intakes and operable windows, preventing emissions from being drawn into the building.

2. Use electric or natural gas alternatives for gasoline and diesel equipment where possible and practical.

3. Cycle equipment off when not being used or needed.

4. Avoid the use of materials and products with high VOC and/or particulate levels. Use products and installation methods with low VOCs such as paints, sealers, sealants, filler materials, insulation, adhesives, caulking and cleaners. Comply with the requirements in other specification Sections.

5. Keep containers of wet products closed as much as possible. Cover and seal waste materials, which can release odor or dust.

6. Protect materials, especially absorbent materials such as insulated ductwork, against moisture during delivery to and storage at the job site. Store materials inside the structure in a dry and clean environment pending installation. Building materials shall be kept dry to avoid the introduction of moisture into the building interior.

7. Avoid the use of moisture-damaged materials. Any porous materials that have been wetted shall be dried thoroughly before installation. Any porous materials that have been damaged remained wet longer than 48 hours, or show signs of visible mold shall be discarded.

8. Ensure that the construction process will not result in moisture intrusion.

9. Avoid tracking pollutants into work areas. Once the framing and mechanical system installation starts, access to the building interior shall be controlled to minimize the tracking in of contaminants. Material deliveries and construction waste removal shall be routed via the most direct route to the building exterior of the building rather than through the space.

10. Provide rough track-off grates or matting at the entryway to remove moisture and containments from entering the building.

11. Prevent the ingress of rodents and pests.

12. Prohibit the use of tobacco products during construction inside the building and within 25 feet of building entrances and “Good neighbor zones.” See Campus plan for specific locations.

G. Housekeeping:

1. Provide temporary ventilation during demolition to minimize accumulation of dust fumes, vapors, or gases in the building.

2. Suppress dust with wetting agents or sweeping compounds.

3. Clean-up dust using a wet rag or damp mop.

4. Increase the cleaning frequency when dust build-up is noted.

5. Remove spills or excess applications of solvent-containing products as soon as possible. Refer to Owner’s Environmental Health & Safety Standards for additional procedures regarding spills of solvent containing chemicals or products.

6. Remove accumulated water and keep work areas as dry as possible.
7. Store volatile liquid containers closed when the container is inside of the building and not in use.
8. Keep volatile liquid containers closed when the container is inside of the building and not in use.
9. HEPA vacuuming and duct cleaning.
10. Use nontoxic cleaning materials and procedures.

H. Scheduling:

1. Comply with the scheduling requirements of Article, "Sequence of Finish Installation" of this Section.
2. To avoid potential contamination of porous or absorbent materials such as ceiling tiles, install furnishings after interior finishes (drywall, paint, and floor finishing) have cured.
3. Phased Completion: Implement IAQ control measures in each tenant area until construction in that area is complete. Do not allow contaminants from an area under construction to enter the HVAC ductwork systems or to migrate to completed areas.
4. Filters: Install new MERV 8 filters at the central fan system, immediately prior to the first phase of building occupancy. Install new MERV 8 filters at fan systems serving limited areas immediately prior to occupancy for each respective area.

3.2 IEQc4: Indoor Air Quality Assessment

A. Prior to flush-out or air testing, the building shall have interior finishes installed including, but not limited to, millwork, doors, paint, carpet, acoustic tiles and movable furnishings (e.g. workstations, partitions), and major VOC punch-list items must be finished.

B. Option 1, Path 1: Flush-out, Before Occupancy.

1. After construction ends, prior to occupancy and with interior finishes and furniture installed, perform a building flush-out by supplying a total volume of 14,000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 degrees F and a relative humidity no higher than 60 percent. Indicate operating procedure for each HVAC system and piece of equipment and the operating duration required for flush-out.
    a. Follow the manufacturer operating procedures for each HVAC system and piece of equipment and the operating duration required for flush out.

C. Option 1, Path 2: Flush-out, During Occupancy.

1. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3,500 cu. ft. of outdoor air per sq. ft. of floor area to the space.
    a. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or the design minimum outside air rate determined in EQ Prerequisite 1, whichever is greater.
    b. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy.
    c. These conditions shall be maintained until a total of 14,000 cu. ft./sq. ft. of outside air has been delivered to the space.
    d. Follow the manufacturer operating procedures for each HVAC system and piece of equipment and the operating duration required for flush out.

D. Option 2: Air Testing:

1. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, for the contaminants listed in Path 1. Particulate Matter and Inorganic Gases and Path 2. Volatile Organic Compounds, using testing protocols consistent with the EPA's Compendium of Methods, or ISO Methods, as detailed in the USGBC's "Reference Guide for Building Design and Construction," version 4 (v4) and supplemented by version 4.1 (v4.1).

2. Path 1: Particulate Matter and Inorganic Gases: Test for the particulate matter (PM) and inorganic gases listed below, using an allowed test method, and demonstrate the contaminants do not exceed the concentration limits listed and as detailed in the USGBC's LEED v4.1 Building Design and Construction (November 2020).

   a. Carbon monoxide (CO): 9 ppm; no more than 2 ppm above outdoor levels

   b. PM 10: ISO 14644-1:2015, cleanroom class of 8 or lower

   c. PM 2.5: 12 µg/m3 or 35 µg/m3.

   d. Ozone: 0.07 ppm.

3. Path 2: Volatile Organic Compounds: Perform a screening test for Total Volatile Organic Compounds (TVOC). Use ISO 16000-6, EPA TO-17, or EPA TO-15 to collect and analyze the air sample. Calculate the TVOC value per EN 16516:2017, CDPH Standard Method v1.2 2017 section 3.9.4, or alternative calculation method as long as full method description is included in test report. If the TVOC levels exceed 500 µg/m3, investigate for potential issues by comparing the individual VOC levels from the GC/MS results to associated cognizant authority health-based limits. Correct any identified issues and re-test if necessary.

   Additionally, test for the individual volatile organic compounds listed below using an allowed test method, as detailed in the USGBC's LEED v4.1 Building Design and Construction (November 2020) and demonstrate the contaminants do not exceed the concentration limits listed. Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use.

   a. Acetaldehyde 75-07-0: 140 µg/m3.

   b. Benzene 71-43-2: 3 µg/m3.

   c. Dichlorobenzene (1,4-) 106-46-7: 800 µg/m3.

   d. Formaldehyde 50-00-0: 20 µg/m3 (16 ppb).

   e. Hexane (n-) 110-54-3: 7000 µg/m3.

   f. Naphthalene 91-20-3: 9 µg/m3.

   g. Phenol 108-95-2: 200 µg/m3.

   h. Styrene 100-42-5: 900 µg/m3.

   i. Tetrachloroethylene 127-18-4: 35 µg/m3.

   j. Toluene 108-88-3: 300 µg/m3.

   k. Vinyl Acetate 108-05-4: 200 µg/m3.

   l. Xylenes-Total 108-38-3, 95-47-6, and 106-42-3: 700 µg/m3.

4. Measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.

5. Prior to testing, the building shall have interior finishes installed including, but not limited to, millwork, doors, paint, carpet, acoustic tiles and movable furnishings (e.g. workstations, partitions), and major VOC punch-list items must be finished.

6. Test at least one location per ventilation system for each occupied space type. There must be a minimum of one test per floor. The locations selected for testing must represent the worst-case zones where the highest concentrations of contaminants of concern are likely to occur.

7. For offices and classroom projects, test areas no larger than 5,000 square feet. For large open spaces, a limit of 50,000 square feet may be used. If there is evidence that the air in the space is well mixed and sources of contaminants of concern are uniform, project teams may test a single location in that space.

8. Determine whether the project includes spaces (e.g., offices, classrooms) that are identical in their construction, finishes, configuration, square footage, and HVAC systems. Project teams may sample identical spaces by testing one in seven. If the sampled space fails the test, all seven must be tested.

9. For each sampling point where the maximum concentration limits are exceeded, take corrective action and retest for the noncompliant contaminants at the same sampling points. Repeat until all requirements are met.

3.3 SEQUENCE OF FINISH INSTALLATION

A. Sequence of Finish Installation: Project schedule shall address construction scheduling/sequencing requirements and procedures necessary to optimize Indoor Air Quality (IAQ) levels for the completed Project.

1. Scheduling Construction Manager’s Project Schedule for finish applications should allow for: Dissipation of high emissions from finishes that off-gas perceptible quantities of deleterious material during curing Separation of off-gassing effects from the installation of adsorptive materials that would act as a "sink" for storage and subsequent release of these unwanted substances into building spaces and mechanical systems after project occupancy.

2. When Construction Manager’s “Project Schedule” requires less than optimal sequencing of finish installation, related to IAQ, provide supplemental filtered “fresh air” ventilation of work areas during construction and restrict / control the use of permanent building mechanical systems prior to Owner’s acceptance of building to prevent contamination of systems by construction wastes and other deleterious substances.

B. Finish Types:

1. Type 1: Materials and finishes which have a potential for short-term levels of off-gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing. Type 1 Finishes include, but are not limited to the following:

a. Adhesives, sealants, and glazing compounds, specifically those with petrochemical vehicles or carriers.

b. Wood preservatives, finishes, and paint.

c. Control and/or expansion joint fillers.

d. All hard finishes requiring adhesive installation.

e. Gypsum board and associated finish processes.

f. Sealants and associated filler materials.

2. Type 2: Finishes: Materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals off-gassed by Type 1 finishes or may be adversely affected by particulates. These materials become "sinks" for deleterious substances, which may be released much later, or collectors of contaminants that may promote subsequent bacterial growth. Type 2 Finishes include, but are not limited to the following:

    a. Carpet and padding.

    b. Fabric wallcovering.

    c. Insulation exposed to the airstream.

    d. Acoustic ceiling materials.

    e. Fabric covered acoustic wall panels.

    f. Upholstered furnishings.

    g. Materials that can be categorized as both Type 1 and Type 2 materials shall be considered to be Type 1 materials.

C. Optimal Order of Installation: Apply Type 1 interior finishes throughout the entire controlled air zone of each enclosed building or building segment and allow such finishes to completely cure according to intervals and times stated in respective finish manufacturer's printed instructions before commencing installation of any Type 2 materials in the same area.

1. Do not store any Type 2 materials in areas where installation or curing of Type 1 materials is in progress.

D. Materials Test Data – Required for Substitutes Only:

1. All manufacturers/producers of materials listed below that are proposed for substitution on this Project are required to illustrate test data for their materials which show permanent, in-place Indoor Air Quality performance in accordance with requirements of this Specification.

2. Material Safety Data Sheets: Review MSDS's of materials to be submitted for testing as well as MSDS's for other products where specifically requested in this Project Manual and identify those classified as "Prohibited Materials."

3. Prohibited Materials: Any building materials or products that emit pollutants included on the International Agency for Research on Cancer (IARD) "List of Chemical Carcinogens", the "Carcinogen List" of the National Toxicology Program, and the "Reproductive Toxin List" of the "Catalog of Teratogenic Agents" shall have approval in writing from the Owner’s Representative before that building material or product may be used on this Project. Carcinogens: Use of materials emitting carcinogens will not be permitted unless a suitable substitute is not available. Do not proceed with procurement of any carcinogen emitting product or material without prior review and written approval of the Owner’s Representative.

END OF SECTION

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

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

B. Related Requirements:

1. Section 01 74 19 "Construction Waste Management and Disposal".
2. Section 01 70 00 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

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

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

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

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

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

1.4 MATERIALS OWNERSHIP

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

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

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

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.

1.6 SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

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

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

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's Representative that on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Use of elevator and stairs.

5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Contract for progress photographs. Submit before Work begins.

E. 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.

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

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

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

1.9 FIELD CONDITIONS

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

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

1. Before start of selective demolition, Owner will remove and store any existing items they wish to salvage.

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

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

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

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

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

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

1.10 WARRANTY

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

1. Roofing warranty.

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

1.11 COORDINATION

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

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

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

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

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or videos.

1. Comply with Division 01 requirements for taking photographs or videos.

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

3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

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

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.

2. Arrange to shut off utilities with utility companies.

3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.

c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

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

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.

5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

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

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

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

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.

6. Maintain adequate ventilation when using cutting torches.

7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

10. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 19 "Construction Waste Management and Disposal."

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

C. Removed and Salvaged Items:

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

D. Removed and Reinstalled Items:

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

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

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings. "Do not use methods requiring solvent-based adhesive strippers.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 01 74 19 "Construction Waste Management and Disposal."

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

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

B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

3.9 SELECTIVE DEMOLITION SCHEDULE

A. Remove: Existing items as indicated on drawings.

B. Remove and Salvage: Owner will remove any existing materials stored within area of work before start of construction.

END OF SECTION

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The General Structural Notes shall be used in conjunction with these specifications. The General Structural Notes shall supersede items in this specification when discrepancies exist.

1.2 SUMMARY

A. Section Includes:

1. Cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for building construction.
2. Items furnished by others installed into formwork, such as, but not limited to, anchor bolts, setting plates, bearing plates, anchorages, inserts and frames.
3. Smooth-finished concrete floor slabs indicated to receive hardened, ground and polished finish.
4. Patch/ repair existing cast-in-place concrete wall where existing cast-in-place bleacher is indicated to be removed; patch/ repair shall meet Architect-approved exposed finish.
5. Structural foam fill (geofoam).
6. Waterstops.
7. Vapor barriers.

B. Related Requirements:

1. Section 01 81 13 “Sustainability Requirements”.
2. Section 03 35 43 “Polished Concrete Floor Finishing” for concrete floors indicated to be hardened, ground and polished.
3. Section 03 53 00 “Concrete Topping” for concrete floor toppings at lap pool deck.
4. Section 05 50 00 “Metal Fabrications” for coordination and provision of embedments and nosings to this Section for installation in forms prior to concrete placement.
5. Division 07 “Thermal and Moisture Protection” waterproofing sections for coordination and provision of waterstops required to be installed in concrete.
6. Section 07 19 00 “Water Repellents” for back-of-house concrete floor slabs to be sealed.
7. Section 07 21 00 “Thermal Insulation” for other building insulations, including perimeter insulation at back-fill locations.
8. Division 31 “Earthwork” Sections for drainage fill under slabs-on-ground.
9. Division 32 “Exterior Improvements” Sections for concrete pavement and walks.

1.3 DEFINITIONS

A. Finished Appearance Concrete: Concrete exposed to view on surfaces indicated, and that requires special concrete materials, formwork, placement, and finishes to obtain specified finish appearance.

B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

C. STG: Surface Texture Grade.

1. Ra: Roughness Average.

D. COF: Coefficient of friction.

E. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site. Addition of water at the Project site is to be special inspected.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. The steel reinforcement detailer shall generate all shop drawing bending and installation details from the structural and architectural drawings and specifications. The use of reproductions or photocopies of the contract drawings shall not be permitted.

1. Provide details of fabrication, bending, and placement prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include special reinforcement required for openings through concrete structures.

2. Shop drawings re-submittals shall clearly identify all revisions to previous submittals.

a. Heavy ink clouded outlines (revision clouds) shall be drawn around revised areas of individual sheets.

b. Architect/ Engineer will not review information outside of revision clouds on resubmitted drawings.

3. Separate shop drawing submittal packages shall be made for each of the building sectors shown on the contract drawings. The submittal for each sector shall contain complete fabrication and installation/ erection information for all elements within that sector. References to shop drawings contained in other shop drawing submittal packages shall not be permitted. Submittal packages for each sector shall be staggered at least 14 calendar days.

D. Formwork Shop Drawings: Prepared by or under the supervision of a structural engineer licensed in the State in which the Project is located detailing fabrication, assembly, and support of formwork.

1. For Finished Appearance Concrete include the following shop drawings for fabricating and erecting specific concrete surfaces as shown or specified.

a. Show general form construction including jointing, specially formed joints or reveals, form tie location and pattern of placement, and other items that visually affect exposed concrete.

b. Include plans, elevations, sections, details and schedules as required to fully illustrate details of Work and to meet job conditions.

c. Include details of methods used to seal joints and maintain alignment of formwork.

d. Include details of alignment and seal between standard concrete and finished appearance concrete. Transitions shall occur in locations not exposed to view and at least 6-inches below grade at exterior vertical concrete.

e. Architect's review will be for general architectural applications and features only. Formwork design for structural stability and sufficiency is the Contractor's responsibility.

f. For Finished Appearance Concrete, include the following in shop drawings:

1) Formwork Tie Layout and Configuration: Refer to Drawings for formwork tie layout requirements. Provide tie configuration based on 1-1/2 in. nominal breakback and resulting in 1-1/4 in. diameter tie hole.

a) Proposed construction tie patterns, tie locations, bar sizes, spacings, clearances and disposition related to adjacent items and other items that visually affect.

2) Construction Joint Layout and Pour Sequence. Include details at construction joints, pour strips, and form joint sealant details conforming with design intent.

a) Location of construction joints for finished appearance concrete is subject to approval of the Architect.

E. Vapor Barrier Shop Drawings: Show termination details, penetration details and transition details coordinated with other work.

1. Drawing Format, Plans: Use of Drawings is acceptable where PDF-writer is used. Hand drawing is prohibited.

2. Provide manufacturer's standard details or other CAD-generated drawings.

F. Structural Foam Fill Shop Drawings: Show layout and connections, dimensions. Include fill type for each location.

G. Qualification Data: For Installer, manufacturer, and testing agency.

1. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and owners, and other information specified.

H. Welding certificates.

I. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.

2. Admixtures.

3. Integral water repellent.

4. Form materials and form-release agents.

5. Steel reinforcement and accessories.

6. Fiber reinforcement.

7. Waterstops.
8. Curing compounds.
9. Floor and slab treatments.
10. Bonding agents.
11. Adhesives.
12. Vapor barriers.
13. Semirigid joint filler.
14. Joint-filler strips.
15. Repair materials.

J. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

K. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

L. Field quality-control reports.

M. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

1. Alternatively, Bidders may be considered appropriate for the Project by providing examples and references for three projects of similar scale and type to this Project, for review and approval by the Architect and Owner.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4.

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
2. ACI 301, "Specification for Structural Concrete", Sections 1 through 5.
3. ACI 303.R-12, “Guide to Cast-in-Place Architectural Concrete Practice”.
4. ACI 305 “Recommended Practice for Hot Weather Concreting”.
5. ACI 306 “Recommended Practice for Cold Weather Concreting”.
6. ACI 315 “Details and Detailing of Concrete Reinforcement”.
7. ACI 318 “Building Code Requirements for Reinforced Concrete”.

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. Form Liners: Store form liners under cover to protect from sunlight.

D. Structural Foam Fill: Store foam fill under cover to protect from sunlight according to manufacturer’s recommendations.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sustainable Design Submittals: Refer to Section 01 81 13 “Sustainability Requirements”.

B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 117.
3. ACI 303R, for Finished appearance concrete

C. Redesign or Departures from Requirements of the Contract Documents Initiated by Contractor:
1. Obtain written acceptance from the Architect and Architect's consultants.
2. Bear costs for Contractor-initiated or construction error due to changes in type, form, system, or details of construction from those indicated by the contract documents.
3. Costs of review of such changes by Architect and Architect's consultants will be deducted from the Contract Sum by Change Order.

D. Match Existing: Where concrete is indicated to match existing, concrete appearance shall match existing concrete in finish and quality. Installer shall select mix designs complying with requirements.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, glass-fiber-reinforced plastic, or other approved panel materials.
2. Exterior-grade plywood panels, nonabsorptive, that will provide continuous, true, and smooth finished appearance concrete surfaces, complying with DOC PS 1, and as follows:
a. Medium-density overlay, Class 1, or better, nonabsorptive, mill-release agent treated and edge sealed.

B. Finished Appearance Concrete: Form-facing panels that provide continuous and true concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Smooth-Formed Concrete: As indicated for panels at Smooth-Formed Finished Concrete articles above, except:
a. High-density overlay, Class 1, or better.
2. Do not provide chamfers at corners of smooth-formed concrete.
3. Sealant Corners: Seal interior corners of formwork with joint sealant to avoid excess drainage of "cream" from concrete during placement.

C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

D. Chamfer Strips: Wood, metal, or rubber strips, 1/2 by 1/2 inch, minimum.

E. Rustication Strips: Wood, metal, or rubber strips, kerfed for ease of form removal.

F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

G. Form Ties: Factory-fabricated, removable or snap-off metal and/or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish ties with integral water-barrier plates at walls indicated to receive dampproofing or waterproofing.

2. Finished Appearance Concrete: At formed concrete exposed to view in the final construction, furnish units that provide 1-1/2 inch nominal break back and leave no corrodible metal closer than 1-1/2 inch to the plane of exposed concrete surface.

   a. Tie Cones: As indicated above for finished appearance concrete.

3. At formed concrete NOT exposed to view in the final construction, furnish units that provide 1 inch nominal break back and leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2.3 FORMWORK DESIGN

A. General: Design, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Carry loads to the ground only by the formwork system and in-place construction that has attained adequate strength.

B. Design forms and falsework to include values of live load, dead load, weight of moving equipment operated on formwork lateral loads, and other factors pertinent to safety of structure during construction.

C. Design formwork for easy removal without impact, shock, or damage to cast-in-place concrete and adjacent materials.

D. Fabricate formwork to prevent cement paste from leaking while placing concrete. Solidly butt joints and provide backup material at joint to prevent leakage and fins.

2.4 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615, Grade 60, deformed. Refer to General Structural Notes and Structural Drawings.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A706, deformed where required or at any location where reinforcing is required to be welded. Refer to General Structural Notes and structural drawings.

D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064, plain, fabricated from as-drawn steel wire into flat sheets.

2.5 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

   1. Finished Appearance Concrete: For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.6 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150, Type I/ II. Cement to be low alkali cement with Equivalent Alkali limits as indicated by ASTM C150.

2. Fly Ash: ASTM C618, Class F or C. Refer to General Structural Notes in Structural Drawings for allowed quantities.

3. For Other Allowable Pozzolan Replacement: Refer to General Structural Notes in Structural Drawings for allowed quantities.

C. Normal-Weight Aggregates: ASTM C33, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: Refer to Structural Notes in Drawings.

2. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50sieve, and less than 8 percent may be retained on sieves finer than No. 50

3. Aggregate for Polished Concrete Floors: Seed floors to receive polished exposed finish with aggregate as selected by Architect. Refer to Section 03 35 43 "Polished Concrete Finishing".

D. Water: ASTM C 94 and potable. Clean and not detrimental to concrete. Do not add water to mix at project site unless letter from concrete supplier is obtained documenting amount of water withheld from mix to be added at project site.

2.7 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494, Type A.

2. Retarding Admixture: ASTM C494, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C494, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.

6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494, Type C.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

2.8 STRUCTURAL FOAM FILL

A. Structural Foam Fill: Rigid cellular polystyrene geofoam, ASTM D6817.

1. Type: Provide types as indicated on Structural Drawings.

B. Connectors: Manufacturer's multi-barbed, galvanized-steel sheet connectors or deformed steel reinforcing bars, 3/4 inch in diameter.

C. Adhesive: Manufacturer's recommended adhesive formulated for use with polystyrene and compatible with substrates.

2.9 WATERSTOPS

A. Waterstops, General: Provide type and product from the types indicated below as required by waterproofing manufacturer for warranty in Division 07 waterproofing Sections.

B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing, div. of Carlisle Co.; www.carlisleccw.com.

b. CETCO, div. of Minerals Technologies Inc.; www.mineralstech.com.

c. Concrete Sealants Inc.; www.conseal.com.

d. Henry Co.; www.henry.com.

e. Sika Corp.; www.sika.com.

f. Tremco Inc.; www.tremcocpg.com.

2.10 VAPOR BARRIER

A. Sheet Vapor Barrier: ASTM E1745, Class A; not less than 15 mils thick.

1. Water-Vapor Permeance: Not exceeding 0.01 Perms as tested in accordance with mandatory conditioning tests per ASTM E1745, Section 7.1.

B. Approved Products: Subject to compliance with requirements, other available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Vapor Block VB15 by Raven Industries, Inc.; www.ravenefd.com.

2. Stego Wrap 15-Mil Vapor Barrier by Stego Industries, LLC; www.stegoindustries.com.

3. Perminator HP (High Puncture Resistance) 15 Mil Underslab Vapor Barrier by W. R. Meadows, Inc.; www.wrmeadows.com.

C. Manufacturer's recommended adhesives and sealants for sealing at overlaps, termination points and penetrations.

2.11 WATER REPELLENT

A. Coordinate with requirements of Section 07 19 00 "Water Repellents".

2.12 CURING MATERIALS

A. General: For all topical treatments, confirm compatibility with finish floor manufacturer's requirements.

B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

D. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

E. Water: Potable.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.

2.13 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Epoxy-Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class, suitable for application temperature and grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

C. Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.14 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 15 percent.

2. Combined Fly Ash or Pozzolan and Slag Cement: 15 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

3. Silica Fume: 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Synthetic Fiber: uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

E. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.15 REPAIR MATERIALS

A. Concrete Smoothing: High-performance, gray concrete smoothing compound of rapid-set, self-curing, hydraulic cement, high-performance polymers, and finely ground aggregate.

1. Application Surface: Clean, sound concrete free from any materials that may inhibit bond, such as form release, oil, curing compound, acid, dirt and loose debris. Apply to a surface that is dry or saturated with no standing water.
    a. Test area for acceptable base for application of concrete smoothing product.
2. Thickness: Skim coat to 1/2 inch.
3. Installation: Surface and ambient temperatures must be between 50°F to 90°F.
4. Compressive Strength: Not less than 2,000 psi at 28 days when tested in accordance with ASTM C109.
5. Basis-of-Design Product: WunderFixx by CTS Cement Manufacturing Corp.; www.ctscement.com.
6. Application: Patch/ repair existing cast-in-place concrete wall where existing cast-in-place bleacher is indicated to be removed; patch/ repair shall meet Architect-approved exposed finish.

2.16 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.17 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94 and ASTM C1116, and furnish batch ticket information.
    1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
    1. Class A, 1/8 inch for smooth-formed finished surfaces, including Finished Appearance Concrete.
    2. Class B, 1/4 inch for rough-formed finished surfaces and concrete NOT exposed to view in the final construction.

D. Forms for Finished Appearance Concrete:
    1. Keep number of panel joints to practical minimum. Ensure vertical joints are plumb and horizontal joints are level. Miter inside corners of plywood so no concrete is placed against panel edges.
    2. All joints between form panels shall be caulked or taped to prevent leakage and occurrence of concrete fins. Form joint leakage at these butt locations of boards will not be permitted. All joints, gaps and apertures in forms wherever located shall be taped, plugged or caulked with suitable material so that they will remain watertight.

3. Drill forms from contact face to outside to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes.

4. Arrange form panels and tie locations in a symmetrical pattern, joints and ties aligned horizontally and vertically with ties evenly spaced. Verify arrangement with Architect.

5. All feature strips shall be non-absorptive and have sufficient draft to avoid spalling of concrete upon stripping. Strips shall be set in a caulking bed so as to prohibit the loss of paste or water beneath the strip. Excess caulking material shall be fully removed when the strip is planted and all nail set holes or screw heads shall be caulked smooth. Contractor shall install feature strips to avoid horizontal and vertical cold joints, verify locations with Architect. All exposed corners and edges shall be formed with 3/4-inch chamfer strips unless otherwise detailed.

6. Gasketing material which is to be used to prevent joint leakage shall be closed-cell compressible neoprene of such thickness, 1/4-inch minimum, as is appropriate to assure leakage prevention. One face shall be coated with an adhesive tape to assure proper positioning at the time of form closure. The neoprene shall be sufficiently compressible as to assure virtual “zero” separation of the forms as a result of the use of this product.

E. Construct forms tight enough to prevent loss of concrete mortar.

F. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.

2. Do not use rust-stained steel form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

M. Additional Requirements for Finished Appearance Concrete:

1. Do not locate form ties at formwork joints.

2. Reusable portions of form ties to be maintained free of rust and damage.

3. Provide sealant at all form tie holes after formwork has been removed; refer to Section 07 92 00 “Joint Sealants” for exterior sealant type and requirements; sealant color shall match concrete color.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for Finished Appearance Concrete. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for Finished Appearance Concrete unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318, and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan a sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR BARRIER INSTALLATION

A. Sheet Vapor Barriers: Place, protect, and repair sheet vapor barrier according to ASTM E1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape and mastic.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces of Finished Appearance Concrete.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

6. Use a bonding agent or roughen interface to 1/4 inch amplitude at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated (and coordinated with the contractor), or if not indicated, then following column center lines.

1. Sawed Joints: Cut contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete to a depth of 1 inch. Perform when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks, but no more than 12 hours after the slab has been placed.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 STRUCTURAL FOAM FILL INSTALLATION

A. Install foam in layers with abutting edges and ends and with the long dimension of each block at right angles to blocks in each subsequent layer.

1. Offset joints of blocks in successive layers.

2. Trim to elevations required.

B. Install foam connectors at each layer of foam to resist horizontal displacement according to foam manufacturer's written instructions.

C. Installation Tolerances: Install to match slope or level and plumb of concrete encapsulating foam. Install foam to the same tolerances as concrete being placed, but not minimizing required concrete thicknesses after finishing.

3.9 WATERSTOP INSTALLATION

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

B. Refer to Section 07 17 00 “Bentonite Waterproofing” for coordination of bentonite system waterstops.

3.10 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Provided dedicated concrete clean-out pit prior to start of concrete placement.

1. Contractor Option: Provide pre-fabricated clean-out pit.

a. Basis-of-Design Product: Large Pan by Eco-Pan; www.eco-plan.com.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mixture designs.

H. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.11 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces to be covered with a coating or covering materials applied directly to concrete.
2. Finished Appearance Concrete: Smooth-formed finish concrete as indicated above, except as indicated elsewhere in this Section to obtain finished appearance.

B. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces NOT exposed to view in the final construction.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.12 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:

a. At Slabs-on-Grade: Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17.

3. The concrete thicknesses indicated are minimums; Contractor shall anticipate additional concrete at center of structural bays where framing will deflect with placement.

4. Concrete floor placement and sequencing shall consider cambers and deflections of steel floor framing; deflections are indicated in General Structural Notes in order to facilitate level placement.

5. For Locations Indicating: Smooth-finished concrete floor slabs to receive horizontal concrete surface sealer; coordinate with Section 07 19 00 “Water Repllents”.

E. Lightly Ground and Sealed Finish: After applying trowel finish, lightly grind concrete slabs in one or two passes to achieve satin finish as approved by Architect.

1. For Locations Indicating: Smooth-finished concrete floor slabs, lightly ground and to receive horizontal concrete surface sealer; coordinate with Section 09 96 00 “High-Performance Coatings”.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

2. Coordinate and confirm approval of required final finish with Architect prior to application.

3.13 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place

construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.14 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.

    b. Continuous water-fog spray.

    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.15 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

A. General: Only repair and patch defective areas where reviewed and approved by Architect.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements. Surface defects that include honeycomb, rock pockets, indentations greater than 3/16 inch, cracks 0.010 inch wide and larger, spalls, chips, air bubbles greater than 3/4 inch diameter, pinholes, bug holes, embedded debris, lift lines, sand lines, bleed lines, leakage from form joints, fins and other projections, form popouts, texture irregularities, and stains and other color variations that cannot be removed by cleaning. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

C. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces of Finished Appearance Concrete by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

E. Repairing Unformed Surfaces and Existing Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

G. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 WATER REPELLENT APPLICATION

A. Coordinate with requirements of Section 07 19 00 “Water Repellents”.

3.18 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Reference requirements of Structural Drawings and Statement of Special Inspections within the structural drawings for all required inspections and testing in addition to this specification.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections: As indicated in the Structural Drawings and Statement of Special Inspections.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture.

2. Testing Frequency: Obtain at least one composite sample for each 150 cu. yd. or fraction thereof of each concrete mixture placed each day and at least one composite sample for each 5000 square feet of surface area of slabs or walls

    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C231, pressure method, for normal-weight concrete; ASTM C173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

6. Unit Weight: ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

7. Compression Test Specimens: ASTM C31.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C39; test one set of two laboratory-cured specimens at 7 days, one set of two specimens at 28 days, and one set of two specimens at 90 days when indicated in the general structural notes.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.

    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days and 90 days if applicable, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7-, 28-, and 90-day tests where required in the general structural notes.

12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42or by other methods as directed by Architect.

14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E1155 within 48 hours of finishing.

END OF SECTION

SECTION 03 37 13 – SHOTCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Shotcrete applied by wet-mix process.

B. Related Requirements:

1. Section 09 24 23 “Cement Stucco Plastering” for coordination of stucco wall finish installation.

1.3 DEFINITIONS

A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.

B. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conferences at Project site.

1. Require representatives of each entity directly concerned with shotcrete to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for shotcrete design mixtures.

c. Ready-mix concrete manufacturer.

d. Shotcrete Installer.

2. Review methods and procedures related to shotcrete, but not limited to, the following:

a. Qualification data, equipment, and facilities needed to make progress and avoid delays.

b. Shotcrete finishes and finishing.

c. Cold- and hot-weather shotcreting procedures.

d. Curing procedures

e. Construction joints.

f. Forms and form-removal limitations.

g. Reinforcement accessory installation.

h. Shotcrete repair procedures.

i. Protection of shotcrete.

1.5 SUBMITTALS

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

B. reinforcement and forming accessories, shotcrete materials, admixtures, and curing compounds.

C. Design Mixes: For each shotcrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

D. Shop Drawings: For shotcrete installation.

1. Include support and anchor details.

2. Detail fabrication, bending, and placing of reinforcement; number and location of splices, and special reinforcement required for openings through shotcrete structures.

3. Locations of proposed construction joints.

E. Qualification Data: For Installer.

F. Material Certificates: For each of the following:

1. Cementitious materials.

2. Admixtures.

3. Form materials.

4. Steel reinforcement and accessories.

5. Curing compounds.

G. Preconstruction Test Reports: For shotcrete.

H. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer employing nozzle operators for the Project, each of whom attains mean core grades not exceeding 2.5, according to ACI 506.2, on preconstruction tests as appropriate to the required shotcrete work.

B. ACI Publications: Comply with ACI 506.2, "Specification for Shotcrete," unless modified requirements in the Contract Documents.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing and inspections indicated below:

1. Produce shotcrete test panels before shotcrete placement according to requirements in ACI 506.2 and ASTM C1140 for each design mixture, shooting orientation, and nozzle operator. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of average thickness of shotcrete, but not less than 3-1/2 inches (90 mm).

2. From each test panel, testing agency will obtain six test specimens: one set of three specimens unreinforced and one set of three specimens reinforced. Reinforcing size and spacing must be representative of typical project reinforcing. Agency will perform the following:

a. Strength Testing: Test each set of unreinforced specimens for compressive strength according to ASTM C42.

b. Core Grading: Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms: Form-facing panels that will provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practicable sizes to minimize number of joints.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: Refer to General Structural Notes on Structural Drawings.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A706, deformed.

C. Plain-Steel Wire: ASTM A82, as drawn.

D. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place manufactured according to CRSI's "Manual of Standard Practice" and as follows:

1. For uncoated reinforcement, use all-plastic or CRSI Class 1, plastic-protected bar supports.

2.3 SHOTCRETE MATERIALS

A. Portland Cement: ASTM C150, Type I or Type III. Use only one brand and type of cement for Project.

1. Fly Ash: ASTM C618, Class C or Class F.

2. Slag Cement: ASTM C989, Grade 100 or Grade 120.

3. Silica Fume: ASTM C1240, amorphous silica.

B. Normal-Weight Aggregates: ASTM C33, from a single source, and as follows:

1. Combined Aggregate Size; ACI 506R or ASTM C1436, Grading No. 1 sieve analysis.

C. Water: Potable, complying with ASTM C94, and free from deleterious materials that may affect color stability, setting, or strength of shotcrete.

D. Ground Wire: High-strength steel wire, 0.8 to 1.0 mm in diameter.

E. Joint Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

2.4 ADMIXTURES

A. General: ASTM C1141, Class A (liquid) or Class B (non-liquid), but limited to the following admixture materials. Provide admixtures for shotcrete that contain not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.

1. Accelerating Admixture, Conventional: ASTM C494, Type C or Type E.

2. Pozzolanic Admixture: Fly ash, ground granulated blast-furnace slag, and silica fume as limited in "Shotcrete Materials" Article.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry, or cotton mats.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.

2.6 SHOTCRETE MIXTURES

A. Source Limitations for Shotcrete: Obtain each color, size, type, and variety of shotcrete material and shotcrete mixture from single manufacturer with resources to provide shotcrete of consistent quality in appearance and physical properties.

B. Design Mixtures: Prepare for each type and strength of shotcrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 506.2.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixture or field test data, or both.

C. Cementitious Materials, Maximum Content: Limit use of fly ash, slag cement and silica fume to not exceed, in combination, 25 percent of Portland cement by weight.

D. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

E. Admixtures: When included in shotcrete design mixtures, use admixtures and retarding admixtures according to manufacturer's written instructions.

F. Design-Mixture Adjustments: Subject to compliance with requirements, shotcrete design-mixture adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

G. Shotcrete Mixture: Proportion mixture to provide shotcrete with the following properties:

1. Compressive Strength (28 Days): Refer to General Structural Notes on Structural Drawings.

2.7 SHOTCRETE EQUIPMENT

A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.

B. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.8 BATCHING AND MIXING

A. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C94/C94M and ASTM C1116/C116/M and furnish batch ticket information.

1. Comply with ASTM C685/C685M when shotcrete ingredients are delivered dry and proportioned and mixed on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Concrete or Masonry: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent

necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces to saturated, surface-dry condition before shotcreting.

1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.

B. Steel Substrates: Clean steel surfaces by abrasive blasting according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3.2 FORMS

A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.

1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.

2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.

C. Securely embed reinforcing anchors into existing substrates, located as required.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports, bolsters, chairs, spacers, and other device, as required to maintain minimum concrete cover.

E. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.

F. Install welded wire reinforcement in longest practical lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.4 JOINTS

A. General: Construct joints at locations indicated or as approved by Architect.

B. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints, unless otherwise indicated.

3.5 ALIGNMENT CONTROL

A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.6 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.7 APPLICATION

A. Apply Shotcrete applied by wet-mix process and according to ACI 506.2.

B. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.

C. Moisten wood forms immediately before placing shotcrete where form coatings are not used.

D. Apply wet-mix shotcrete materials within 90 minutes after batching.

E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.

1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray, and prevent buildup against front face during shotcreting.

G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

H. Do not permit shotcrete to sag, slough, or dislodge.

I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

J. Do not disturb shotcrete surfaces before beginning finishing operations.

K. Remove ground wires or other alignment control devices after shotcrete placement.

L. Shotcrete Core Grade: Apply shotcrete to achieve mean core grades not exceeding 2.5 according to ACI 506.2, with no single core grade exceeding 3.0.

M. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117, increased by a factor of two.

N. Cold-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 306.1 and as follows. Protect shotcrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. Discontinue shotcreting when ambient temperature is 40 deg F and failing.

2. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F and not more than 90 deg F.

3. Do not use frozen materials or materials containing ice or snow.

4. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.

5. Do not use calcium chloride, salt, or other materials containing antifreeze agents.

O. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to recommendations of ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:

1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg F for dry mix or 90 deg F for wet mix.

2. Reduce temperature of reinforcing steel and receiving surfaces below 100 deg F before shotcreting.

3.8 SURFACE FINISHES

A. General: Finish shotcrete according to descriptions in ACI 506R.

B. Natural Finish:

1. Broom Finish: Rough-textured finish obtained by screeding or cutting exposed face of shotcrete to plane with cutting rod, edge of trowel, or straightedge after initial set; followed by uniform brooming.

3.9 CURING

A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.

B. Begin curing immediately after placing and finishing but not before free water, if any, has disappeared from shotcrete surface.

C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.

b. Continuous water-fog spray.

c. Water-saturated absorptive covers, or moisture-retaining covers. Lap and seal sides and ends of covers with 12-inch (300-mm) lap over adjacent covers.

2. Curing Compound: Apply uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Apply curing compound to natural gun-finish or flash-coat shotcrete at rate of 1 gal./100 sq. ft.

D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.10 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing for 24 consecutive hours at not less than 50 deg F (10 deg C) provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.

B. Air Content: ASTM C173, volumetric method or ASTM C231, pressure method; one test for each compressive-strength test for each mixture of air-entrained, wet-mix shotcrete measured before pumping.

C. Shotcrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.

D. Test Panels: Make a test panel, reinforced as in structure, for each shotcrete mixture and for each workday or for every 50 cu. yd. of shotcrete placed, whichever is less. Produce test panels with dimensions of 24 by 24 inches minimum and of average thickness of shotcrete, but not less than 4-1/2 inches. Testing agency will obtain sets of test specimen from each test panel.

1. Compressive Strength Testing: One set of three unreinforced specimens. Test each set of unreinforced specimens for compressive strength according to construction testing requirements in ACI 506.2.

2. Visual Core Grading: One set of three reinforced specimens. Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

E. Strength of shotcrete will be considered satisfactory according to the following:

1. Specimen Cores: Mean compressive strength of each set of three unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength.

2. Mean compressive strength of each set of three unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

F. Shotcrete will be considered defective if it does not pass tests and inspections.

3.12 REPAIRS

A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.

1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs.

2. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders.

3. Dampen surfaces and apply new shotcrete. Match adjacent color and finish.

B. Repair core holes from in-place testing according to repair provisions in ACI 301, except do not use shotcrete. Match adjacent color and finish.

3.13 CLEANING

A. Immediately remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION

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SECTION 03 53 00 - CONCRETE TOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete floor topping (PCT) for standard applications.

B. Related Requirements:

1. Section 01 60 00 "Product Requirements" for Buy American and Bonneville purchasing requirements.
2. Division 32 “Exterior Improvements” Sections for concrete pavement and walks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Test Reports: For each concrete floor topping, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Field quality-control reports by Owner.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Integrated (In-Place) Mockup: Install mockup of concrete topping to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup using typical components, attachments to building structure, and methods of installation.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Contracting Officer in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
4. Location: Provide mockup of concrete topping at approved back-of-house location.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance.

1. Place concrete floor topping only when ambient temperature and temperature of base slabs are between 50 and 86 deg F (10 and 30 deg C).

B. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Ardex Americas; www.ardexamericas.com.

2.2 CONCRETE FLOOR TOPPINGS, PCT

A. Concrete Floor Topping for Standard Applications: Non-industrial, cement-based self-leveling interior concrete topping or resurfacing.

1. Primer: Product recommended by lightweight fill and topping manufacturer for substrate, conditions, and application.

a. Basis-of-Design Product: Ardex P 51 Primer by Ardex Americas.

2. Self-Leveling Topping Layer:

a. Basis-of-Design Product: Ardex PC-T Polished Concrete Topping by Ardex Americas.

3. Compressive Strength (28 Days): Minimum 4,500 psi; ASTM C109/C109M.

2.3 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, 25 percent solids content, minimum.

2.4 RELATED MATERIALS

A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids epoxy resin with a Type A Shore durometer hardness of 80 in accordance with ASTM D2240.

B. Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

C. Portland Cement: ASTM C150/C150M, Type I or II.

D. Sand: ASTM C404, fine aggregate passing No. 16 sieve.

E. Water: Potable.

F. Acrylic-Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

G. Cement Binder: ASTM C150/C150M, portland cement or hydraulic or blended hydraulic cement as defined by ASTM C219.

H. Bond-Breaker Membrane: ASTM D2178/D2178M, asphalt glass felt, Type III, standard ply sheet.

I. Crack and Joint Repair:

1. Crack repair materials as recommended in writing by concrete topping manufacturer.

2. Joint sealant materials as recommended in writing by concrete topping manufacturer.

J. Epoxy Adhesive: ASTM C881/C881M, Type V, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

K. Power-Actuated Fasteners: Fastener systems with an evaluation report based on ICC-ES AC70.

L. Nonslip Aggregate Materials: As recommended in writing by concrete topping manufacturer.

M. Concrete Hardener and Dustproofer: Chemical clear liquid hardener which produces a dense, hard and dustproof concrete surface.

N. Moisture Control System: As required for Project, and as recommended by manufacturer.

O. Low Viscosity Rigid Polyurethane Crack and Joint Repair: As recommended in writing by manufacturer.

P. Semi-Rigid Joint Sealant: As recommended in writing by manufacturer.

Q. Topical Color: As selected by Architect.

R. Resilient Emulsion: As recommended in writing by manufacturer.

S. Integral Color: As selected by Architect. Pigment type as recommended in writing by manufacturer.

2.5 MIXING

A. Floor Topping: Mix concrete floor topping materials and water in appropriate drum-type batch machine mixer or truck mixer in accordance with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

3.2 PREPARATION

A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch.

1. Prepare and clean existing base slabs in accordance with concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.

2. Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch and fill with semirigid joint filler.

B. Install joint-filler strips where topping abuts vertical surfaces.

C. Primers: Provide priming as recommended in writing by manufacturer.

3.3 APPLICATION OF FLOOR TOPPING

A. Begin floor topping application in presence of manufacturer's technical representative.

B. Monolithic Floor Topping: After textured-float finish is applied to fresh concrete of base slabs installed in accordance with Section 033000 "Cast-in-Place Concrete," place concrete floor topping while concrete is still plastic.

C. Deferred Floor Topping: Within 72 hours of placing base slabs, mix and scrub bonding slurry into dampened concrete to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while slurry is still tacky.

D. Existing Concrete: Apply epoxy-bonding adhesive, mixed in accordance with manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while adhesive is still tacky.

E. Aggregate Concrete Topping: Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.

1. Screed surface with a straightedge and strike off to correct elevations.

2. Slope surfaces uniformly where indicated.

3. Begin initial floating, using bull floats to form a uniform and open-textured surface plane free of humps or hollows.

F. Overlay or Micro-Topping: Apply in strict compliance with manufacturer's written installation instructions. Mix and spread material on to the surface with recommended squeegees and trowels.

G. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.

1. Hard Trowel Finish: After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel without allowing blisters to develop. Continue troweling passes and restraighten until surface is smooth and uniform in texture.

H. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Architect.

1. Coat face of construction joint with epoxy adhesive at locations where concrete floor topping is placed against hardened or partially hardened concrete floor topping.

I. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.

1. Form joints in concrete floor topping over contraction joints in base slabs unless otherwise indicated.

2. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.

3. Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch deep.

3.4 PROTECTING AND CURING

A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.

B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply in accordance with

manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.

C. Begin curing immediately after finishing concrete floor topping. Cure by one or a combination of the following methods, in accordance with concrete floor topping manufacturer's written instructions:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for not less than seven days.

3. Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller in accordance with manufacturer's written instructions.

3.5 JOINT FILLING

A. Prepare and clean contraction joints and install semirigid joint filler, in accordance with manufacturer's written instructions, once topping has fully cured.

B. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.

3.6 REPAIR

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION

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SECTION 04 01 20 - BRICK MASONRY REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Repairing brick masonry, including replacing and re-anchoring units.
2. Removing abandoned anchors.
3. Preparing and painting steel uncovered during the work.
4. Salvaging existing brick for reuse.

B. Related Requirements:

1. Section 01 74 19 “Construction and Demolition Waste Management and Disposal”.
2. Section 02 41 19 “Selective Demolition”.
3. Section 04 21 13 “Brick Veneer Masonry”.
4. Section 09 91 00 "Painting".

1.3 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

C. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to brick masonry repair including, but not limited to, the following:
    a. Verify brick masonry repair specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Materials, material application, sequencing, tolerances, and required clearances.
    c. Quality-control program.
    d. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

A. Order sand and gray portland cement for colored mortar immediately after approval of mockups. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform brick masonry repair work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Clean masonry.
4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
5. Repair masonry, including replacing existing masonry with new masonry materials.
6. Rake out mortar from joints to be repointed.
7. Point mortar and sealant joints.
8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
9. Where water repellents are to be used on or near masonry work, delay application of these chemicals until after pointing and cleaning.

C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units according to Masonry Unit Patching article.

1.6 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of replacement masonry units on the structure, showing relation of existing and new or relocated units.
2. Show provisions for expansion joints or other sealant joints.
3. Show provisions for flashing, lighting fixtures, conduits, and weep holes as required.
4. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

C. Samples for Initial Selection: For the following:

1. Colored Mortar: Submit sets of mortar that will be left exposed in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.
    a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching existing, cleaned mortar when cured and dry.
    b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.
2. Sand Types Used for Mortar: Minimum 8 oz. of each in plastic screw-top jars.

3. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.

    a. Have each set contain a close color range of at least three Samples of different mixes of patching compound that matches the variations in existing masonry when cured and dry.

4. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type of brick unit to be used for replacing existing units. Include sets of Samples to show the full range of shape, color, and texture to be expected. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.

2. Each type of patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.

3. Accessories: Each type of accessory and miscellaneous support.

E. Qualification Data: For brick masonry repair specialist, including field supervisors and workers and testing service.

F. Preconstruction Test Reports: For replacement masonry units.

G. Quality-control program.

1.7 QUALITY ASSURANCE

A. Brick Masonry Repair Specialist Qualifications: Engage an experienced brick masonry repair firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing masonry is insufficient experience for masonry repair work.

1. Field Supervision: Brick masonry repair specialist firm shall maintain experienced full-time supervisors on Project site during times that brick masonry repair work is in progress.

2. Brick Masonry Repair Worker Qualifications: When masonry units are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on masonry units as follows:

1. Provide test specimens as indicated and representative of proposed materials and existing construction.

2. Replacement Brick: Test each proposed type of replacement masonry unit according to sampling and testing methods in ASTM C67 for compressive strength, 24-hour cold-water absorption, five-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).

3. Existing Brick: Test each type of existing masonry unit indicated for replacement according to testing methods in ASTM C67 for compressive strength, 24-hour cold-water absorption, five-hour boil absorption, saturation coefficient, and initial rate of absorption (suction). Carefully remove five existing units from locations designated by Architect. Take testing samples from these units.

4. Existing Mortar: Test according to ASTM C295, modified as agreed by testing service and Architect for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength.

5. Temporary Patch: As directed by Architect, provide temporary materials followed by permanent repairs at locations from which existing samples were taken.

B. Refer to Structural Drawings for additional testing requirements, including pull tests for seismic steel anchors at existing masonry walls.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons and protected against impact and chipping.

B. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

F. Handle masonry units to prevent overstressing, chipping, defacement, and other damage.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit brick masonry repair work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repair masonry units only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for masonry repair unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.

2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after repair.

D. Hot-Weather Requirements: Protect masonry repairs when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain each type of material for repairing brick masonry (brick, cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 MASONRY MATERIALS

A. Salvage existing materials for reuse in existing building. Provide new brick masonry units as required, matching size and appearance of existing bricks.

2.3 MORTAR MATERIALS

A. Matching color of existing mortar.

2.4 MANUFACTURED REPAIR MATERIALS

A. Brick Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching brick masonry.

1. Use formulation that is vapor and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than masonry units being repaired, and develops high bond strength to all types of masonry.

2. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.

3. Formulate patching compound in colors and textures to match each masonry unit being patched. Provide sufficient number of colors to enable matching of the color, texture, and variation of each unit.

B. Temporary Shoring: Helical wall tie system for temporary shoring of existing brick veneer masonry during repair procedures.

1. Spira-Lok Stainless Steel Wall Tie System by Blok-Lok, Div. of Hohmann & Barnard Co.; www.blok-lok.com.

2. Refer to Demolition Series Drawings for other requirements.

2.5 ACCESSORY MATERIALS

A. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units, less the required depth of pointing materials unless removed before pointing.

B. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

C. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer according to MPI #23 (surface-tolerant, anticorrosive metal primer) or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

1. Surface Preparation: Use coating requiring no better than SSPC-SP 2, "Hand Tool Cleaning", SSPC-SP 3, "Power Tool Cleaning" or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" surface preparation according to manufacturer's literature or certified statement.

2. VOC Limit: Use coating with a VOC content of 400 g/L or less.

D. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

2.6 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:

1. Rebuilding (Setting) Mortar by Volume: ASTM C270, Proportion Specification, 1 part portland cement, 1 part lime, and 6 parts sand.
2. Rebuilding (Setting) Mortar by Type: ASTM C270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to the following: portland cement and lime, masonry cement, or mortar cement.
3. Rebuilding (Setting) Mortar by Property: ASTM C270, Property Specification, Type N unless otherwise indicated; with cementitious material limited to the following: portland cement and lime, masonry cement, or mortar cement.
4. Pigmented, Colored Mortar: Add mortar pigments to produce exposed, setting (rebuilding) mortar of colors required.

PART 3 - EXECUTION

3.1 SALVAGE

A. Brick Salvage: Salvage existing bricks removed from the building to the greatest extent possible, for reuse as indicated.

3.2 PROTECTION

A. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below rebuilding and repair work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

B. Remove gutters and downspouts and associated hardware adjacent to masonry and store during masonry repair. Reinstall when repairs are complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.3 MASONRY REPAIR, GENERAL

A. Appearance Standard: Repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.4 ABANDONED ANCHOR REMOVAL

A. Remove abandoned anchors, brackets, wood nailers, and other extraneous items no longer in use unless indicated to remain or indicated to be removed.

1. Remove items carefully to avoid spalling or cracking masonry.

2. Notify Architect before proceeding if an item cannot be removed without damaging surrounding masonry. Do the following where directed:

a. Cut or grind off item approximately 3/4 inch beneath surface and core drill a recess of same depth in surrounding masonry as close around item as practical.

b. Immediately paint exposed end of item with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.

3. Patch hole where each item was removed unless directed to remove and replace masonry unit.

3.5 BRICK REMOVAL AND REPLACEMENT

A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area.

C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Coordinate with new flashing, reinforcement, and lintels, which are specified in other Sections.

D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

E. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.

2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.

3. Store brick for reuse. Store off ground, on skids, and protected from weather.

4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.

G. Replace removed damaged brick with other removed brick in good condition, where possible, or with new brick matching existing brick. Do not use broken units unless they can be cut to usable size.

H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.
2. Use setting buttons or shims to set units accurately spaced with uniform joints.

I. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with enough mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. Rake out mortar used for laying brick before mortar sets. Point at same time as repointing of surrounding area.
3. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.

J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.

1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.6 PAINTING STEEL UNCOVERED DURING THE WORK

A. Notify Architect if steel is exposed during masonry removal. Where Architect determines that steel is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:

1. Surface Preparation: Remove paint, rust, and other contaminants according to SSPC-SP 2, "Hand Tool Cleaning" or SSPC-SP 3, "Power Tool Cleaning" as applicable to comply with paint manufacturer's recommended preparation.
2. Antirust Coating: Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and rust removal, the thickness of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

3.7 MASONRY UNIT PATCHING

A. Patch the following masonry units unless another type of repair or replacement is indicated:

1. Units indicated to be patched.
2. Units with holes.
3. Units with chipped edges or corners. Patch chipped edges or corners measuring more than 3/4 inch in least dimension.
4. Units with small areas of deep deterioration. Patch deep deteriorations measuring more than 3/4 inch in least dimension and more than 1/4 inch deep.

B. Remove and replace existing patches where indicated.

C. Patching Bricks:

1. Remove loose material from masonry surface. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch thick, but not less than recommended in writing by patching compound manufacturer.

2. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of masonry unit.
3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
4. Rinse surface to be patched and leave damp, but without standing water.
5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
6. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of masonry unit. Shape and finish surface before or after curing, as determined by testing, to best match existing masonry unit.
8. Keep each layer damp for 72 hours or until patching compound has set.
9. Remove and replace patches with hairline cracks or that show separation from brick at edges, and those that do not match adjoining brick in color or texture.

3.8 MASONRY CLEANING

A. Only wastewater from water-only washing of surfaces that do not contaminate the wash water may be discharged to storm drains.

B. Do not allow wastewater or rinse water to soak into the landscaping unless prior arrangements have been made with grounds maintenance staff. Some landscaped areas are under a strict watering schedule to minimize plant diseases.

C. When using cleaning products or washing contaminated surfaces, waste water must be collected for discharge to sanitary sewer. At the job site, berms must be set up to prevent wash water from reaching storm drains. Sweep the area to minimize the rinsing of dirt and other solids into the storm sewer.

D. Wastewater may have to be collected and treated to meet the pH limit of 5.5-12. Agricultural lime has limited effectiveness as a neutralizer. Test the pH of the waste water after treatment and adjust treatment or disposal methods accordingly.

E. Lead, asbestos and other hazardous materials cause the wash water to violate sewer discharge limits. If hazardous materials could be in the wash water, samples must be collected and analyzed for the concentrations of those materials. If the water violates local sewer discharge limits, it must be disposed of as hazardous waste.

F. Avoid the use of strong cleaners and solvents, which can cause the waste water to be hazardous waste even after use and dilution with rinse water.

3.9 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonmasonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

C. Notify inspectors and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors and Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

3.11 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Salvage to the greatest extent possible the existing bricks removed from the building, for reuse as indicated.

B. Masonry Waste: Remove masonry waste and legally dispose of off Owner's property.

END OF SECTION

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Please note that the General Structural Notes shall be used in conjunction with these specifications. The General Structural Notes shall supersede items in this specification when discrepancies exist.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Requirements:

1. Section 01 40 00 "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Section 05 31 00 “Steel Decking”.
3. Section 05 50 00 "Metal Fabrications" for other steel items not defined as structural steel.
4. Section 07 81 00 “Applied Fireproofing”.
5. Section 09 96 00 "High-Performance Coatings" for painting requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 SUBMITTALS

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

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Source quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/ D1.1M, "Structural Welding Code – Steel" and WABO (or approved equal) requirements.

B. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.

2. Clean and relubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.8 REDESIGN

A. Redesign or Departures from Requirements of the Contract Documents Initiated by Contractor:

1. Obtain written acceptance from the Architect and Architect’s consultants.

2. Bear costs for Contractor-initiated or construction error-caused changes to type, form, system, or details of construction from those indicated by the contract documents.

3. Pay fees required by Architect and Architect’s consultants for review of such changes.

1.9 EXCEPTIONS TO AISC CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES

A. Revise Section 7.14, Correction of Errors, as follows:

1. “The correction of minor misfits by moderate amounts of reaming or grinding, and the drawing of elements into line with drift pins, shall be considered to be normal erection operations. Errors that cannot be corrected using the foregoing means, or that require welding, cutting or changes in member or Connection configuration, shall be promptly reported to the Owner’s Designated Representatives for Design and Construction and the Fabricator by the Erector, to enable the responsible entity to either correct the error or approve the method of correction to be used by others.”

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Refer to Structural Drawings for requirements.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992 or ASTM A572, Grade 50 (345).

B. Channels, Angles, M-Shapes and S-Shapes: ASTM A36 or ASTM A572, Grade 36 (250).

C. Plate and Bar: ASTM A36 or ASTM A572 , Grade 50 (345).

D. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A588, Grade 50 (345).

E. Cold-Formed Hollow Structural Sections: ASTM A500/ A500M, Grade B, structural tubing.

F. Steel Pipe: ASTM A53, Type E or Type S, Grade B.

1. Weight Class: As indicated.

2. Finish: Black except where indicated to be galvanized.

G. Steel Castings: ASTM A216, Grade WCB with supplementary requirement S11.

H. Steel Forgings: ASTM A668.

I. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959, Type 325, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip or mechanically deposited zinc coating.

2. Direct-Tension Indicators: ASTM F959, Type 325, compressible-washer type with mechanically deposited zinc coating, baked epoxy-coated finish.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Mechanically deposited zinc coating.

D. Shear Connectors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Headed Anchor Rods: ASTM F1554, Grade as indicated on Structural Drawings.

1. Nuts: ASTM A563 heavy-hex carbon steel.

2. Plate Washers: ASTM A36 carbon steel.

3. Washers: ASTM F436, Type 1, hardened carbon steel.

4. Finish: Hot-dip zinc coating, ASTM A153, Class C or Mechanically deposited zinc coating, ASTM B695, Class 50.

F. Threaded Rods: ASTM A36.

1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Washers: ASTM A36 carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A153, Class C or Mechanically deposited zinc coating, ASTM B695, Class 50.

G. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A108, Grade 1035.

H. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1030.

I. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A108, Grade 1018.

2.4 PRIMER

A. Primer: Comply with Section 09 91 00 "Painting," and Section 09 96 00 "High-Performance Coatings."

B. Primer at Locations Exterior of the Building Envelope: SSPC-Paint 25, Type II zinc oxide, alkyd, linseed oil primer.

C. Primer at Locations Within or Interior of the Building Envelope: SSPC-Paint 23, latex primer.

D. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time with minimum 6000 psi compressive strength.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

F. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

G. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.

H. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, Pretensioned or Slip critical, as indicated in The Structural Drawings.

B. Weld Connections: Comply with AWS D1.1/ D1.1M and AWS D1.8/ D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar including tops of beams with metal deck or metal deck with concrete topping. Extend priming of partially embedded members to a depth of 2 inches.

2. Surfaces to be field welded.

3. Surfaces of high-strength bolted, slip-critical connections.

4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).

5. Galvanized surfaces.

6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. At non-exposed structural steel locations, provide SSPC-SP 3, "Power Tool Cleaning."

2. At exposed structural steel locations, provide SSPC-SP 10/ NACE No. 2, "Near-White Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2. All structural steel exposed to weather or placed beyond the exterior weather resistance barrier shall be hot-dip galvanized.

3. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections as required. Reference requirements of structural drawings and Statement of Special Inspections within the structural drawings for all required inspections and testing in addition to this specification.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/ D1.1M and the following inspection procedures where required, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E165.

2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

3. Ultrasonic Inspection: ASTM E164.

4. Radiographic Inspection: ASTM E94.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Light drifting will be permitted to draw the parts together, but drifting to match unfair holes will not be permitted. Any enlargement of holes necessary to make connections in the field shall be done by reaming with twist drills, care being taken not to weaken the adjoining metal. If, in the opinion of the Architect, the extent of the reaming is such that holes cannot be properly filled or accurately adjusted after reaming, the faulty member shall be discarded and replaced with a new one, and all costs and expenses resulting shall be paid by the Contactor.

H. No cutting of sections, either flanges, webs, stems or angles, shall be done by the Contractor without the consent of the Architect, unless this cutting is particularly specified or shown on the drawings.

I. Corrective Measures

1. Any errors in locations or inaccuracies in the setting of anchor bolts, base plates, bearing plates, or other items of attachment or support for steel work shall be reported to the Architect, and shall be corrected in a manner subject to the approval of the Architect.

2. Any misfits due to errors in fabrication shall be reported immediately to the Architect, along with proposed method of correction of same and Architect approval obtained before proceeding with corrective measures.

3. No members shall be cut or burned without specific approval in writing.

4. Bolted or welded connections, joints, or fastenings, which are classified as defective in the opinion of the Architect, shall be corrected by the Contractor in a manner subject to the Architect's approval.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and all other required steel special inspections as required per the Statement of Special Inspections within the Structural Drawings.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.5 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780.

B. Touchup Painting: Cleaning and touchup painting are specified in Section 09 91 00 "Painting" and Section 09 96 00 "High-Performance Coatings".

END OF SECTION

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The General Structural Notes shall be used in conjunction with these specifications. The General Structural Notes shall supersede items in this specification when discrepancies exist.

1.2 SUMMARY

A. Section Includes:

1. Composite floor deck.
2. Roof deck.
3. Supplementary framing for openings up to and including 18 inches.
4. Bearing plates and angles.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 05 12 00 “Structural Steel Framing”: Support framing for openings larger than 18 inches and shear stud connectors and placement of embedded steel anchors for bearing plates in cast-in-place concrete.
3. Section 05 50 00 “Metal Fabrications”: Steel angle concrete stops at deck edges.

1.3 SUBMITTALS

A. Refer to Section 01 33 00 “Submittals”.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.

D. Certificates: Certify that products furnished meet or exceed specified requirements.

E. Manufacturer's installation instructions.

F. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1 and dated no more than 12 months before start of scheduled welding work.

G. Designer's Qualification Statement.

H. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.4 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Washington.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1 and AWS D1.3 and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

D. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. ASC Steel Deck; www.ascsd.com.
2. Canam Steel Corporation; www.canam-steeljoists.ws.
3. Cordeck, Inc; www.cordeck.com.
4. Verco Decking, Inc.; www.vercodeck.com.

B. Substitutions: Refer to Section 01 60 00 “Product Requirements”.

2.2 STEEL DECK

A. All Deck Types: Select and design metal deck in accordance with Structural Drawings, General Structural Notes and SDI Design Manual.

1. Calculate to structural working stress design and structural properties specified.
2. Maximum Vertical Deflection of Roof Deck: 1/240 of span.
3. Maximum Lateral Deflection of Diaphragms: 1/500 of the height of the wall.

B. Galvanized Composite Steel Deck:

1. Material: Composite floor deck shall be galvanized steel conforming to ASTM A653 Grade 33 Fy (min) = 33,000 psi with a G60 coating of zinc prior to being formed. Furnish decking of depth and profile as indicated on the drawings.
2. Gage of deck and minimum connections shall be determined by the Contractor based on the span conditions, unshored condition, and the superimposed loads shown on the drawings, load diagrams, and notes. Minimum gauge is 20. The capacities of the deck shall be based on current ICC-ES (or IAPMO-ES equivalent) Reports.
3. For floor deck indicated as part of a fire rated system, furnish decking listed in the UL "Fire Resistance Directory" and bearing the UL label for the system detailed.
4. Fabricate composite deck units with integral embossing or raised patterns to provide mechanical bond with concrete slabs.
5. Furnish deck panels of lengths required to span continuously over four or more supports (three spans) unless framing does not allow for such layout.

6. Furnish deck panels with butted end conditions and interlocking side laps, unless otherwise noted.

7. Furnish deck panels with provisions for venting through the deck ("vent deck") for slabs that are to receive impervious coatings such as roofing materials or waterproof

8. membranes.

C. Roof Deck: Non-composite type, fluted steel sheet:

1. Galvanized Steel Sheet: ASTM A653, Structural Steel (SS) Grade 33/230, with G90 galvanized coating.

2. Primer: Shop-coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.

2.3 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36 steel, galvanized per ASTM A123.

B. Fasteners: Galvanized hardened steel, self-tapping.

C. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.

1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.

2. Material: Steel; ASTM A510.

a. Hardness: Rockwell C 54.5, minimum.

b. Tensile Strength: 285 kips per square inch, minimum.

c. Shear Strength: 175 kips per square inch, minimum.

3. Approved Products:

a. Hilti, Inc.; www.us.hilti.com.

b. Simpson Strong-Tie; www.strongtie.com.

D. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.

1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.

2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.

3. Fasteners for Exposed Steel Roof Deck Application: Manufacturer's standard stainless steel with bonded neoprene washer.

4. Approved Products:

a. ITW Commercial Construction North America; ITW CCNA-Buildex Teks Select Series; www.ITWBuildex.com.

5. Substitutions: Refer to Section 01 60 00 “Product Requirements”.

E. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

H. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.4 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gauge, 0.0299 inch thick sheet steel; of profile and size as indicated; finished same as deck.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On steel supports provide minimum 1-1/2 inch bearing.

C. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.

1. Welding: Use fusion welds through weld washers.

2. Place and secure special deep fluted sections for integral concrete bridging.

D. Clinch lock seam side laps.

E. At mechanically fastened male/ female side laps fasten at 24 inches on center maximum.

F. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

G. At welded male/female side laps weld at 18 inches on center maximum.

H. Weld deck in accordance with AWS D1.3.

I. At deck openings from 6 inches to 18 inches in size, refer to Structural Plans in Drawings.

J. At deck openings greater than 18 inches in size, refer to Structural Plans in Drawings.

K. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates of same thickness as deck. Fusion weld 12 inches on center maximum.

L. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

M. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

N. Place metal cant strips in position and fusion weld.

O. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

P. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. The General Structural Notes in Structural Contract Documents for structural design criteria shall be used in conjunction with this specification. The General Structural Notes shall supersede items in this specification when discrepancies exist.

1.2 SUMMARY

A. Section Includes provision and installation of the following:

1. Steel framing and supports for operable partitions, overhead doors and grilles, and countertops.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Steel tube reinforcement for low partitions.
5. Elevator machine beams, hoist beams, and divider beams.
6. Steel shapes for supporting elevator door sills.
7. Elevator pit sump covers.
8. Slotted channel framing.
9. Shelf angles.
10. Metal ladders, crossovers and alternating tread devices.
11. Metal floor plate and supports.
12. Miscellaneous steel trim including steel angle corner guards steel edgings and loading-dock edge angles.
13. Abrasive metal nosings, treads and thresholds.
14. Loose bearing and leveling plates for applications where they are not specified in other Sections.
15. Delegated design for steel framing and supports for operable partitions, overhead doors and grilles, and mechanical and electrical equipment.
16. Delegated design for ladders.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 01 61 16 “Delegated Design Requirements” for ladders.
2. Section 01 81 13 “Sustainability Requirements”.
3. Section 04 22 00 “Concrete Unit Masonry” for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1. Wherever dissimilar metals may come in contact with each other in exterior conditions they must be separated with an approved layer of bituminous coating or other anti-galvanic coating products. In areas exposed to exterior conditions, galvanized metal or zinc plated fasteners shall not be used to anchor aluminum or copper; use stainless steel, aluminum or copper fasteners.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
    a. Wherever dissimilar metals may come in contact with each other in exterior conditions, they must be separated with an approved layer of bituminous coating or other anti-galvanic coating products. In areas exposed to exterior conditions, galvanized metal or zinc plated fasteners shall not be used to anchor aluminum or copper; use stainless steel, aluminum or copper fasteners.
2. Shop primers.
3. Shrinkage-resisting grout.
4. Slotted channel framing.
5. Metal ladders.
6. Abrasive metal nosings, treads and thresholds.

B. Sustainable Design Submittals: Refer to Section 01 81 13 “Sustainability Requirements”.

1. MR Credit 3 - BPDO, Sourcing of Raw Materials:
    a. Recycled Content: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost-value.
        1) Regionally Sourced Recycled Material: Documentation indicating locations of recovery, manufacture, and purchase of recycled raw materials.

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel tube reinforcement for low partitions.
2. Elevator machine beams, hoist beams and divider beams.
3. Steel shapes for supporting elevator door sills.

4. Elevator pit sump covers.
5. Shelf angles.
6. Metal floor plate and supports.
7. Miscellaneous steel trim including steel angle corner guards, steel edgings and loading-dock edge angles.
8. Loose steel lintels.

D. Shop Drawings for Delegated Design Components: Submit shop drawings and calculations for all attachments to the structure for all elements requiring delegated design, including structural bracing for equipment, conveyances, and architectural components; seismic restraints and vibration isolation systems; details of lateral bracing; and attachment systems designed to accommodate differential movement between building levels.

1. Steel framing and supports for operable partitions, overhead doors and grilles, and countertops.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Metal ladders.
5. For all attachments to the structure, shop drawings and calculations shall be sealed by the structural engineer responsible for their design.

E. Samples for Verification: For each type and finish of extruded nosing and tread.

F. Delegated-Design Submittal: For items indicated for delegated design, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

G. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

H. Mill Certificates: Where Type 316L stainless steel is provided submit mill certificate signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

I. Welding certificates.

J. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

K. Research Reports: For post-installed anchors.

1.5 QUALITY ASSURANCE

A. Engineer Qualifications: Qualified professional engineer responsible for delegated design.

B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1, "Structural Welding Code - Steel."
2. AWS D1.2, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design metal ladders.

B. Structural Performance of Ladders: Such assemblies, including landings and railings where applicable, shall withstand the effects of the following loads and stresses within limits and under conditions specified in ANSI A14.3:

1. Uniform Load: 100 lbf/sq. ft.

2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.

3. Uniform and concentrated loads need not be assumed to act concurrently.

4. Alternating Tread Device Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.

C. Recycled Content:

1. Steel: Provide steel with at least 25 percent post-consumer recycled content.

D. Regional Materials: If available, provide materials and products manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Regional Materials: If available, provide materials and products manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.

C. Interior Wet-Applied Coatings: Comply with low-emitting requirements in Section 01 81 13 “Sustainability Requirements”.

D. Steel Plates, Shapes, and Bars: ASTM A36.

E. Stainless Steel Sheet, Strip, and Plate: ASTM A240 or ASTM A666, Type 304.

1. Exception: For corrosive environments provide Type 316L.

F. Stainless Steel Bars and Shapes: ASTM A276, Type 304.

1. Exception: For corrosive environments provide Type 316L.

G. Rolled-Steel Floor Plate: ASTM A786, rolled from plate complying with ASTM A36 or ASTM A283, Grade C or D.

H. Rolled-Stainless Steel Floor Plate: ASTM A793.

I. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.

1. Source Limitations: Obtain floor plate from single source from single manufacturer.

J. Steel Tubing: ASTM A500, cold-formed steel tubing.

K. Steel Pipe: ASTM A53, Standard Weight (Schedule 40) unless otherwise indicated.

L. Zinc-Coated Steel Wire Rope: ASTM A741.

1. Wire Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

M. Stainless Steel Wire Rope: Wire rope manufactured from stainless steel wire complying with ASTM A492, Type 316.

1. Wire Rope Fittings: Stainless steel connectors, Type 316, with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

N. Steel Prestressing Strand: ASTM A416, Grade 270 (Grade 1860), low-relaxation, seven-wire, with 0.9-lb/sq. ft. zinc coating.

1. Steel Prestressing Strand Fittings: Hot-dip galvanized-steel anchors and connectors with capability to sustain, without failure, a load equal to minimum breaking strength of steel prestressing strand with which they are used.

O. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches.

2. Metal thickness: 12 gauge (0.108-inch), 14 gauge (0.079-inch) or 16 gauge (0.064-inch) nominal thickness.

3. Material for Exterior Applications: Galvanized steel, ASTM A653, commercial steel, Type B or structural steel, Grade 33 (Grade 230).

4. Material for Interior Applications: Cold-rolled steel, ASTM A1008, commercial steel, Type B or structural steel, Grade 33 (Grade 230); coated with rust-inhibitive, baked-on, acrylic enamel.

P. Cast Iron: Either gray iron, ASTM A48, or malleable iron, ASTM A47, unless otherwise indicated.

Q. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

R. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

S. Aluminum-Alloy Rolled Tread Plate: ASTM B632, Alloy 6061-T6.

T. Aluminum Castings: ASTM B26, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required. For corrosive environments provide Type 316 stainless steel fasteners.

1. Provide stainless steel fasteners for fastening aluminum and stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1 (A1) for Type 304 stainless steel and Group 2 (A4) for Type 316L stainless steel installations in corrosive atmospheres.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) (Type 304) and Group 2 (A4) (Type 316L) stainless steel bolts, ASTM F593, and nuts, ASTM F594.

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers:

1. Interior Applications: Provide primers that comply with Section 09 91 00 "Painting".

2. Exterior Applications: Provide primers that comply with Section 09 96 00 "High-Performance Coatings."

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

D. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.

2. Furnish inserts for units installed after concrete is placed.

C. Custom Fabrications: Fabricate supports for countertops, shelving and other casework from steel plate and members of sizes indicated or recommended by countertop fabricator, with attached bearing plates, anchors, and braces as recommended by countertop manufacturer. Predrill or punch to receive fasteners.

D. Countertop Support Products: Supports for countertops of steel or aluminum plate by manufacturer, with attached bearing plates, anchors and braces predrilled to receive fasteners.

1. Approved Manufacturers:

a. Centerline Brackets, div. of Centerline Steel, LLC; www.countertopbracket.com.

b. Rakks, div. of Rangine Corp.; www.rakks.com.

2. Basis-of-Design Products:

a. Wall Framing-Mounted Countertop Support:

1) Inside Wall Mount EH Counter Support Bracket by Rakks. Concealed

attachment.

2) Floating Wall Mount Support by Centerline Brackets. Concealed attachment.

b. Wall Framing-Mounted Countertop Support with Accessibility Panel Support: ADA Compliant Vanity Support Bracket by Rakks.

E. Fabricate supports for operable partitions from continuous steel members of sizes indicated or recommended by partition manufacturer with attached bearing plates, anchors, and braces as indicated or recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

F. Galvanize miscellaneous framing and supports where indicated.

G. Prime miscellaneous framing and supports with zinc-rich primer or primer specified in Section 09 96 00 "High-Performance Coatings" where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.

2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located at the exterior or within exterior walls.

D. Prime shelf angles located in exterior walls with zinc-rich primer or primer specified in Section 09 96 00 "High-Performance Coatings."

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, except for elevator pit ladders.

2. For elevator pit ladders, comply with ASME A17.1.

3. Materials:

a. Elevator pit ladders to be fabricated of steel.

b. Exterior access ladders to be fabricated of one of the following along with Type 316 stainless steel mounting hardware, fasteners and anchors.:

1) Hot dip galvanized steel.

2) Stainless steel.

3) Aluminum.

c. Separate dissimilar metals at exterior conditions with an approved layer of bituminous coating or other anti-galvanic coating product.

d. Anchors at exterior conditions for aluminum or copper:

1) Provide stainless steel, aluminum or copper fasteners to anchor exterior aluminum or copper.

2) Galvanized metal or zinc-plated fasteners are not to be used for anchors.

B. Steel Ladders:

1. Space siderails 18 inches apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 1-inch-diameter, steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
7. Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
8. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
9. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
10. Galvanize and prime exterior ladders, including brackets.
11. Prime exterior ladders, including brackets and fasteners, with zinc-rich primer or primer specified in Section 09 96 00 "High-Performance Coatings."

C. Aluminum Ladders:

1. Source Limitations: Obtain aluminum ladders from single source from single manufacturer.
2. Space siderails 18 inches apart unless otherwise indicated.
3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with ribbed tread surfaces.
5. Fit rungs in centerline of siderails; fasten by welding or with stainless steel fasteners or brackets and aluminum rivets.
6. Provide platforms as indicated fabricated from pressure-locked aluminum bar grating or extruded-aluminum plank grating, supported by extruded-aluminum framing. Limit openings in gratings to no more than 3/4 inch in least dimension.
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted aluminum brackets.
8. Provide minimum 72-inch-high, hinged security door with padlock hasp at foot of ladder to prevent unauthorized ladder use.

2.9 METAL FLOOR PLATE

A. Fabricate from rolled-steel floor, rolled-stainless steel floor or rolled-aluminum-alloy tread with abrasive-surface floor plate of thickness indicated below:

1. Thickness: As indicated in Structural Drawings.

B. Provide grating sections where indicated, fabricated from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 3/4 inch in least dimension.

C. Provide steel angle supports as indicated.

D. Include steel angle stiffeners, and fixed and removable sections as indicated.

E. Provide flush steel bar drop handles for lifting removable sections, one at each end of each section.

2.10 ELEVATOR PIT SUMP COVERS

A. Fabricate from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 3/4 inch in least dimension.

B. Provide steel angle supports unless otherwise indicated.

2.11 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

2.12 ABRASIVE METAL NOSINGS, TREADS AND THRESHOLDS

A. Cast-Metal Units: Cast iron, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Safety Tread Co., Inc.; www.americansafetytread.com.

b. Balco; a CSW Industrials Co.; www.balcousa.com.

c. Safe-T-Metal Company, Inc.; www.safetmetal.com.

d. Wooster Products Inc.; www.woosterproducts.com.

2. Source Limitations: Obtain units from single source from single manufacturer.

B. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Safety Tread Co., Inc.; www.americansafetytread.com.

b. Balco; a CSW Industrials Co.; www.balcousa.com.

c. Wooster Products Inc.; www.woosterproducts.com.

2. Source Limitations: Obtain units from single source from single manufacturer.

3. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion or solid-abrasive-type units without ribs as indicated.

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

D. Apply bituminous paint to concealed surfaces of cast-metal units.

E. Apply clear lacquer to concealed surfaces of extruded units.

2.13 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize bearing and leveling plates.

C. Prime plates with zinc-rich primer or primer specified in Section 09 96 00 "High-Performance Coatings."

2.14 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with zinc-rich primer or primer specified in Section 09 96 00 "High-Performance Coatings."

2.15 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.16 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.17 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.18 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.

2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions, overhead doors and overhead grilles securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to supporting construction with expansion anchors, anchor bolts or through bolts, as indicated or as required for secure anchorage.

3.3 INSTALLATION OF NOSINGS, TREADS, AND THRESHOLDS

A. Center nosings on tread widths unless otherwise indicated.

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 07 92 00 "Joint Sealants" to provide a watertight installation.

3.4 INSTALLATION OF BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 "Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

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SECTION 05 51 13 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel stair, with concrete-filled treads and landings.

B. Related Requirements:

1. Section 05 12 00 “Structural Steel Framing”.
2. Section 05 73 00 “Decorative Metal Railings”.
3. Section 09 96 00 “High-Performance Coatings”.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. 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.

C. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

1.4 SUBMITTALS

A. Product Data: For metal floor plate treads, vertical metal plate, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work signed and sealed by the qualified professional Engineer responsible for their preparation.

C. Structural Calculations: Submit a comprehensive analysis of design loads, including dead loads, live loads, and thermal movement.

D. Samples for Verification: For each type and finish of nosing and tread.

E. Welding certificates.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

G. Qualification Data: For installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."

2. AWS D1.3, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A36.

D. Steel Tubing: ASTM A500 (cold formed) or ASTM A513.

2.2 ABRASIVE NOSINGS

A. Provide nosings to match nosings at existing Atrium stair, meeting Code requirements.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

2.4 MISCELLANEOUS MATERIALS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Concrete Materials and Properties: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3,000 psi unless otherwise indicated.

C. Welded Wire Reinforcement: ASTM A185, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.

2. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.6 STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Service Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Fabricate stringers of steel plates.

a. Provide plate stringers.

2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.

3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 in.

1. Steel Sheet: Uncoated cold hot-rolled steel sheet unless otherwise indicated.

2. Directly weld metal pans to stringers; locate welds on top of subtreads where they are concealed by concrete fill. Do not weld risers to stringers.

3. Shape metal pans to include nosing integral with riser except where precast concrete treads will be installed.

a. Attach abrasive nosings to risers.

4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.7 STAIR RAILINGS

A. Coordinate with Section 05 73 00 “Decorative Metal Railings”.

B. Welded Connections: Install railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes are okay as shown in NAAMM AMP 521.

2.8 FINISHES

A. Shop-prime for field-paint finish. Provide primers that comply with Section 09 91 00 "Painting".

B. Preparation for Shop Priming: Meet primer manufacturer’s requirements.

C. Apply shop primer to uncoated surfaces of metal stair components, except those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION OF METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

F. Field Welding: Comply with requirements for welding in Fabrication, General article.

G. Place and finish concrete fill for treads and platforms to comply with Section 03 30 00 "Cast-In-Place Concrete."

1. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

3.2 INSTALLATION OF RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

1. Anchor posts to steel by welding or bolting to steel supporting members.

2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION

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SECTION 05 73 00 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Decorative railing assembly.

B. Related Requirements:

1. Section 01 81 13 “Sustainable Requirements”.
2. Section 05 50 00 “Metal Fabrications”.
3. Section 05 51 13 “Metal Pan Stairs”.

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. 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.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 SUBMITTALS

A. Product Data:

1. Steel railings.
2. Paint products.
3. Grout.

B. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

C. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.

2. Fittings and brackets.

3. Welded connections. Confirm all weld finishes for each location prior to fabrication.

4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples shall be full height.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

E. Qualification Data: For testing agency.

F. Welding certificates.

G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

A. Structural Design: Structural elements shall be designed by a structural engineer licensed to practice in State of Washington.

B. Installer Qualifications: Fabricator of products.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code - Steel."

D. Mock-Ups: build mock-ups to verify selections made under sample submittals, to demonstrate aesthetic effects and conformance to design intent, and to set quality standards for fabrication and installation. Locate in areas designated by Architect.

1. Do not proceed with remaining work until the mock-up is approved by Architect.

2. Rework mock-up as required to produce acceptable work.

3. Retain the approved mock-up during construction as quality standard.

4. Build mock-ups for the following components:

a. Decorative metal railings: Minimum of 6 LF.

5. Subject to compliance with requirements, approved mock-ups may become part of the completed Work if undisturbed at the time of Substantial Completion. Otherwise, remove and legally dispose of mock-up when no longer needed.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 FABRICATORS

A. Source Limitations: Obtain each type of assembly from single source from single fabricator.

2.2 GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.3 RAILINGS, GENERAL

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Connections: Fabricate railings with welded connections unless otherwise indicated.

2.4 DECORATIVE RAILING ASSEMBLY

A. Metal Railing: Custom steel members for guardrail stanchions, top rail and infill.

1. Handrail: Steel of shape and size indicated.
2. Stanchions: As indicated in Drawings for decorative railing assembly.
3. Top Rail: As indicated in Drawings for decorative railing assembly.
4. Infill: 1/2 in by 2 in or as indicated in Drawings for decorative railing assembly.
5. Finish: Refer to Steel Finishes articles in this Section.

B. Applications: As indicated in Drawings.

2.5 STEEL

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

C. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

D. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

E. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011, structural steel, minimum Grade 30 (Grade 205).

F. Expanded Metal Carbon Steel: ASTM F 1267, Class 1.

2.6 STAINLESS STEEL

A. Tubing: ASTM A554, Grade MT 304.

B. Pipe: ASTM A312/A312M, Grade TP 304.

C. Castings: ASTM A743/A743M, Grade CF 8 or CF 20.

D. Sheet, Strip, Plate, and Flat Bar: ASTM A666, Type 304.

E. Bars and Shapes: ASTM A276, Type 304.

2.7 FASTENERS

A. General:

1. Steel components: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

2. Stainless-steel components: Type 304 stainless-steel fasteners.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.8 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that are compatible with and comply with Section 09 96 00 “High-Performance Coatings.”

1. Interior: Provide zinc-rich primers that comply with Section 09 91 00 “Painting” and compatible with topcoats specified.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.9 RAILING FABRICATION, GENERAL

A. General: Fabricate steel guardrail components in accordance with AISI Steel Product Manual and the manufacturer’s requirements.

B. Provide complete assemblies, including metal railings, framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchors, railings and platforms on supporting structure as follows:

1. Comply with fabrication requirements indicated of “Architecturally Exposed Structural Steel (AESS)” as defined by American Institute of Steel Construction.

2. Join components by welding unless otherwise indicated.

3. Use connections that maintain structural value of joined pieces.

4. Exposed surfaces shall be smooth, with square profiles of edges, be straight without deformation, warping or twisting, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, roller trade names, and roughness.

5. No visible piece marks are permitted.

6. Stich welding is only permitted when Architect has reviewed and approved the use of methods prior to fabrication, of the following:
    a. Scope and location of welds to be finished with filler.
    b. Welds to be finished with plastic-based metal filler compound with smooth surfaces prior to priming, or alternate methods.
    c. Filler products and methods of application and installation.
    d. Final finish of compounds and materials used are provided in mockup for review.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form changes in direction as detailed, by radius bends of radius indicated.

F. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

G. Close exposed ends of hollow railing members with prefabricated end fittings.

H. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.

I. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

J. Shear and punch metals cleanly, accurately and square. Remove shear marks and other surface imperfections or irregularities.

K. Form exposed work with accurate angles and surfaces and straight edges.

L. Form work true to line and level with accurate angles and surfaces.

M. Weld connections to comply with the following:
    1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    2. Obtain fusion without undercut or overlap.
    3. Oversize welds to comply with structural performance requirements and complying with weld finishing indicated.
    4. Remove welding flux immediately.
    5. Weld exposed corners and seams continuously unless otherwise indicated.
    6. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

N. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
    1. Architect shall review and approve all splice methods and fasteners prior to fabrication.

O. Remove blemishes by filling, grinding, or by welding and grinding prior to cleaning, treating and shop priming.

P. Provide closure plates at all hollow, tube-shaped and channel members; weld continuously and grind smooth as indicated.

Q. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

R. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

S. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.11 STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Decorative Railing Assembly:

1. Shop prime iron and steel items not indicated to be galvanized or shop-finished unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

a. Shop prime with universal shop primer indicated.

b. Shop prime with primer indicated in Section 09 96 00 “High-Performance Coatings” where finish is indicated to be high-performance or at exterior steel fabrications.

2. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

a. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

b. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

c. Items Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

d. Other Items: SSPC-SP 3, "Power Tool Cleaning."

3. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

a. Stripe paint corners, crevices, bolts, welds, and sharp edges.

C. Pre-Manufactured Decorative Railing Assembly:

1. Factory-finish metal railings after assembly; powder-coat finish.

2. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils. Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.

a. Color and Gloss: As indicated.

D. Stainless Steel: Directional, satin finish; ASTM A 480, No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 RAILING CONNECTIONS

A. Non-welded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.3 ANCHORING POSTS

A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout , mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Where approved by Architect and Structural Engineer prior to coring, form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

D. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 " Painting" and Section 09 96 00 "High-Performance Coatings."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780.

END OF SECTION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A Specifications including divisions 00 and 01.

B Section 011000 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.

C Section 013000 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

D Section 017800 - Closeout Submittals: Project record documents, operation and maintenance (O&M) data, warranties and bonds.

E Section 017900 - Demonstration and Training: Detailed requirements.

F Section 019113 - General Commissioning Requirements.

1.02 SECTION INCLUDES

A Work included in 23 00 00, HVAC Basic Requirements applies to Division 23, HVAC work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of heating, ventilating and air conditioning systems for proposed project.

B Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C Definitions:

1. Provide: To furnish and install, complete and ready for intended use.
2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work provided.
4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and othe rreviewing entity whose approval is required to obtain systems acceptance.

1.03 REFERENCE STANDARDS

A State of Oregon:

1. OAR - Oregon Administrative Rules
2. OESC - Oregon Electrical Specialty Code
3. OFC - Oregon Fire Code
4. OMSC - Oregon Mechanical Specialty Code
5. OPSC - Oregon Plumbing Specialty Code
6. OSSC - Oregon Structural Specialty Code
7. OEESC - Oregon Energy Efficiency Specialty Code
8. Oregon Elevator Specialty Code

B Reference standards and guidelines include but are not limited to the latest adopted editions from:

1. ABA - Architectural Barriers Act
2. ABMA - American Bearing Manufacturers Association
3. ADA - Americans with Disabilities Act
4. AHRI - Air-Conditioning Heating & Refrigeration Institute
5. AMCA - Air Movement and Control Association
6. ANSI - American National Standards Institute
7. ASCE - American Society of Civil Engineers
8. ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers
9. ASHRAE Guideline 0, The Commissioning Process
10. ASME - American Society of Mechanical Engineers
11. ASPE - American Society of Plumbing Engineers
12. ASSE - American Society of Sanitary Engineering
13. ASTM - ASTM International
14. AWWA - American Water Works Association
15. CFR - Code of Federal Regulations
16. CGA - Compressed Gas Association
17. CHPS - Collaborative for High Performance Schools
18. CISPI - Cast Iron Soil Pipe Institute
19. CSA - CSA International
20. EPA - Environmental Protection Agency
21. ETL - Electrical Testing Laboratories
22. FDA - Food and Drug Administration
23. FM - FM Global
24. GAMA - Gas Appliance Manufacturers Association
25. HI - Hydraulic Institute Standards
26. IAPMO - International Association of Plumbing & Mechanical Officials
27. ICC - International Code Council
28. IFGC - International Fuel Gas Code
29. ISO - International Organization for Standardization
30. LEED - Leadership in Energy and Environmental Design
31. MSS - Manufacturers Standardization Society
32. NEC - National Electric Code
33. NEMA - National Electrical Manufactures Association
34. NFPA - National Fire Protection Association
35. NFGC - National Fuel Gas Code
36. NRCA - National Roofing Contractors Association
37. NSF - National Sanitation Foundation
38. OSHA - Occupational Safety and Health Administration
39. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
40. TEMA - Tubular Exchanger Manufactures Association
41. TIMA - Thermal Insulation Manufactures Association
42. UL - Underwriters Laboratories, Inc.
43. USDA - United States Department of Agriculture

44. USGBC - United States Green Building Council

C ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2021.

D FM (AG) - FM Approval Guide; current edition.

E NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A See Section 013000 - Administrative Requirements, for submittal procedures.

B Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.

C In addition:

1. 1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.
2. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
    a. a. Label submittal to match numbering/references as shown in Contract Documents .Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
    b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 23, HVAC Specification Sections for specific items required in product data submittal outside of these requirements.
    c. For vibration isolation of equipment, list make and model selected with operating load and deflection.
    d. See Division 23, HVAC individual Sections for additional submittal requirements.
3. Maximum of two reviews of submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.
4. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer’s comments. Identify Engineer’s comments and provide an individual response to each of the Engineer’s comments. Cloud changes in the submittals and further identify changes which are in response to Engineer’s comments.
5. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet Section 23 05 48, and provide engineered seismic drawings and equipment seismic certification. Equipment Importance Factor as specified in Division 01 and in Structural

documents.

6. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required by Division 23, HVAC Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.
7. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
8. Substitutions and Variation from Basis of Design:
    a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
    b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.
9. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, equipment, ductwork and piping layout plans, and control wiring diagrams. Reference individual Division 23, HVAC Specification Sections for additional requirements for shop drawings outside of these requirements.
    a. Provide Shop Drawings indicating access panel locations for items that require Code or maintenance access, size and elevation for approval prior to installation.
10. Samples: Provide samples when requested by individual Sections.
11. Resubmission Requirements: Make any corrections or change in submittals when required. Provide submittals as specified. The engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
    a. Resubmit for review until review indicates no exception taken or make "corrections as noted".
    b. When submitting drawings for Engineers re-review, clearly indicate changes on drawings and "cloud" any revisions. Submit a list describing each change.
12. Operation and Maintenance Manuals:
    a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.

1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.
3) Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 23 00 00, and individual Sections.
4) Include product certificates of warranties and guarantees.
5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.
6) Include copy of startup and test reports specific to each piece of equipment.
7) Include copy of final air and water systems balancing log along with pump, fan and distribution system operating data.
8) Include commissioning reports.
9) Include copy of valve charts/schedules.
10) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 23 00 00, HVAC Basic Requirements Article titled "Demonstration".
c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance, and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

D Product Data & Shop Drawings: Provide product submittals and shop drawings in electronic format (pdf).

E Record Drawings:
1. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.
2. Record Drawings are to include equipment and fixture/connection schedules, control dampers, fire smoke dampers, fire dampers, valves, bottom of pipe, duct and equipment elevations and dimensioned locations for all distribution systems (hydronic and air). Invert elevations and dimensioned locations for underground systems below grade to 5-feet outside building that accurately reflect "as constructed or installed" for project.
3. At completion of project, input changes to original project Revit Model and make one set of black-line drawings created from Revit Model in version/release equal to contract drawings. Submit drawings upon substantial completion.

1.05 QUALITY ASSURANCE

A Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

B Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

C Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

D Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

E Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

F Provide products that are UL and CSA listed.

G Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials.

H ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.

I Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.

J Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

K Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

L Coordination Documents:

1. Prior to construction, prepare and submit coordinated layout drawings (composite drawings), to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, plumbing, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, fire protection, electrical, ceiling suspension, and ceiling tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence. Unless otherwise required by Division 00, Procurement and Contracting Requirements and/or Division 01, General Requirements, Division 23, HVAC to combine information furnished by other trades onto

master coordination documents.

2. Prepare Drawings as follows:
   a. Coordination models/drawings may be created using Revit 3D modeled elements or a 3D CAD software. The modeled elements to be graphically represented within the model as a specific system, object or assembly in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information. Non-graphic information may also be attached to the model elements. Model elements must have the ability to be spatially coordinated with other modeled elements using either Revit, Autodesk Navisworks or Autodesk A360.
   b. Drawings in Revit Mode release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
   c. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
   d. Indicate hydronic and air distribution system piping including fittings, hangers, access panels, valves, and bottom of pipe and duct elevations above finished floor.
   e. Indicate inverts and provision for piping that must be graded to have right-of-way over more flexible items. Drawings also to indicate proposed ceiling grid and lighting layout as shown on electrical drawings and architectural reflected ceiling drawings and HVAC equipment, ductwork and piping.
   f. Incorporate Addenda items and change orders.
   g. Distribute drawings to trades and provide additional coordination as requested by other trades.
3. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.
4. Verify in field exact size, location, invert, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.
5. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

1.06 WARRANTY

A See Section 017800 - Closeout Submittals, for additional warranty requirements.

B Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 ACCESS PANELS

A See Division 01, General Requirements and Division 08, Openings for products and installation requirements. Confirm Access Panel requirements in Division 01, General Requirements, Division 08, Openings and individual Division 23, HVAC Sections. In absence of specific requirements in Division 01, General Requirements, comply with the following:

1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly.
   a. Ceiling access panels to be minimum 24-inch by 24-inch required and approved size.
   b. Wall access panels to be minimum of 12-inch by 12-inch required and approved size.

c. Provide screwdriver operated catch; cylinder type locks. Provide two keys for each cylinder. Locks to be keyed for Master Keying; or cylinder type locks. Provide two keys for each cylinder. Locks to be keyed for or sequential keying system.
d. Manufacturers and Models:
    1) Drywall: Karp KDW.
    2) Plaster: Karp DSC-214PL.
    3) Masonry: Karp DSC-214M.
    4) 2 hour rated: Karp KPF-350FR.
    5) Manufacturers: Milcor, Elmdor, Acudor or approved equivalent.

PART 3 EXECUTION

3.01 INSTALLATION AND ACCESSIBILITY

A Install in accordance with manufacturer's instructions.

B Install equipment having components requiring access (i.e., drain pans, drains, control operators, valves, motors and vibration isolation devices) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C Install equipment and products complete as directed by manufacturer's installation instructions including all appurtenances recommended in manufacturer's installation instructions, at no additional charge to Owner. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.

D Earthwork:
1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following
    a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork Sections. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
    b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
    c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E Firestopping:
1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
    a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F Pipe Installation:
1. Provide installation of piping systems coordinated to account for expansion and contraction of piping materials and building, as well as anticipated settlement or shrinkage of building. Install work to

prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, seismic flexible joints, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building with Project Structural Engineer. Verify construction phasing, type of building construction products and rating for coordinating installation of piping systems Include provisions for servicing and removal of equipment without dismantling piping.

G Plenums: Materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84 or UL 723. Immediately notify Architect / Engineer of any discrepancy.

3.02 COMMISSIONING

A See Section 019113 - General Commissioning Requirements, for commissioning requirements.

3.03 SEISMIC CONTROL

A Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, Section 23 05 48, Vibration and Seismic Controls for HVAC Equipment, Division 13, Special Construction, and individual Division 23 HVAC Sections.

1. General: Earthquake resistant designs for HVAC (Division 23) equipment and distribution, i.e. motors, ductwork, piping, equipment, etc. to conform to regulations of jurisdiction having authority.
2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping equipment and water heaters. Submit Shop Drawings along with equipment submittals.
3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.
4. Piping and Ductwork: Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.
5. Provide means to prohibit excessive motion of mechanical equipment during earthquake.

3.04 DEMOLITION

A Confirm requirements in Division 01, General Requirements and Division 02, Existing Conditions. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. Scope: It is the intent of these documents to provide necessary information and adjustments to the HVAC system required to meet code, and accommodate installation of new work. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
2. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.

3. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.
4. Unless specifically indicated on Drawings, remove exposed, unused ductwork and piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap and patch surfaces to match surrounding finish.
5. Unless specifically indicated on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).

3.05 CUTTING AND PATCHING

A Confirm Cutting and Patching requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:

1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 TEMPORARY HEATING, COOLING, AND HUMIDITY CONTROL

A Provide temporary heating, cooling, controls, humidification and dehumidification as required to facilitate the construction of the project. Size and select temporary system based on the requirements of the various trades during construction. This includes, but is not limited to, drywall, case work, wood flooring and wood finishes that are subject to warping. Size and install system to prevent mold growth. Coordinate the location of the temporary system. The house system can be used. Develop a procedure for how the house system will be used including a sketch depicting the house system, how filtration will be used to prevent construction debris from entering the system and how often the filters will be changed, how the ductwork will be cleaned after use to ensure a clean system is turned over to the Owner and how the units are sized. Submit this procedure to the Mechanical Engineer for review. Follow National Air Duct Cleaners Association (NADCA) duct cleaning procedures and guidelines. Warranties for the house system, if new, to commence when the Owner moves in if house system is used as the means to maintain the climate within the building during construction. Include this warranty requirement in the original bid or proposal amount. Coordinate and provide any temporary power, controls, ductwork, piping, plumbing anchorage,

miscellaneous steel and structural supports required to support the temporary system. Installation of the system to comply with all applicable codes and be acceptable to the Authority Having Jurisdiction (AHJ).

3.07 EQUIPMENT SELECTION AND SERVICEABILITY

A Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

B Maintain design intent where equipment other than as shown as Basis of Design in Contract Documents is provided. Where equipment requires ductwork or piping arrangement, controls/control diagrams, or sequencing different from that indicated in Contract Documents, provide at no additional cost to Owner.

3.08 CLEANING

A Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.09 INSTALLATION

A Confirm Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment. Do not place equipment in sustained operation prior to initial balancing of HVAC systems.

D Provide miscellaneous supports/metals required for installation of equipment, piping and ductwork.

E Electrical interlocks: Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

3.10 ACCESS PANELS

A Confirm Access Panel requirements in Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following: Coordinate locations/sizes of access panels with Architect prior to work.

3.11 REVIEW AND OBSERVATION

A Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 23 00 00, HVAC Basic Requirements and individual Division 23, HVAC Sections.

B B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:

1. Underground system installation prior to backfilling.
2. Prior to covering walls.
3. Prior to ceiling cover/installation.
4. After major equipment is installed.
5. When main systems, or portions of, are being tested and ready for inspection by AHJ.

6. Final Punch.

C Costs incurred by additional final punch list trips required due to incomplete systems will be the responsibility of the Contractor.

3.12 DEMONSTRATION, TRAINING, AND CLOSEOUT ACTIVITIES

A See Section 017800 - Closeout Submittals, for closeout submittals.

B See Section 017900 - Demonstration and Training, for additional requirements.

C Demonstration: Demonstrate operation of system to Owner's personnel.
1. Use operation and maintenance data as reference during demonstration.
2. Briefly describe function, operation, and maintenance of each component.

D Training: Train Owner's personnel on operation and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Manufacturer's training personnel.

E Acceptance:
1. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 23, HVAC Sections and the following:
   a. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
      1) Testing and Balancing Reports
      2) Cleaning
      3) Operation and Maintenance Manuals
      4) Training of Operating Personnel
      5) Record Drawings
      6) Warranty and Guaranty Certificates
      7) Start-up/Test Document
      8) Commissioning Reports

F Letter of Conformance
1. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that HVAC items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

END OF SECTION

SECTION 31 62 23 – MICROPILES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes Micropiles: grout-filled steel pipe piles with steel reinforcement.

B. The General Structural Notes shall be used in conjunction with these specifications. The General Structural Notes shall supersede items in this specification when discrepancies exist.

1.2 SUBMITTALS

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

B. Shop Drawings: Provide calculations and drawings adhering to the criteria shown on the design drawings stamped and sealed by an engineer licensed in the State of Oregon. Show fabrication and installation details for piles, including splices and tip details.

1. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

2. Indicate locations, sizes, type, and arrangement of reinforcement.

C. Welding certificates.

D. Concrete design mixes.

E. Material certificates.

F. Material test reports.

G. Pile-Drilling Equipment Data.

H. Pile installation records.

I. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Comply with requirements in ACI 301, "Specifications for Structural Concrete."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel".

2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.4 QUALIFICATIONS

A. The micropile contractor shall be experienced in the construction and load testing of micropiles and have successfully constructed at least 5 projects in the last 5 years involving construction totaling at least 100 micropiles of similar capacity to those required in the design plans and specifications.

PART 2 - PRODUCTS

2.1 STEEL PIPE PILES

A. Steel Pipe: ASTM A 252, Grade 3; seamless or welded with a minimum yield strength of 50ksi.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60 or Grade 75; deformed or ASTM A722, Grade 150, deformed.

B. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending, as follows:

1. Steel Reinforcement: As noted in section 2.2A; deformed.

C. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M, as follows:

1. Steel Reinforcement: As noted in section 2.2A; deformed.

2.3 GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I, II, III, or V.

B. Fine Aggregates: ASTM C144.

C. Water: Potable, complying with ASTM C 94/C 94M requirements.

D. Admixtures shall conform to ASTM C 494. Accelerators are not permitted. Admixtures containing chlorides are not permitted.

1. Air-Entraining Admixture: ASTM C 260.

2. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

3. Retarding Admixture: ASTM C 494/C 494M, Type B.

4. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 PILE ACCESSORIES

A. Centralizers and Spacers: Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used.

2.5 GROUT MIXES

A. Prepare neat cement or sand/cement grout mix with a minimum 4000psi 28-day compressive strength.

PART 3 - EXECUTION

3.1 STEEL REINFORCEMENT

A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.2 GROUT PLACEMENT

A. Grout shall be installed as soon as possible after drilling is complete. The grout shall be pumped through a tremie pipe extending to the bottom of the pile until grout of a suitable quality returns to the top of the pile. The grout level shall be maintained at the top of the pile with additional grout pumped under pressures of 50 psi to 150 psi into the casing during withdrawl of the casing to ensure that the grout completely fills the drill hole.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage the geotechnical engineer for the project or for the design of the micropiles to perform the following special inspections:

1. Micropile foundations. Reference the Statement of Special Inspections within the Structural Drawings for more information and requirements.

B. Testing Agency: Owner will engage a qualified independent testing agency to perform tests and inspections.

C. Tests and Inspections:

1. Pile Load Testing: Verification and proof loading tests in tension shall be performed on installed piles according to ASTM D 3689. Reference the Structural Drawings for Verification and Proof Testing requirements The testing procedures and acceptance criteria shall be noted on the bidder design submittal. The bidder design engineer shall verify with the City of Portland that additional tesing will not be required.

2. Weld Testing: In addition to visual inspection, welds shall be tested and inspected according to AWS D1.1/D1.1M.

3. Grout: Sampling and testing of concrete for quality control shall include the following:

a. Sampling Fresh Grout:

1) Grout consistency: ASTM C 188.

2) Compressive-Strength Tests: ASTM C 109; one set for each day of operation or per every 10 piles, whichever oocurs more frequently.

END OF SECTION

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PCC SYLVANIA HEALTH TECHNOLOGY (HT)

BUILDING WEST SIDE RENOVATION

CONSTRUCTION DOCUMENTS: DEMOLITION AND STRUCTURAL

FEBRUARY 23, 2024