

**PROJECT MANUAL - VOLUME 2**  
**Div 1 – Div 21**

Issued for Bidding: August 31, 2015  
Project No.: 14-004

**MULTI-PURPOSE FACILITY**  
**Bid Package 2 - Rebid**

for

**Joliet Junior College**

1215 Houbolt Road  
Joliet, Illinois 60431



DEMONICA KEMPER ARCHITECTS

125 N. Halsted Street, Suite 301  
Chicago, Illinois 60661  
Phone: 312.496.0000



**DIVISION 1 - GENERAL REQUIREMENTS**

01 25 00 ..... Substitution Procedures ..... 4  
01 26 00 ..... Contract Modification Procedures ..... 3  
01 33 00 ..... Submittal Procedures ..... 10  
01 42 00 ..... References ..... 16  
01 57 13 ..... Temporary Erosion and Sediment Control ..... 5  
01 60 00 ..... Product Requirements ..... 5  
01 73 00 ..... Execution ..... 10  
01 74 19 ..... Construction Waste Management ..... 6  
01 77 00 ..... Closeout Procedures ..... 5  
01 78 23 ..... Operation and Maintenance Data ..... 6  
01 78 39 ..... Project Record Documents ..... 4  
01 79 00 ..... Demonstration and Training ..... 4  
01 81 13.13 .. Sustainable Design Requirements – LEED NC ..... 8  
01 91 13 ..... General Commissioning Requirements ..... 13  
01 91 14 ..... Functional Testing Requirements ..... 15

**DIVISION 11 - EQUIPMENT**

11 66 23 ..... Gymnasium Equipment ..... 12  
11 66 43 ..... Interior Electronic Scoreboards ..... 6  
11 66 53 ..... Gymnasium Dividers ..... 5

**DIVISION 12 - FURNISHINGS**

12 66 00 ..... Telescoping Stands ..... 8

**DIVISION 21 – FIRE SUPPRESSION**

21 05 00 ..... Basic Fire Suppression Requirements ..... 21  
21 05 03 ..... Through Penetration Firestopping ..... 5  
21 05 29 ..... Fire Suppression Supports and Anchors ..... 7  
21 05 53 ..... Fire Suppression Identification ..... 3  
21 08 00 ..... Commissioning of Fire Protection ..... 3  
21 13 00 ..... Fire Protection Systems ..... 8



## SECTION 012500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 012300 "Alternates" for products selected under an alternate.
  - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

#### 1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use CSI Form 13.1A.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable

Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
- e. Samples, where applicable or requested.
- f. Certificates and qualification data, where applicable or requested.
- g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
- h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
- i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
- j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
- k. Cost information, including a proposal of change, if any, in the Contract Sum.
- l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
- m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

- 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
- b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

## 1.5 QUALITY ASSURANCE

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

## 1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - b. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
  - c. Substitution request is fully documented and properly submitted.
  - d. Requested substitution will not adversely affect Contractor's construction schedule.
  - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - f. Requested substitution is compatible with other portions of the Work.
  - g. Requested substitution has been coordinated with other portions of the Work.
  - h. Requested substitution provides specified warranty.
  - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  - b. Requested substitution does not require extensive revisions to the Contract Documents.
  - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - d. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.

- e. Substitution request is fully documented and properly submitted.
- f. Requested substitution will not adversely affect Contractor's construction schedule.
- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified warranty.
- k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

**END OF SECTION 012500**



## SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

#### 1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions" or similar form.

#### 1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Construction Manager are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - e. Quotation Form: Use forms acceptable to Architect.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Construction Manager.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  4. Include costs of labor and supervision directly attributable to the change.
  5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
  7. Proposal Request Form: Use form provided by Owner. Sample copy is included in Project Manual. form acceptable to Architect.

#### 1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

#### 1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Construction Manager will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

#### 1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect or Construction Manager may issue a Construction Change Directive on AIA Document G714 or similar form. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 012600**



## SECTION 01 33 00 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 2. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 3. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

#### 1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time

required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal category: Action; informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's and Construction Manager's final release or approval.
  - g. Scheduled date of fabrication.
  - h. Scheduled dates for purchasing.
  - i. Scheduled dates for installation.
  - j. Activity or event number.

#### 1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
  1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. Digital Drawing Software Program: The Contract Drawings are available in Autodesk Revit 2014.
    - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
    - d. .
    - e. The following digital data files will by furnished for each appropriate discipline:
      - 1) Floor plans.
      - 2) Reflected ceiling plans.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Construction Manager's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
    - a. Architectural Precast Panels will require an extended review period, so multiple trades must coordinate type, location, and quantity of embedded junction boxes; and size and routing of embedded conduit.
  5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Construction Manager, through Architect, before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
    - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after

another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect and Construction Manager.
  4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software electronic form acceptable to Owner, containing the following information:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name of Construction Manager.
    - e. Name of Contractor.
    - f. Name of firm or entity that prepared submittal.
    - g. Names of subcontractor, manufacturer, and supplier.
    - h. Category and type of submittal.
    - i. Submittal purpose and description.
    - j. Specification Section number and title.
    - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
    - l. Drawing number and detail references, as appropriate.
    - m. Location(s) where product is to be installed, as appropriate.
    - n. Related physical samples submitted directly.
    - o. Indication of full or partial submittal.
    - p. Transmittal number[, numbered consecutively].
    - q. Submittal and transmittal distribution record.
    - r. Other necessary identification.
    - s. Remarks.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.



## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.
    - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:

- a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data[, unless submittal based on Architect's digital data drawing files is otherwise permitted].
- 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
  - 3. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
  - 4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.
    - a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - 2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
    - e. Specification paragraph number and generic name of each item.
  - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  - 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

- a. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  
- 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
  - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
  
- 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - a. Number of Samples: Submit at least three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
    - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least [three] <Insert number> sets of paired units that show approximate limits of variations.
  
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  - 2. Manufacturer and product name, and model number if applicable.
  - 3. Number and name of room or space.
  - 4. Location within room or space.
  - 5. Submit product schedule in the following format:
    - a. PDF electronic file.
  
- F. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
  
- G. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

- H. LEED Submittals: Comply with requirements specified in Section 018113.13 "Sustainable Design Requirements - LEED for New Construction and Major Renovations."
- I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- P. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
  2. Date of evaluation.
  3. Time period when report is in effect.
  4. Product and manufacturers' names.
  5. Description of product.
  6. Test procedures and results.
  7. Limitations of use.
- R. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

- S. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- T. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- U. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## 2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.
  - 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.

- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S AND CONSTRUCTION MANAGER'S ACTION

- A. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

**END OF SECTION 01 33 00**

## SECTION 014200 - REFERENCES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

#### 1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### 1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

AA	Aluminum Association (The) www.aluminum.org	(703) 358-2960
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955



AHRI	Air-Conditioning, Heating, and Refrigeration Institute, The www.ahrinet.org	(703) 524-8800
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air- Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400

ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions www.atis.org	(202) 628-6380
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	
AWCI	Association of the Wall and Ceiling Industry www.awci.org	(703) 534-8300
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI, Inc. www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200

CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CEA	Consumer Electronics Association www.ce.org	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CPA	Composite Panel Association www.pbmdf.com	(703) 724-1128
CRI	Carpet and Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200 (800) 328-6306
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CSA	Canadian Standards Association www.csa.ca	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087

DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
ECA	Electrical Components Association www.ec-central.org	(703)907-8024
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee http://content.asce.org/ejcdc/	(703) 295-6000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association (Electrostatic Discharge Association) www.esda.org	(315) 339-6937
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) www.intertek-etlsemko.com	(800) 967-5352
FIBA	Federation Internationale de Basketball (The International Basketball Federation) www.fiba.com	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FM Approvals	FM Approvals LLC www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridarroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(301) 277-8686
GANA	Glass Association of North America	(785) 271-0208

	www.glasswebsite.com	
GRI	(Part of GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association Division of Air-Conditioning, Heating, and Refrigeration Institute (AHRI) www.ahrinet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAPSC	International Association of Professional Security Consultants www.iapsc.org	(515) 282-8192
ICBO	International Conference of Building Officials www.iccsafe.org	(888) 422-7233
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
ICPA	International Cast Polymer Association www.icpa-hq.org	(703) 525-0320
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IES	Illuminating Engineering Society of North America www.iesna.org	(703) 525-0320
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510

ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISA	Instrumentation, Systems, and Automation Society, The www.isa.org	(919) 549-8411
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (801) 341-7360
ITS	Intertek Testing Service NA (Now ETL SEMCO)	
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LGSEA	Light Gauge Steel Engineers Association www.arcat.com	(202) 263-4488
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MCA	Metal Construction Association www.metalconstruction.org	(847) 375-4718
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578
MSS	Manufacturers Standardization Society of The Valve and	(703) 281-6613

	Fittings Industry Inc. www.mss-hq.com	
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6223 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport  www.aahperd.org/nagws/	(800) 213-7193, ext. 453
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 222-2300
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NelMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776

NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.org	(901) 526-5016
NOMMA	National Ornamental & Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NWFA	National Wood Flooring Association www.nwfa.org	(800) 422-4556 (636) 519-9663
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.cee.uiuc.edu	(217) 333-3929
PTI	Post-Tensioning Institute www.post-tensioning.org	(248) 848-3180
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	(706) 882-3833
RIS	Redwood Inspection Service www.redwoodinspection.com	(925) 935-1499



SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SCAQMD	South Coast Air Quality Management District www.aqmd.com	(909) 396-2000
SCTE	Society of Cable Telecommunications Engineers www.scte.org	(800) 542-5040 (610) 363-6888
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(877) 294-5424 (516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SIA	Security Industry Association www.siaonline.org	(866) 817-8888 (703) 683-2075
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331

STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWPA	Submersible Wastewater Pump Association www.swpa.org	(847) 681-1868
TCA	Tilt-Up Concrete Association www.tilt-up.org	(319) 895-6911
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TEMA	Tubular Exchanger Manufacturers Association www.tema.org	(914) 332-0040
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrassod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tilerroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USAV	USA Volleyball www.usavolleyball.org	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association	(212) 297-2122

[www.wcmanet.org](http://www.wcmanet.org)

WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) <a href="http://www.wdma.com">www.wdma.com</a>	(800) 223-2301 (312) 321-6802
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) <a href="http://www.wicnet.org">www.wicnet.org</a>	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association <a href="http://www.wmmpa.com">www.wmmpa.com</a>	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association <a href="http://www.wsrca.com">www.wsrca.com</a>	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association <a href="http://www.wwpa.org">www.wwpa.org</a>	(503) 224-3930

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

DIN	Deutsches Institut für Normung e.V. <a href="http://www.din.de">www.din.de</a>	49 30 2601-0
IAPMO	International Association of Plumbing and Mechanical Officials <a href="http://www.iapmo.org">www.iapmo.org</a>	(909) 472-4100
ICC	International Code Council <a href="http://www.iccsafe.org">www.iccsafe.org</a>	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. <a href="http://www.icc-es.org">www.icc-es.org</a>	(800) 423-6587 (562) 699-0543

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

COE	Army Corps of Engineers <a href="http://www.usace.army.mil">www.usace.army.mil</a>	(202) 761-0011
CPSC	Consumer Product Safety Commission <a href="http://www.cpsc.gov">www.cpsc.gov</a>	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce <a href="http://www.commerce.gov">www.commerce.gov</a>	(202) 482-2000
DOD	Department of Defense <a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a>	(215) 697-6257

DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science <a href="http://www.hhs.gov/ophs/">http://www.hhs.gov/ophs/</a>	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board <a href="http://gulliver.trb.org">http://gulliver.trb.org</a>	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USP	U.S. Pharmacopeia www.usp.org	(800) 227-8772
USPS	Postal Service www.usps.com	(202) 268-2000

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

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board <a href="http://www.access-board.gov">www.access-board.gov</a>	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office <a href="http://www.gpoaccess.gov/cfr/index.html">www.gpoaccess.gov/cfr/index.html</a>	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point <a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a>	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point <a href="http://dodssp.daps.dla.mil/">http://dodssp.daps.dla.mil/</a>  Available from Defense Standardization Program <a href="http://www.dsp.dla.mil">www.dsp.dla.mil</a>  Available from General Services Administration <a href="http://www.gsa.gov">www.gsa.gov</a>  Available from National Institute of Building Sciences <a href="http://www.wbdg.org/ccb">www.wbdg.org/ccb</a>	(215) 697-2664     (202) 619-8925  (202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point <a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a>	(215) 697-2664
UFAS	Uniform Federal Accessibility Standards Available from Access Board <a href="http://www.access-board.gov">www.access-board.gov</a>	(800) 872-2253 (202) 272-0080

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

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation <a href="http://www.dca.ca.gov/bhfti">www.dca.ca.gov/bhfti</a>	(800) 952-5210 (916) 574-2041
CCR	California Code of Regulations <a href="http://www.calregs.com">www.calregs.com</a>	(916) 323-6815
CDHS	California Department of Health Services <a href="http://www.dhcs.ca.gov">www.dhcs.ca.gov</a>	(916) 445-4171
CDPH	California Department of Public Health, Indoor Air Quality Section <a href="http://www.cal-iaq.org">www.cal-iaq.org</a>	
CPUC	California Public Utilities Commission <a href="http://www.cpuc.ca.gov">www.cpuc.ca.gov</a>	(415) 703-2782
TFS	Texas Forest Service Forest Resource Development <a href="http://txforestservation.tamu.edu">http://txforestservation.tamu.edu</a>	(979) 458-6606

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 014200**

## **SECTION 01 57 13 – TEMPORARY EROSION AND SEDIMENT CONTROL**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings of the Contract, including General and supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  - 1. All temporary erosion and sediment control on the project site.
  - 2. LEED Documentation for certification.

#### **1.2 SUMMARY**

- A. This Section includes:
  - 1. Prevention of erosion due to construction activities.
  - 2. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
  - 3. Restoration of areas eroded due to insufficient preventive measures.
  - 4. Compensation of owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.
- B. Related Sections include the following:
  - 1. Section 31 10 00 – Site Clearing: Limits on clearing: disposition of vegetative clearing debris.
  - 2. Section 31 20 00 – Earth Moving: Preparation and excavation of site for site construction.

#### **1.3 REFERENCE STANDARDS**

- A. Illinois Urban Manual, latest edition.
- B. Illinois Department of Transportation, Standard Specifications for Road and Bridge Construction, latest edition.
- C. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus.
- D. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- E. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
- F. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
- G. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.

- H. ASTM D 4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Review the drawings (erosion control notes).
- B. Conduct stormwater pre-construction meeting with construction manager, all ground-disturbing sub-contractors, site engineer of record or their representative who is familiar with the site and state and local agency personnel if available.
- C. Timing: Put preventive measures in place before disturbance of surface cover and before precipitation occurs.
- D. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
  - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
  - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- E. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
  - 1. Control movement of sediment and soil from temporary stockpiles of soil.
  - 2. Prevent development of ruts due to equipment and vehicular traffic.
  - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to owner.
- F. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
  - 1. Prevent windblown soil from leaving the project site.
  - 2. Prevent tracking of mud onto public roads outside site.
  - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
  - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to owner.
- G. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
  - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- H. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.



1. If sedimentation occurs, install or correct preventive measures immediately at no cost to owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- I. Open Water: Prevent standing water that could become stagnant.
- J. Maintenance: Maintain temporary preventive measures until permanent measures have been established.
- K. Prepare all appropriate documentation required by LEED regulations to attain LEED approval.

## 1.5 SUBMITTALS

- A. Contractor shall submit shop drawings or material certifications for all manufactured erosion and sediment control measures.
- B. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- C. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- D. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
  1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
  2. Permittivity:  $0.05 \text{ sec}^{-1}$ , minimum, when tested in accordance with ASTM D 4491.
  3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
  4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
  5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
  6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
  7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

- B. Silt Fence Posts: One of the following, minimum 5 feet long:
1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
  2. Softwood, 4 by 4 inches in cross section.
  3. Hardwood, 2 by 2 inches in cross section.

## PART 3 EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

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

### 3.3 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- C. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- E. Soil Stockpiles: Protect using one of the following measures:
1. Cover with polyethylene film, secured by placing soil on outer edges.
  2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

### 3.4 INSTALLATION

- A. Silt Fences:
1. Store and handle fabric in accordance with ASTM D 4873.
  2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
  3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.

4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
5. Install with top of fabric at nominal height and embedment as specified.
6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
8. Fasten fabric to wood posts using one of the following:
  - a. Four 3/4 inch diameter, 1 inch long, 14 gage nails.
  - b. Five 17-gage staples with 3/4 inch wide crown and 1/2 inch legs.
9. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
10. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

### 3.5 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Clean out temporary sediment control structures weekly and relocate soil on site.
- D. Place sediment in appropriate locations on site; do not remove from site.

### 3.6 CLEAN UP

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

**END OF SECTION 01 57 13**



## SECTION 01 60 00 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 01 23 00 "Alternates" for products selected under an alternate.
  - 2. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
  - 3. Section 01 42 00 "References" for applicable industry standards for products specified.

#### 1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

#### 1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
    - a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
    - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

#### 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

#### 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

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

## 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
  - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
  - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of



an unnamed product by one of the other named manufacturers.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
  - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  - 3. Evidence that proposed product provides specified warranty.
  - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  - 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 60 00**



## **SECTION 01 73 00 - EXECUTION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner-installed products.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
  - 9. Correction of the Work.
- B. Related Requirements:
  - 1. Section 01 33 00 "Submittal Procedures" for submitting surveys.
  - 2. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
  - 3. Section 02 41 00 "Demolition" for demolition and removal of selected portions of the site and building.

#### **1.3 DEFINITIONS**

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

#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  3. Products: List products to be used for patching and firms or entities that will perform patching work.
  4. Dates: Indicate when cutting and patching will be performed.
  5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit two copies signed by land surveyor professional engineer.
- E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

## 1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
  2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    - a. Primary operational systems and equipment.
    - b. Fire separation assemblies.
    - c. Air or smoke barriers.
    - d. Fire-suppression systems.
    - e. Mechanical systems piping and ducts.
    - f. Control systems.
    - g. Communication systems.
    - h. Fire-detection and -alarm systems.
    - i. Conveying systems.
    - j. Electrical wiring systems.

- k. Operating systems of special construction.
- 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
  - a. Water, moisture, or vapor barriers.
  - b. Membranes and flashings.
  - c. Exterior curtain-wall construction.
  - d. Sprayed fire-resistive material.
  - e. Equipment supports.
  - f. Piping, ductwork, vessels, and equipment.
  - g. Noise- and vibration-control elements and systems.
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
  - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Section 01 81 13.13 "Sustainable Design Requirements - LEED for New Construction and Major Renovations."
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
  1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  2. Establish limits on use of Project site.
  3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  4. Inform installers of lines and levels to which they must comply.
  5. Check the location, level and plumb, of every major element as the Work progresses.
  6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
  7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

### 3.4 FIELD ENGINEERING

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

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
  2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
  2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.



- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
  1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

### 3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
  4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not

recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

### 3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

**END OF SECTION 01 73 00**

## **SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for the following:
  - 1. Recycling nonhazardous demolition and construction waste.
  - 2. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
  - 1. Section 02 41 00 "Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
  - 2. Section 31 10 00 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

#### **1.3 DEFINITIONS**

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste

management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:
  - a. Asphalt paving.
  - b. Concrete.
  - c. Concrete reinforcing steel.
  - d. Brick.
  - e. Concrete masonry units.
  
2. Construction Waste:
  - a. Masonry and CMU.
  - b. Lumber.
  - c. Wood sheet materials.
  - d. Wood trim.
  - e. Metals.
  - f. Roofing.
  - g. Insulation.
  - h. Carpet and pad.
  - i. Gypsum board.
  - j. Piping.
  - k. Electrical conduit.
  - l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
    - 1) Paper.
    - 2) Cardboard.
    - 3) Boxes.
    - 4) Plastic sheet and film.
    - 5) Polystyrene packaging.
    - 6) Wood crates.
    - 7) Plastic pails.

#### 1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for the Notice of Award.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
  1. Material category.
  2. Generation point of waste.
  3. Total quantity of waste in tons.
  4. Quantity of waste salvaged, both estimated and actual in tons.
  5. Quantity of waste recycled, both estimated and actual in tons.
  6. Total quantity of waste recovered (salvaged plus recycled) in tons.

7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
- H. Qualification Data: For waste management coordinator.

## 1.7 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:
  1. Review and discuss waste management plan including responsibilities of waste management coordinator.
  2. Review requirements for documenting quantities of each type of waste and its disposition.
  3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  5. Review waste management requirements for each trade.

## 1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  - 1. Comply with operation, termination, and removal requirements in CM Requirements for "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.



- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
  - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
  - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
  
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with CM Requirements for "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
  
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.
  
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
  
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

### 3.3 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
  - 1. Asphalt Paving may not be used as general fill.
- B. Concrete: Break up and transport concrete to concrete-recycling facility.
  - 1. Concrete may not be used as general and subbase fill.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

### 3.4 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.
  - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
  - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

### 3.5 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

**END OF SECTION 01 74 19**

## **SECTION 01 77 00 - CLOSEOUT PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Repair of the Work.
- B. Related Requirements:
  - 1. Section 01 73 00 "Execution" for progress cleaning of Project site.
  - 2. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 4. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.

#### **1.3 ACTION SUBMITTALS**

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

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

#### **1.5 MAINTENANCE MATERIAL SUBMITTALS**

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

## 1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
  
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number where applicable.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
  - 5. Submit test/adjust/balance records.
  - 6. Submit sustainable design submittals required in Section 01 81 13.13 "Sustainable Design Requirements - LEED for New Construction and Major Renovations."
  - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Advise Owner of pending insurance changeover requirements.
  - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 3. Complete startup and testing of systems and equipment.
  - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
  - 6. Advise Owner of changeover in heat and other utilities.

7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements, including touchup painting.
  10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for final completion.

## 1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Construction Manager's requirements.
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

## 1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A or similar.
1. Organize list of spaces in sequential order, starting with exterior areas first and

- proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Page number.
  4. Submit list of incomplete items in the following format:
    - a. MS Excel electronic file. Architect, through Construction Manager, will return annotated file.

## 1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
  1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
  4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
  - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

## PART 3 - EXECUTION

### 3.1 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
  - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
  - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
  - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
  - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

**END OF SECTION 01 77 00**





## **SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Product maintenance manuals.
- B. Related Requirements:
  - 1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Section 01 91 13 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

#### **1.3 DEFINITIONS**

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

#### **1.4 CLOSEOUT SUBMITTALS**

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
  - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

- a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
  - b. Enable inserted reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
  - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

## PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### 2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.
  7. Name and contact information for Architect.
  8. Name and contact information for Commissioning Authority.
  9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

## 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.

- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

## 2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.

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

## 2.5 PRODUCT MAINTENANCE MANUALS

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

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

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  1. Do not use original project record documents as part of operation and maintenance manuals.
  2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."
- G. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

**END OF SECTION 01 78 23**

## SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
- B. Related Requirements:
  - 1. Section 01 73 00 "Execution" for final property survey.
  - 2. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
  - 3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints and one of file prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
      - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

## PART 2 - PRODUCTS

### 2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding archive photographic documentation.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.



5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file with comment function enabled.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect and Construction Manager.
    - e. Name of Contractor.

## 2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
  5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

## 2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Product Data.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

**END OF SECTION 01 78 39**

## **SECTION 01 79 00 - DEMONSTRATION AND TRAINING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.

#### **1.3 QUALITY ASSURANCE**

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### **1.4 COORDINATION**

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

## PART 2 - PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  - 2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project record documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  - 3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  - 4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.

- e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Maintenance: Include the following:
- a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

### 3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final

operation and maintenance data submittals.

- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

**END OF SECTION 01 79 00**

## **SECTION 01 81 13.13 - SUSTAINABLE DESIGN REQUIREMENTS - LEED FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Silver certification based on USGBC's "LEED 2009 for New Construction & Major Renovations."
  - 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 Architect's design and other aspects of Project that are not part of the Work of the Contract.
  - 3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
  - 4. Specific requirements for LEED are included in greater detail in other Sections.

#### **1.3 DEFINITIONS**

- A. 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 manufacturer is certified for chain of custody by an FSC-accredited certification body.
- B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- C. 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.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

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

#### 1.5 ACTION SUBMITTALS

- A. General: Submit additional LEED submittals required by other Specification Sections.
- B. LEED submittals 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.
- C. LEED Documentation Submittals:
  - 1. Credit MR 2: Comply with Section 01 74 19 "Construction Waste Management and Disposal."
  - 2. Credit MR 4: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating cost for each product having recycled content.
  - 3. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
  - 4. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
  - 5. Credit EQ 3.1:
    - a. Construction indoor-air-quality management plan.
    - b. Product data for temporary filtration media.
    - c. Product data for filtration media used during occupancy.
    - d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.
  - 6. Credit IEQ 3.2:
    - a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
    - b. Product data for filtration media used during flush-out and during occupancy.



- c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.
- 7. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
- 8. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
- 9. Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
  - 1. Furniture.
  - 2. Plumbing.
  - 3. Mechanical.
  - 4. Electrical.
  - 5. Specialty items such as elevators and equipment.
  - 6. Wood-based construction materials.
- C. LEED Action Plans: Provide preliminary submittals within 30 days of date established for the Notice of Award indicating how the following requirements will be met:
  - 1. Credit MR 2: Waste management plan complying with Section 01 74 19 "Construction Waste Management and Disposal."
  - 2. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
  - 3. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
  - 4. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
  - 5. Credit IEQ 3.1: Construction indoor-air-quality management plan.
- D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
  - 1. Credit MR 2: Waste reduction progress reports complying with Section 01 74 19 "Construction Waste Management and Disposal."
  - 2. Credit MR 3: Salvaged, refurbished, and reused materials.
  - 3. Credit MR 4: Recycled content.
  - 4. Credit MR 5: Regional materials.
  - 5. Credit MR 7: Certified wood products.

## 1.7 QUALITY ASSURANCE

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

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

### 2.2 RECYCLED CONTENT OF MATERIALS

- A. Credit MR 4: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of 20 percent of cost of materials used for Project.
  - 1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
  - 2. Do not include furniture, plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

### 2.3 REGIONAL MATERIALS

- A. Credit MR 5: Not less than 20 percent of building materials (by cost) shall be regional materials.

### 2.4 CERTIFIED WOOD (ALTERNATE BID)

- A. Credit MR 7: Not less than 50 percent (by cost) of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
  - 1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
    - a. Rough carpentry.
    - b. Miscellaneous carpentry.
    - c. Heavy timber construction.
    - d. Wood decking.

- e. Metal-plate-connected wood trusses.
- f. Structural glued-laminated timber.
- g. Finish carpentry.
- h. Architectural woodwork.
- i. Wood paneling.
- j. Wood veneer wall covering.
- k. Wood flooring.
- l. Wood lockers.
- m. Wood cabinets.
- n. Furniture.

## 2.5 LOW-EMITTING MATERIALS

A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

- 1. Wood Glues: 30 g/L.
- 2. Metal-to-Metal Adhesives: 30 g/L.
- 3. Adhesives for Porous Materials (Except Wood): 50 g/L.
- 4. Subfloor Adhesives: 50 g/L.
- 5. Plastic Foam Adhesives: 50 g/L.
- 6. Carpet Adhesives: 50 g/L.
- 7. Carpet Pad Adhesives: 50 g/L.
- 8. VCT and Asphalt Tile Adhesives: 50 g/L.
- 9. Cove Base Adhesives: 50 g/L.
- 10. Gypsum Board and Panel Adhesives: 50 g/L.
- 11. Rubber Floor Adhesives: 60 g/L.
- 12. Ceramic Tile Adhesives: 65 g/L.
- 13. Multipurpose Construction Adhesives: 70 g/L.
- 14. Fiberglass Adhesives: 80 g/L.
- 15. Contact Adhesive: 80 g/L.
- 16. Structural Glazing Adhesives: 100 g/L.
- 17. Wood Flooring Adhesive: 100 g/L.
- 18. Structural Wood Member Adhesive: 140 g/L.
- 19. Single-Ply Roof Membrane Adhesive: 250 g/L.
- 20. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine-covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
- 21. Top and Trim Adhesive: 250 g/L.
- 22. Plastic Cement Welding Compounds: 250 g/L.
- 23. ABS Welding Compounds: 325 g/L.
- 24. CPVC Welding Compounds: 490 g/L.
- 25. PVC Welding Compounds: 510 g/L.
- 26. Adhesive Primer for Plastic: 550 g/L.
- 27. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
- 28. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
- 29. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
- 30. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.
- 31. Other Adhesives: 250 g/L.
- 32. Architectural Sealants: 250 g/L.
- 33. Nonmembrane Roof Sealants: 300 g/L.
- 34. Single-Ply Roof Membrane Sealants: 450 g/L.
- 35. Other Sealants: 420 g/L.

36. Sealant Primers for Nonporous Substrates: 250 g/L.
  37. Sealant Primers for Porous Substrates: 775 g/L.
  38. Modified Bituminous Sealant Primers: 500 g/L.
  39. Other Sealant Primers: 750 g/L.
- B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: VOC not more than 50 g/L.
  2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
  3. Dry-Fog Coatings: VOC not more than 400 g/L.
  4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
  5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
  6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
  7. Pretreatment Wash Primers: VOC not more than 420 g/L.
  8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
  9. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
  10. Floor Coatings: VOC not more than 100 g/L.
  11. Shellacs, Clear: VOC not more than 730 g/L.
  12. Shellacs, Pigmented: VOC not more than 550 g/L.
  13. Stains: VOC not more than 250 g/L.
- C. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin.

## PART 3 - EXECUTION

### 3.1 CONSTRUCTION WASTE MANAGEMENT

- A. Credit MR 2: Comply with Section 01 74 19 "Construction Waste Management and Disposal."

### 3.2 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

- A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 01 50 00 "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
  2. Replace all air filters immediately prior to occupancy.
- B. Credit IEQ 3.2: Comply with one of the following requirements:
1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.
  2. If occupancy is desired prior to flush-out completion, the space may be occupied

following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. 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 Prerequisite EQ 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space.

3. Air-Quality Testing:

- a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide."
- b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
  - 1) Formaldehyde: 27 ppb.
  - 2) Particulates (PM10): 50 micrograms/cu. m.
  - 3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
  - 4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
  - 5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
- c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.
- d. Air-sample testing shall be conducted as follows:
  - 1) All 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.
  - 2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
  - 3) Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
  - 4) Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

**END OF SECTION 01 81 13.13**

# U S Green Building Council

40	11	10	46	<b>Total Project Score</b>
----	----	----	----	----------------------------

**Certified** 40 points    **Silver** 50 points    **Gold** 60 points    **Platinum** 80 or more points

Probable	Medium	Low	Not Likely				
7	7	2	13	<b>Sustainable Sites</b>	Possible Points	<b>26</b>	
Y				Prereq 1	<b>Erosion &amp; Sedimentation Control</b>		D & C
	2			Credit 1	<b>Site Selection</b>	1	D
			5	Credit 2	<b>Development Density &amp; Community Connectivity</b>	5	D
			1	Credit 3	Brownfield Redevelopment	1	D
			6	Credit 4.1	<b>Altern Transportation, Public Transportation Access</b>	6	D
			1	Credit 4.2	<b>Altern Transportation, Bicycle Storage &amp; Changing Rooms</b>	1	D
3				Credit 4.3	<b>Altern Transportation, Low Emission</b>	3	D
2				Credit 4.4	<b>Altern Transportation, Parking Capacity</b>	2	D
	2			Credit 5.1	<b>Protect or Restore Habitat</b>	1	D & C
		1		Credit 5.2	<b>Maximize Open Space</b>	1	D
		1		Credit 6.1	<b>Stormwater Management, Quantity Control</b>	1	D
	2			Credit 6.2	<b>Stormwater Management, Quality Control</b>	1	D
1				Credit 7.1	<b>Reduce Heat Islands, Site / Non-Roof</b>	1	C
1				Credit 7.2	<b>Reduce Heat Islands, Roof</b>	1	C
	1			Credit 8	<b>Light Pollution Reduction</b>	1	D

7			4	<b>Water Efficiency</b>	Possible Points	<b>10</b>	
Y				Prereq 1	<b>Water Use Reduction</b>		D
5				Credit 1.1	<b>Water Efficient Landscaping</b>	4	D
			2	Credit 2	<b>Wastewater Technologies</b>	2	D
2			2	Credit 3	<b>Water Use Reduction</b>	4	D

6	2	6	21	<b>Energy &amp; Atmosphere</b>	Possible Points	<b>35</b>	
Y				Prereq 1	<b>Fundamental Building Systems Commissioning</b>		C
Y				Prereq 2	<b>Minimum Energy Performance</b>		D
Y				Prereq 3	<b>Fundamental Refrigerant Management</b>		D
1	2		16	Credit 1.5	<b>Optimize Energy Performance,</b>	19	D
		2	5	Credit 2.1	<b>Renewable Energy</b>	7	D
		2		Credit 3	<b>Enhanced Commissioning</b>	2	C
2				Credit 4	<b>Enhanced Refrigerant Management</b>	2	D
1		2		Credit 5	<b>Measurement &amp; Verification</b>	3	C
2				Credit 6	<b>Green Power</b>	2	C

6		1	4	<b>Materials &amp; Resources</b>	Possible Points	<b>14</b>	
Y				Prereq 1	<b>Storage &amp; Collection of Recyclables</b>		D
			1	Credit 1.1	Building Reuse, Existing Shell and Structure	3	C
			1	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1	C
2				Credit 2.1	<b>Construction Waste Management</b>	2	C
			1	Credit 3.1	<b>Material Reuse</b>	2	C
2				Credit 4.1	<b>Recycled Content</b>	2	C
2				Credit 5.1	<b>Local/Regional Materials</b>	2	C
			1	Credit 6	<b>Rapidly Renewable Materials</b>	1	C
		1		Credit 7	<b>Certified Wood</b>	1	C

## U S Green Building Council

9	1	1	4	Indoor Environmental Quality	Possible Points	15
Y				Prereq 1 <b>Minimum IAQ Performance</b>		D
Y				Prereq 2 <b>Environmental Tobacco Smoke Control</b>		D
1				Credit 1 <b>Carbon Dioxide (CO<sub>2</sub>) Monitoring</b>	1	D
			1	Credit 2 <b>Increase Ventilation Quantity</b>	1	D
1				Credit 3.1 <b>IAQ Management Plan</b> , During Construction	1	C
1				Credit 3.2 <b>IAQ Management Plan</b> , Before Occupancy	1	C
1				Credit 4.1 <b>Low-Emitting Materials</b> , Adhesives & Sealants	1	C
1				Credit 4.2 <b>Low-Emitting Materials</b> , Paints	1	C
1				Credit 4.3 <b>Low-Emitting Materials</b> , Flooring	1	C
1				Credit 4.4 <b>Low-Emitting Materials</b> , Composite Wood	1	C
1				Credit 5 <b>Indoor Chemical &amp; Pollutant Source Control</b>	1	D
			1	Credit 6.1 <b>Controllability of Systems</b> , Lighting Controls 90% spaces	1	D
	1			Credit 6.2 <b>Controllability of Systems</b> , Thermal Controls	1	D
1				Credit 7.1 <b>Thermal Comfort</b> , Comply with ASHRAE 55-1992	1	D
		1		Credit 7.2 <b>Thermal Comfort</b> , Assessment	1	C
			1	Credit 8.1 <b>Daylight</b> , 75% of Spaces	1	D
			1	Credit 8.2 <b>Views</b> , 90% of Spaces	1	D

5	1			Innovation & Design Process	Possible Points	5
1				Credit 1.1 <b>Innovation Design</b> : Green Education	1	
1				Credit 1.2 <b>Innovation Design</b> : Green Power	1	
1				Credit 1.3 <b>Innovation Design</b> : Increased Recycled Content	1	
	1			Credit 1.4 <b>Innovation Design</b> : Pest Control	1	
1				Credit 1.5 <b>Innovation Design</b> : Green Cleaning	1	
1				Credit 2 <b>LEED™ Accredited Professional</b>	1	



## **SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. This Section specifically identifies the requirements of the Project Commissioning Team, which includes the Commissioning Provider (CxP), Owner, General Contractor, Installation Contractors, Equipment Suppliers and Vendors in the execution of the commissioning process. A Commissioning Plan shall be provided by the CxP early in the Construction Phase to outline the Commissioning Process, including roles and responsibilities of the Project Commissioning Team. The plan shall also identify the logistics, schedules and management protocols associated with the commissioning process. The plan shall be updated by the CxP as required to accommodate project logistical changes.
  
- B. This Section shall delineate the requirements of the GC and Installation Contractors for the execution of the commissioning process for the following activities:
  - 1. Participation in Commissioning Meetings
  - 2. Commissioning submittal requirements
  - 3. Installation verification and start-up for system components.
  - 4. Functional operational demonstration of system performance
  - 5. Commissioning field deficiencies and test deficiencies.
  - 6. The GC and Installation Contractors shall:
    - a. Verify installation and perform quality control.
    - b. Provide project scheduling that coordinates commissioning activities with installation contractors' activities
    - c. Execute the Training Plan
    - d. Perform equipment installation verification and start up. Contractor shall verify the functional readiness of systems to be tested, using pre-functional performance tests, prior to scheduling and demonstrating the functional operational performance in the presence of the CxP.
    - e. Conduct functional performance testing
    - f. Correct deficiencies
    - g. Conduct functional performance retesting, as necessary
    - h. Provide documentation of the effort.
  
- C. The Owner, Architect/Engineer, and CxP are not responsible for construction means, methods, job safety, or management function related to commissioning on the job site.

#### **1.2 RELATED SECTIONS**

- A. Section 01 91 14 – Functional Testing Requirements
- B. Division 14 – Conveying Equipment
- C. Division 21 – Fire Protection
- D. Division 22 – Plumbing
- E. Division 23 – Heating, Ventilation and Air Conditioning
- F. Division 26 – Electrical
- G. Division 28 – Electronic Safety and Security

### 1.3 EQUIPMENT AND SYSTEMS INCLUDED IN COMMISSIONING PROGRAM

- A. The following is a list of the equipment and system test requirements included in this section:
1. Division 14 – Conveying Equipment
    - a. Elevators
  2. Division 21 – Fire Protection
    - a. Fire Protection System
  3. Division 22 - Plumbing
    - a. Sump Systems
    - b. Water Supply Including Circulation Systems & Auto Valves
  4. Division 23 - Heating Ventilating and Air Conditioning
    - a. Rooftop Unit With DX Cooling
    - b. Computer Room Air Conditioning Units
    - c. Variable Air Volume Boxes
    - d. Fan Coil Units
    - e. Cabinet Heaters
    - f. Unit Heaters
    - g. Toilet Exhaust
    - h. Gas Fired Rooftop Units
    - i. Boilers
    - j. DDC Building Control System (HVAC System, Security Systems & Emergency Power)
  5. Division 26 - Electrical
    - a. Lighting Control Including Time Settings & Sensitivity on Sensors
    - b. Power Monitoring & Control
    - c. Variable Frequency Drives
    - d. Electrical Distribution, Greater Than 400A
    - e. Automatic Transfer Switches
  6. Division 28 – Electronic Safety
    - a. Fire Alarm System

### 1.4 DEFINITIONS

- A. Acceptance Phase: Phase of construction after startup and initial checkout when Functional Performance Testing, O&M documentation review, and facility and user training occur.
- B. Basis of Design (BOD): Documentation of design criteria and decisions made to meet design intent. Describes systems, components, conditions, and methods chosen to define the intent of the Owner.
- C. Building Automation System (BAS): The system used to control building system in accordance with specifies sequenced of operation.
- D. Commissioning Plan (CP): A manual providing documentation of roles and responsibilities and provides structured means of scheduling, coordination and documentation for the commissioning process.
- E. Commissioning Provider (CxP): The consultant who facilitates the commissioning program and directs and coordinates day-to-day commissioning activities. Acts as the objective advocate for the Owner. The CxP is contracted by the Owner.
- F. Commissioning Team (CT): The Project Team including the Owner, General Contractor, Design Professional, Installation Contractors and equipment manufacturer representatives (as needed).

- G. Deferred Functional Test: Functional performance test performed after substantial completion due to conditions that preclude test from being performed in normal sequential order of project delivery. Also includes seasonal testing of environmental systems.
- H. Deficiency: Condition of a component, piece of equipment, or system that is not in compliance with Contract Documents. The CxP shall conduct a series of construction phase site visits to observe the progress of installation of building systems in the Commissioning Program. Deficiencies identified by the CxP shall be reviewed by the Design Professionals to determine if the deficiency is a non-conformance issue. If the issue is a non-conformance issue, the Design Professionals shall include the issue in their non-conforming issues report to the contractors.
- I. Design Professional (A/E): The design team, generally the Architect, Mechanical Engineer and Electrical Engineer.
- J. Factory Testing: Testing of equipment at factory by the Manufacturer.
- K. Functional Performance Test (FPT): Test of dynamic function and operation of equipment and systems. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. Systems are run through all specified sequences of operation. Components are verified to be responding in accordance with contract documents. Functional Performance Tests are witnessed by the CxP and executed by the responsible contractor after installation certification forms and start-ups and Pre-Functional Test documentation.
- L. Functional Performance Test Document: Protocols and instructions provided for and described in the Commissioning Plan and specifications that describe process required to document Functionality Testing process for each system. Also includes the Systems Integration Tests to confirm that various inter-related systems respond as intended. . CxP develops Functional Performance Test procedures in sequential written form, coordinates, oversees and documents actual testing, which is usually performed by installing contractor or vendor.
- M. General Contractor (GC): The prime contractor responsible for the construction of the facility in accordance with contract documents. Responsible for oversight and coordination of all sub-contractor activities to ensure on-time project delivery and compliance with the commissioning program.
- N. Installation Certification Form (ICF): Document used by the GC to certify that they have inspected the work of the installing contractors and determined that it is in full compliance with the contract requirements. This form is required on each piece of equipment or component prior to functionally testing the system. Monitoring: Recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or trending capabilities of control systems.
- O. Installation Contractor (Sub-Contractor): Contractor who is under contract to General Contractor who provides and/or installs building components and systems.
- P. Phased Commissioning: Commissioning completed in phases due to size of structure, construction phasing, availability of systems, etc.
- Q. Pre-Functional Testing (PFT): Testing performed by the responsible contractor utilizing the functional performance test protocol This testing is a prerequisite to the Functional Performance Test witnessed and documented by the CxP.
- R. Seasonal Performance Evaluation: Functional Performance evaluation executed at the time of year such that system(s) experience conditions closer to design conditions. Includes a combination of trend log analysis and possibly on-site testing as appropriate.
- S. Specifications: Construction specifications of Contract Documents.

- T. Startup: Initial start or activation of dynamic equipment, including executing the Installation Certification Form and completing a manufacturer's start-up and form where applicable.
- U. Trending: Monitoring controls points of systems as a function of time using building control system.
- V. Vendor: Supplier of equipment.

## 1.5 COORDINATION

- A. Perform commissioning services to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
- B. CxP shall provide overall coordination and management of the commissioning program as specified herein.
- C. Commissioning Team:
  - 1. The Commissioning Team (CT) is comprised of representatives from the project team who shall be the primary contact for commissioning activities:
    - a. Commissioning Provider (CxP)
    - b. Owner's Representative(s) (OR)
    - c. General Contractor
    - d. Design Professional (A/E)
    - e. Finishes Contractors
    - f. Equipment Installation Contractors
    - g. Mechanical Contractor (MC)
    - h. Electrical Contractor (EC)
    - i. Test and Balance Contractor (TAB)
    - j. Controls Contractor (CC)
    - k. Equipment Suppliers and Vendors
- D. The CxP may witness test activities specified in Division 1 and the technical specifications as well as select construction tests (e.g. piping pressure tests, duct leakage test, etc.) and equipment start-up tests. The OR shall witness commissioning activities as appropriate. Contractors shall provide a minimum five (5) working days advanced notice when tests are scheduled.
- E. Contractor shall provide written timely notice to GC and CxP of any changes in date, time, and location or anticipated duration of start-up and test activities. For the purpose of this paragraph written notice shall be received by a minimum of 48 hours in advance to be considered timely.
- F. Tests that are not performed as scheduled shall be considered a failed test unless notification of cancellation or rescheduling was received by all parties. The notification shall be received 48 hours prior to the scheduled arrival of the CxP on site to witness functional testing. Contractor shall reimburse Owner for actual costs incurred by the Owner as the result of failure to provide timely notice, per preceding paragraph, of changes in date, time, location, or anticipated duration of start-up and test activities. The actual costs incurred by the Owner shall include costs associated with the CxP involvement.
- G. Meeting:
  - 1. Within 90 days after all installation contractors involved in the commissioning program have been awarded a contract for the project, the CxP shall plan, schedule, and conduct a commissioning kickoff meeting with designated project team commissioning representatives in attendance. Responsibilities of the commissioning team shall be clarified at this meeting. The CxP shall distribute meeting minutes to all parties.

2. Commissioning meetings shall be held on a monthly basis as a minimum during the construction installation phase of work. The frequency of these meetings shall increase as construction and acceptance activities require. Designated project team commissioning representatives shall attend the meetings as appropriate based upon the agenda topics to be discussed.
3. Commissioning meetings shall be held weekly during the functional performance testing phase to review status of testing discrepancies and scheduling of retests and back checks.

H. Scheduling:

1. Once a master construction schedule is issued, the CxP shall provide for incorporation to the schedule, commissioning milestone activities linked to specific predecessor construction activities. As construction progresses, more specific activities and milestones shall be incorporated into the master construction schedule.
2. Approximately 6 to 8 weeks prior to the commencement of equipment start-ups, the CxP shall conduct a commissioning functional testing schedule workshop with all commissioning representatives. The purpose of this workshop is to establish a coordinated approach to the integration of the function testing activities with the master construction schedule to ensure substantial completion can be achieved as scheduled.
3. In cooperation with the CxP, the GC shall integrate commissioning activities into the master construction schedule.
4. Scheduling issues shall be resolved at monthly commissioning meetings.

1.6 SUBMITTALS

- A. General: Submit the following in accordance with requirements of Section 01 33 00.
- B. Start-up plan: For each piece of equipment or system, the GC and Installation Contractors shall submit a start-up plan. Obtain approval of the plan prior to beginning activities. The plan should include, but not be limited to, the following:
  1. Start-up schedule
  2. Names of firms/individuals required to participate
  3. Detailed manufacturer start-up procedures
  4. Manufacturer start-up data forms
- C. Installation Certification Form (ICF): Installation contractors shall provide CxP, through the GC a completed ICF and a completed manufacturer's start-up form for each piece of equipment or component of a building system included in the commissioning program. These documents shall be used to determine the readiness of the building system for functional performance testing.
- D. Pre-Functional Performance Test Documentation: Responsible contractor shall execute the pre-functional performance test and document the satisfactory results of the testing. The completed test shall be provided to the CxP through the GC for review and approval. Final scheduling of the functional performance test on a building system shall not be established until the pre-functional performance test documentation is approved.
- E. Temporary Use of Permanent Equipment Operations and Maintenance Plan: Should the contractor receive authorization from the OR to utilize permanent equipment per Section 01 9113-3.2, an Operations and Maintenance Plan shall be submitted for review and approval prior to temporary use of permanent equipment. The Plan shall include a temporary sequence of operations.
- F. Submit the final program logic and as-built control sequences used to control all systems included in the commissioning program. As-built control sequences shall also include all system setpoints and reset schedules.
- G. The CxP shall review submittals for criteria as related to commissioning. Review is primarily intended to aid in development of functional testing procedures and secondarily to verify

compliance with equipment specifications. The CxP notifies the GC, OR and A/E of missing items or where issues may exist.

## PART 2 - PRODUCTS

### 2.1 TEST EQUIPMENT

- A. Installation contractors shall provide all specialized tools, test equipment, and instruments required to execute startup, checkout, field calibration and functional performance testing of equipment under their contract.
- B. Test equipment shall be of sufficient quality and accuracy (greater accuracy than specified for component) to test and/or measure system performance according to specified tolerances. Test equipment is to have been calibrated within the previous 12 months. Calibration shall be NIST traceable. Equipment shall be re-calibrated when dropped or damaged. Calibration tags shall be affixed or certificates be readily available for review by the CxP.
- C. Datalogging equipment or software required to test equipment will be provided by the CxP, but shall not become the property of the Owner.

## PART 3 - EXECUTION

### 3.1 COMMISSIONING OVERVIEW

- A. The following provides a brief overview of typical commissioning tasks during construction and general order in which they occur.
  - 1. Commissioning kick-off meeting held within 90 days after all installation contractors involved in the commissioning program have been awarded a contract for the project.
  - 2. Contractor's submittals for equipment and system components included in the commissioning program are reviewed by the A/E and the CxP as specified and in accordance with the requirements of other sections of this project manual.
  - 3. CxP completes development of Functional Performance Tests protocols based on submittals and approved sequence of operations and submits to Project Team for review and comment. Final format of testing protocols, based on review comments, are prepared by CxP and distributed in sufficient time to allow the responsible contractor to complete the pre-functional performance test.
  - 4. During the Construction Phase, the CxP shall make periodic site visits to observe installation progress, conduct commissioning meetings and follow-up on open issues from past visits. Frequency of visits shall increase as systems are nearing start-up and functional testing. Observation reports shall be issued after each site visit.
  - 5. The GC and sub-contractors document proper installation and start-up of equipment utilizing the Installation Certification Form (ICF) developed by the CxP. Supplemental start up documentation and manufacturer authorized representatives start up documentation shall also be attached to the ICF.
  - 6. CxP receives the completed ICF along with the completed manufacturer's start-up form for each respective piece of equipment and/or system. During site visits, CxP may conduct random review of equipment included in completed ICF's.
  - 7. Prefunctional Performance Test documentation. After the system components have been properly installed and started in accordance with the ICF and manufacture representative start up activities, the responsible contractor shall perform a prefunctional performance test on the system utilizing the functional performance test protocols. This test shall not be witnessed by the CxP but is required prior to scheduling the FPT.
  - 8. Contractor and Owner develops Training Plan including training agendas in coordination with the OR and GC.
  - 9. Functional Performance Testing for a system shall be scheduled upon completion of the ICF's for each piece of equipment and component in a building system and Prefunctional

Performance Testing. The contractor with responsibility for the functionality of a system demonstrates system functionality to CxP. The CxP shall document the results of the testing.

10. CxP recommends acceptance of performance and functionality or recommends remedial action and re-testing.
11. GC and sub-contractors shall be responsible for providing training in accordance with the Training Plan. Training Plan schedule is coordinated with the OR by the GC.
12. Final Commissioning Report.
13. Deferred Testing.
  - a. Unforeseen Deferred Tests.
  - b. Seasonal Testing.
  - c. End-of-Warranty Review.

### 3.2 TEMPORARY USE OF PERMANENT BUILDING SYSTEMS DURING CONSTRUCTION

- A. Temporary use of permanent building systems shall be authorized only by the Owner in coordination with the A/E and GC.
- B. An Operations and Maintenance Plan shall be developed and submitted for review and approval. Should the temporary operation of the system include a Sequence of Operations that does not conform fully to the contract requirements, this temporary Sequence of Operations shall be in the Operations and Maintenance Plan. The temporary Sequence of Operations shall include all safeties to ensure the permanent equipment is protected against failure or damage. A/E and CxP shall review and approve the temporary Operations and Maintenance Plan prior to the contractor energizing and operating the system in the temporary mode.
- C. As the construction progresses it may be necessary to utilize building systems for temporary environmental control within the building. Should systems be used for temporary environmental control, this activity shall be sequenced into the system delivery process and involve temporary start-up and functional operations testing. Temporary conditions shall not be fully functionally tested to the extent that a duplication of effort must occur for final delivery to the Owner, once the system is fully operational and balanced. Temporary conditions must, at a minimum, meet the intent of the documentation regarding functionality, hydronic flow rates and space pressurization. The sub-contractor shall utilize the ICF for documenting the readiness of the system to be temporarily operated based upon an approved Operations and Maintenance Plan for the temporary use. The contractor shall be responsible to verify that all temporary conditions meet the requirements of the design documents.
- D. A formal verification process for temporary systems will be at the discretion of the Owner and the A/E in the event the need becomes apparent. A formal process is defined as the responsible contractor demonstrating comprehensive functionality to a representative of the Owner, CxP or A/E. The Owner shall not bear additional cost for this demonstration and the demonstration shall occur at the request of the Owner or A/E.
- E. The above applies to systems that serve areas of phased construction. Testing shall occur piecewise as determined prudent by the project team for conditions of a system considered to be permanent. The intent is to not repeat the formal functional testing process on a system except as deemed prudent for effective delivery to the Owner.

### 3.3 RESPONSIBILITIES

- A. Responsibilities of contractors are provided as follows (the project Commissioning Plan shall include a comprehensive list of responsibilities of all project parties):
  1. General Contractor (GC):
    - a. Include requirements for commissioning in each purchase order or subcontract written.
    - b. Ensure acceptable representation, with the means and Provider to assist the CxP in the coordination and execution of the commissioning program.

- c. Attend commissioning kick-off meeting and other commissioning team meetings. Ensure appropriate representation at these meetings by sub-contractors.
  - d. Incorporate commissioning milestones and activities including functional performance testing into master construction schedule. Maintain and update schedule, as needed, such that it is an accurate representation of construction progress through the completion of functional performance testing and resolution of all punch list issues. Also incorporate durations for scheduled training in the schedule.
  - e. Review and provide comment on the Commissioning Plan and Functional Performance Test protocols developed by CxP.
  - f. Take lead role in coordinating completion and documentation of the Installation Certification Form for equipment and components of building systems included in the Commissioning Program.
    - 1). Coordinate this activity with knowledgeable staff of.
    - 2). Once all ICF's are completed for a building system, GC shall forward them ICF's to CxP as a system package.
  - g. Coordinate the execution of prefunctional performance test documentation with the responsible contractors.
  - h. Coordinate Contractor participation in execution of the Training Plan.
  - i. Provide CxP with required documentation from commissioning activities and submittal requests.
  - j. Schedule, coordinate and assist CxP in seasonal or deferred testing and deficiency corrections required by specifications.
2. Installation Contractors:
- a. Ensure acceptable representation on the commissioning team, with the means and Provider to assist the CxP in the coordination and execution of the commissioning program.
  - b. Attend commissioning kick-off meeting and other commissioning team meetings scheduled by CxP.
  - c. Assist CxP with developing a comprehensive commissioning schedule during regularly scheduled commissioning meetings. Participate in the functional test scheduling workshop.
  - d. Complete commissioning activities as scheduled in master construction schedule.
  - e. Complete Installation Certification Form along with respective manufacturer's start-up form and submit with supporting documentation to the GC.
  - f. Address deficiencies identified during construction phase site visits in a timely manner. Within two (2) work days of notification of a deficiency, acknowledge the deficiency and implement action required to address the issue. Within five (5) work days of notification of a deficiency have deficiency corrected.
  - g. Provide certified and calibrated instrumentation to field calibrate all sensors and devices and assist during Functional Performance Testing.
  - h. Ensure installation work is complete, in compliance with Contract Documents, in accordance with approved submittals and meets or exceeds industry standards and ready for Functional Performance Testing.
  - i. Execute the prefunctional performance test successfully. Resolve any performance issues with the A/E.
  - j. Execute inspections, tests, and Functional Performance Tests as described in contract documents and Commissioning Plan. Operate systems and equipment to demonstrate proper sequences of operation.
  - k. Review Commissioning Plan and Functional Performance Test procedures.
  - l. Provide required training for Owner personnel utilizing qualified and experienced instructors.
  - m. Provide documentation according to contract documents.



- n. Address deficiencies identified during functional testing in a timely manner. Within one (1) work day of notification of a deficiency, acknowledge the deficiency and implement action required to address the issue. Within two (2) work days of notification of a deficiency have deficiency corrected unless an extension is approved by the OR and CxP.
  - o. Execute seasonal or deferred Functional Performance Testing.
3. Controls Contractor:
- a. Ensure acceptable representation, with the means and Provider to assist the CxP in the coordination and execution of the commissioning program.
  - b. Completely install and thoroughly inspect, startup, test, adjust, field calibrate, and document systems, equipment, devices, sensors, etc. controlled by the building automation system. Provided documented point-to-point check out of the system prior to functional performance testing. Field calibration of sensors and devices shall be performed even though factory calibration documentation has been provided.
  - c. Address deficiencies identified during construction phase site visits in a timely manner. Within two (2) work days of notification of a deficiency, acknowledge the deficiency and implement action required to address the issue. Within five (5) work days of notification of a deficiency have deficiency corrected.
  - d. Complete prefunctional performance tests for all sequence of operations controlled by the Building Automation System.
  - e. Assist CxP during Functional Performance Testing. Assistance shall generally include the following:
    - 1). Attend Cx progress and coordination meetings
    - 2). Complete Installation Certification Forms (ICF's) with supporting documentation and submit to the GC.
    - 3). Prepare and submit required draft forms and systems information.
    - 4). Set up trend logs of system operation at discretion of CxP.
    - 5). Demonstrate system operation to the CxP.
    - 6). Address deficiencies identified during functional testing in a timely manner. Within one (1) work day of notification of a deficiency, acknowledge the deficiency and implement action required to address the issue. Within two (2) work days of notification of a deficiency have deficiency corrected unless an extension is approved by the OR and CxP.
    - 7). Provide onsite programmer(s), in addition to those dedicated to functional testing, to correct deficiencies in control sequences during the commissioning period. Minor adjustments to program logic may be made during the functional testing at the discretion of the CxP. All other programming issues shall be completed either after hours or by utilizing additional controls technicians.
    - 8). Provide instrumentation, in calibration, necessary for field verification of all sensors and devices and Functional Performance Testing.
    - 9). Manipulate control systems to facilitate verification and Functional Performance Testing.
    - 10). Provide at least one dedicated controls technician who is totally familiar with the controls installation and program logic on the project to work with the CxP during the functional performance testing.
    - 11). Provide an as-programmed copy of the control logic for each system controlled by the Building Automation System and provide an as-built sequence of operations for each system.
4. Test Adjust Balance (TAB) Subcontractor:
- a. Ensure acceptable representation, with the means and Provider to assist the CxP in the coordination and execution of the commissioning program.
  - b. Attend Commissioning meetings.

- c. Both air and hydronic balancing of systems supporting a building system shall be completed prior to the functional performance test of the system.
- d. Once TAB record is completed, coordinate with the CxP to verify up to 10% of the record. Contractor shall utilize equipment used during initial TAB balancing for the TAB verification.
- e. Rebalance deficient areas identified during commissioning.

### 3.4 COMMISSIONING TEAM MEETINGS

- A. Commissioning Team Meetings shall be held periodically as determined by CxP with frequency increasing as construction advances and systems become operational. Three days prior to a scheduled meeting the CxP shall issue an Agenda and a list of meeting participants. Not all meetings will require all team members to be present. Attendance is mandatory for Contractors on the agenda participant list. CxP shall chair Commissioning Team Meetings and issue meeting minutes within two (2) days of the meeting.
- B. Discussions held in Commissioning Team Meetings shall include but not be limited to system / equipment start-up, progress, scheduling, testing, documentation, training, deficiencies, and problem resolution.

### 3.5 BUILDING SYSTEM MAINTENANCE/SERVICE POINT ACCESS REQUIREMENTS

- A. Each trade contractor shall be responsible for flagging all maintenance points that are located above the ceiling. Construction warning ribbon (1" minimum width) shall be securely attached to the maintenance point and, where applicable, extended down to the ceiling height level such that it is highly visible by all trades. If the location has no ceiling the ribbon shall extend a minimum of 3 feet.
- B. All trades shall ensure that unobstructed access to the maintenance point is maintained from floor level up to the point of service. Unobstructed access shall include full body access to the service point should that be required for maintenance activities. Any trade who installs systems encroaching upon the unobstructed access shall be required to relocate their material, systems and/or equipment at no additional cost to the Owner.

### 3.6 INSTALLATION CERTIFICATION FORM (ICF)

- A. The purpose of this certification form is to formally document the contractor's quality assurance effort as it relates to the installation and start-up of the specified piece of equipment or system component. The installing contractor responsible for the system shall be responsible for coordinating the completion of this form with the other trades supporting the installation and start-up. The individual signing this certification shall have the Provider to sign on behalf of the contractor and shall have direct personal knowledge of the equipment or system component installation. Any contractor start-up forms or manufacturer specified start-up procedures and documentation shall be attached to this certification form. The completed ICF shall be submitted to the GC.
- B. The GC shall coordinate the effort. When an installing contractor completes an ICF and submits it to the GC, the GC representative shall sign the ICF after inspecting the installation and confirming the equipment/system component, as installed, meets the requirements of the project documents and is ready for functional performance testing. The GC shall compile all ICF's for equipment/system components then submit a system package to the CxP for review.
- C. At appropriate milestones, the GC shall review the status of the completion of the ICF's with each contractor to ensure progress in completing this documentation does not delay the start of functional testing.
- D. Lead Trade Contractor and supporting trade contractors shall execute the ICF and provide the GC with an original signed and dated form. Only individuals with the Provider to sign as the contractor representative and having direct knowledge of the installation and start-up of the

equipment or system component shall sign Installation Certification Form. The CxP receives completed ICF's from the GC as system packages. Once all equipment and system component certification forms have been submitted for a building system the contractor shall proceed with the Pre-Functional Performance Testing.

E. The OR, A/E or CxP reserve the right to witness any startup and preliminary equipment testing.

### 3.7 FUNCTIONAL PERFORMANCE TESTING

#### A. General:

1. Refer to Section 01 9114 for additional details regarding the functional performance testing.

#### B. Objectives and Scope:

1. Each system shall be operated through all modes of operation (normal operation, failure/recovery operation, seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, etc.) where there is a specified system response. Verifying each sequence in the specified sequence of operation is required including responses to conditions such as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. The first step in achieving these objectives is the successful execution of the FPT by the responsible contractor as a prefunctional performance test prior to demonstrating the system operation to the CxP.
2. The contractor responsible for the dynamic operation of a system shall demonstrate comprehensive functionality of that system. All contractors that have contributed to the installation of the same system shall not be required to directly participate in the functional testing activity but shall be required to be immediately available for reconciliation of issues that fall within their scope and responsibility during testing.
3. Functional Performance Testing witnessed by the CxP shall be considered successful when repeatable acceptable outcomes meeting the Basis of Design criteria are achieved.

#### C. Coordination and Scheduling:

1. Functional Performance Testing is conducted following completion of all installation and start-up contractor activities for all equipment and system components associated with the building system. The ICF's for all system equipment/components shall be completed by the installing contractors, submitted by the GC and reviewed by the CxP prior to performing the Pre-Functional Performance Test. Once both of these tasks are complete and reviewed by the CxP, the Functional Performance Test shall be scheduled.
2. Coordination and final scheduling confirmation of Functional Performance Testing shall occur during regularly scheduled commissioning meetings.
3. All commissioning activities shall be fully integrated into the construction activity schedule. This includes milestone deadlines for completion of installation of major system components and the durations for functional testing of a system.
4. The GC shall provide sufficient notice to CxP regarding changes to the coordinated completion schedule for systems testing.
5. CxP shall witness and document Functional Performance Testing of systems. Designated sub-contractor or vendor responsible for dynamic operation of a system or device shall demonstrate system functionality to CxP.
6. Functional Performance Test discrepancies shall be issued upon completion of a system test, or portion thereof should the deficiency preclude continuation of testing.

#### D. Test Strategy

1. Each contractor shall comprehensively test and document all building systems in the Commissioning Program for which they are responsible utilizing the Pre-Functional Performance Test Document. Any discrepancies or issues identified during the Pre-Functional Performance Test shall be resolved then retested and documented by the installation contractor.

2. Once the successful Pre-Functional Performance Test has been documented, then the CxP shall witness and document the Functional Performance Test for the record.
3. Systems that contain many repeated identical devices may be selected and demonstrated to the project team based on the sampling strategy indication in paragraph 1.3A of this specification.

E. Non-Conformance:

1. CxP shall document results of Functional Performance Test to FPT forms. Deficiency or non-conformance issues shall be noted and reported to commissioning team as a punch list item with specific responsibility indicated.
2. Corrections of minor deficiencies identified may be made during testing at discretion of CxP. In such case, deficiency and resolution shall be documented on procedure form and to punch list as a resolved issue.
3. Every effort shall be made to expedite testing and minimize unnecessary delays, while not compromising integrity of procedures.
4. Deficiencies are handled in the following manner:
  - a. When there is no dispute on deficiency and Contractor accepts responsibility for remedial action:
    - 1). CxP documents deficiency and contractor's response and intention. CxP posts issue to action list. Contractor corrects deficiency and resubmits to CxP. Contractor addresses all issues noted on action list by correcting deficiencies or by posting date for completion of resolution of deficiency.
    - 2). Contractor shall provide a response pertaining to the deficiency within one (1) work day of notification of the deficiency. This response shall include the contractor's intentions for addressing the issue. Contractor shall satisfactorily address the issue including completion of the corrective actions within two (2) work days of the initial notification of the deficiency unless an extension is authorized by the OR and CxP.
    - 3). The GC reschedules test with CxP and contractor. New test time is posted to project schedule.
  - b. When there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
    - 1). CxP documents deficiency and contractor's response and testing proceeds on subsequent test or sequence. CxP posts issue to punch list and distributes to team.
    - 2). The GC facilitates resolution of deficiency. Other parties are brought into discussions as needed. Final interpretive Provider is with A/E. Final acceptance Provider is with the Owner.
    - 3). CxP documents resolution process.
    - 4). Once interpretation and resolution has been decided, appropriate party corrects deficiency, and CxP is given notice to proceed for retest. The GC and CxP reschedule test. New test time is posted to project schedule.

F. Cost of Retesting:

1. Cost to contractor to recheck Installation Certification Form, re-execute the prefunctional performance test or the FPT, if they are responsible for deficiency or failure, shall be theirs. If contractor is not responsible, cost recovery for re-visitation shall be negotiated with the GC. Final determination as to whether the ICF, PFT or FPT was properly executed as it relates to the project documents and the Basis of Design falls with the A/E.
2. Time for CxP to witness and document any retesting required because a specific Installation Certification Form, start-up test item or prefunctional performance test reported to have been successfully completed, but determined during Functional Performance Testing to be faulty, shall be back charged to the contractor.
3. Contractors shall be held responsible for expenses incurred by Owner for retesting due to the contractor's state of reported readiness or lack thereof as represented on the completion

of all commissioning documentation required prior to the FPT. Expenses could include, but not be limited to, retesting labor costs, travel expenses, and remobilization for owner and consulting teams.

G. Approval:

1. CxP notes each satisfactorily demonstrated function on test form. CxP, GC, and OR provide formal approval of FPT after review.

### 3.8 DEFERRED TESTING

A. Unforeseen Deferred Tests:

1. Any testing that is not completed prior to substantial completion due to reasons beyond the control of the GC or at the request of the Owner shall be conducted as soon after substantial completion as possible so as not to disrupt the building occupants when the facility is fully occupied.

- B. Opposite Season Testing: Testing procedures shall be repeated and/or conducted as necessary during appropriate seasons. "Opposite season" testing is primarily for environmental systems and shall be required where scheduling prohibits thorough testing in all modes of operation. Opposite season testing may also be required when conditions have been simulated to observe the response of the system. The CxP shall schedule the opposite season testing during the warranty period to coincide with a design day condition when possible. Alternatively, should the testing during the normal testing period demonstrated the acceptability of the program logic for the opposite season, then trending of the system during the opposite season is also an acceptable means of documenting operational performance.

**END OF SECTION 01 91 13**



## SECTION 01 91 14 - FUNCTIONAL TESTING REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 INCLUDED SYSTEMS AND EQUIPMENT

A. The following systems and equipment included in commissioning program. The sampling rate shown indicates what percentage of system components shall be tested during the functional performance period.

1. Division 14 – Conveying Equipment	Sampling Rate
a. Elevators	100%
2. Division 21 – Fire Protection	Sampling Rate
a. Fire Protection System	100%
3. Division 22 - Plumbing	Sampling Rate
a. Sump Systems	100%
b. Water Supply Including Circulation Systems & Auto Valves	100%
4. Division 23 - Heating Ventilating and Air Conditioning	Sampling Rate
a. Rooftop Unit With DX Cooling	100%
b. Computer Room Air Conditioning Units	100%
c. Variable Air Volume Boxes	20%
d. Fan Coil Units	20%
e. Cabinet Unit Heaters	20%
f. Unit Heaters	20%
g. Toilet Exhaust	100%
h. Gas Fired Rooftop Units	100%
i. Boilers	100%
j. DDC Building Control System	100%
k. Test, Adjust and Balance Verification	5%
5. Division 26 - Electrical	Sampling Rate
a. Lighting Control System	100%
b. Power Monitoring & Control	100%
c. Variable Frequency Drives	100%
d. Electrical Distribution, Greater Than 40A	100%
e. Automatic Transfer Switches	100%
6. Division 28 – Electronic Safety and Security	Sampling Rate
a. Fire Alarm System	100%

#### 1.2 DESCRIPTION

A. This section specifies the functional testing requirements for, 14, 21, 22, 23, 26, and 28 systems and equipment. From these requirements, the Commissioning Provider (CxP) shall develop step-by-step procedures to be executed by the Subs or the CxP. The general functional testing process, requirements and test method definitions are described in Section 01 9113. The test requirements for each piece of equipment or system contain the following:

1. The contractors responsible to execute the tests, under the direction of the CxP.
2. A list of the integral components being tested.
3. Functions and modes to be tested.

4. Required conditions of the test for each mode.
  5. Special procedures.
  6. Required methods of testing.
  7. Required monitoring.
  8. Acceptance criteria.
  9. Sampling strategies allowed.
- B. The functional performance testing protocols developed shall be used as follows:
1. The responsible contractor shall perform a Prefunctional Performance Test utilizing the testing protocol. During the execution of test, the contractor may encounter issues or requires clarification to a test procedure that may require coordination with both the A/E and the CxP. Any changes or modifications to the test protocol shall be made by the CxP for use in the final test effort. Any changes to the test protocol that result in changes to the sequence of operation of the system shall require written approval by the A/E. Once written approval is obtained from the A/E, the control sequence changes shall be incorporated into the test protocol by the CxP. The Contractor shall be responsible for performing and documenting the test results should the control sequences be modified.
  2. Upon completion of the prefunctional testing documentation by the contractor, the Functional Performance Test protocol shall be updated to reflect any approved changes or modifications and then used by the CxP to witness and document the final testing by the contractor.

### 1.3 PREREQUISITES

- A. The first prerequisite for the start of functional performance testing is the completion and acceptance of the Installation Certification Form (ICF) for each system and/or system component. Refer to Section 01 9113 for information regarding the Installation Certification Form (ICF). The second prerequisite for the start of functional performance testing is the prefunctional performance test documentation from the responsible contractor.
- B. The Controls Sub-Contractor shall have completed the BAS network communication for the entire system, verified and completed the BAS graphics package and confirm the availability of a dedicated controls technician knowledgeable with the programming for the project during the functional performance testing.
- C. All test and Balance (TAB) work shall be completed for the respective and associated systems that are to be tested.

### 1.4 MONITORING

- A. Monitoring is a method of testing as a stand-alone method or to augment manual testing.
- B. All points listed in the required monitoring section of the test requirements that are control system monitored points shall be trended by the Controls Subcontractor. Other points shall be monitored by the CxP using data loggers or other independent stand-alone devices. At the option of the CxP, some control system monitoring may be replaced with data logger monitoring. At the CxP's request, the Controls Subcontractor shall trend up to 20% more points than listed herein at no extra charge.
- C. Systems not controlled by the integrated automation system: Systems like the fire detection system or prepackaged control systems for boilers or chillers, events logs shall be set up by the contractor to record all events and alarms during the period of testing
- D. Copies of monitored trend data shall also be provided in electronic format in either Microsoft Excel or Word.



- E. Graphical output is desirable, and will be required for all output, if the system can produce it.

## PART 2 - PRODUCTS

- A. NOT APPLICABLE

## PART 3 - EXECUTION

### 3.1 DIVISION 14 – CONVEYING SYSTEMS

#### A. Elevator

1. Obtain documentation indicating correct equipment has been provided and installed as specified. Include all manufacturer and installer certifications as specified.
2. Perform testing verifying the elevator door operation (open and closing)
3. Verify operation under fire alarm conditions.
4. Verify operation during emergency power operations.

### 3.2 DIVISION 21 – FIRE PROTECTION

#### A. Fire Protection System

1. Parties Responsible to Execute Functional Test
  - a. Fire Protection Contractor: to perform testing
  - b. Fire Detection Contractor to assist in testing
  - c. CxP: direct, witness, and document testing
2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
  - a. Fire Protection System
3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Commissioning testing shall include but not be limited to the following:
    - 1). Flow and Tamper Switches
    - 2). Fire Pump
4. Required Monitoring
  - a. None

#### B. Acceptance Criteria (referenced by function or mode ID)

1. For the conditions, sequences and modes tested, the fire protection system, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

### 3.3 DIVISION 22 - PLUMBING

#### A. Plumbing related systems

1. Parties Responsible to Execute Functional Test
  - a. CxP: perform and document testing.
  - b. Plumbing contractor: operate the controls to activate the equipment.
2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
  - a. Equipment, systems, and associated devices for systems in the commissioning scope of work as listed above in section 1.1

3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Commissioning testing shall include but not be limited to the following:
    - 1). Domestic Water Heaters
      - a). Recovery Rate
      - b). Temperature Control
      - c). Staging
    - 2). Potable Hot/Cold Systems
      - a). Pressure Control
      - b). Mixing Valves
      - c). Fixture Sensors
      - d). Temperature
    - 3). Sump Pumps
      - a). Location of Level Floats
      - b). Operation of Pump Staging
      - c). Alarms
  4. Required Monitoring
    - a. None
  5. Acceptance Criteria (referenced by function or mode ID)
    - a. For the conditions, sequences and modes tested, the heating hot water integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

B. Sump Pumps

1. Parties Responsible to Execute Functional Test
  - a. Plumbing contractor: operate the controls to activate the equipment.
  - b. Controls Contractor: assist in testing sequences (Monitoring Alarms).
  - c. CxA: direct, witness and document testing
2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
  - a. Sump Pumps
3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Verify all alarms and safeties
    - 2). Verify sensor calibration checks on any controlling equipment
    - 3). Verify schedules and setpoints to be reasonable and appropriate
    - 4). Verify floats activate the pumps
    - 5). Verify high-level water alarm
    - 6). Verify low-level water alarm
    - 7). Verify the sequencing of the each pump

- 8). Determine the diversity/recovery rate in system (if any) then test to maximum diversity.

4. Acceptance Criteria

- a. For the conditions, sequences and modes tested, the sump pumps, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

### 3.4 DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

#### A. General

1. Required Monitoring

- a. All controlled parameters, respective setpoints, and output points/values for controlling devices shall be trended at a sampling rate specified by the Owner. The controls contractor shall program the respective trend logs in the BAS. All other points that are control system monitored points shall be made available for trending and respective trend logs shall be programmed by the Controls Contractor if owner or CxP require these (any or all) points to be (historically) trended. Other points may be monitored by the CxP using data loggers. During Functional Testing, trend log sampling rates may be increased to monitor responses to various control sequences and failure scenarios.

2. Acceptance Criteria for Air Handling Systems

- a. For the conditions, sequences and modes tested, the HVAC equipment and/or other building systems, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified, and according to acceptable operating practice.
- b. HVAC equipment and supporting systems shall be able to maintain the respective controlled temperature and humidity within specified tolerances either side of the current setpoint without excessive hunting.
- c. HVAC equipment and controls shall control the duct static pressure and/or air flows to maintain the controlled parameter within specified tolerances either side of the setpoint value without excessive hunting.

3. Acceptance Criteria for Hydronic Systems

- a. For the conditions, sequences and modes tested, the chilled water system, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.
- b. Chiller shall maintain the chilled water supply setpoint to within +/- 1.0F of setpoint deadband without excessive hunting.
- c. Pumping system and controls shall maintain the current desired pressure setpoint to within an amount equal to [5%] of the setpoint value either side of the deadband without excessive hunting.

4. Acceptance Criteria for Building Automation System(BAS) and Test and Balance (TAB) Report

- a. A failure of more than 10% of the randomly selected items shall result in the failure of acceptance of the BAS system or the TAB report.
5. BAS contractor shall be responsible for performing a new point-to-point verification check, provide documentation and repeat the random verifications of the system
6. TAB contractor shall be responsible to rebalance the system, provide a new system TAB report and repeat random verifications of the new TAB report.

## B. Humidifiers

1. Parties Responsible to Execute Functional Test
  - a. Controls contractor: operate the controls to activate the equipment as needed.
  - b. HVAC mechanical contractor: assist in testing sequences as needed.
  - c. CxP: to witness, direct and document testing.
2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
  - a. Air Handling Units
3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. This testing shall include the following as applicable:
      - a). Sensor activator calibration checks
      - b). Device and actuator calibration and stroke checks
      - c). Control parameters and setpoints are reasonable and appropriate
    - 2). Control loops are tuned to eliminate hunting or significant overshoot
    - 3). Alarms

## C. Exhaust Fans

1. Parties Responsible to Execute Functional Test
  - a. Controls contractor: operate the controls to activate the equipment as needed.
  - b. HVAC mechanical contractor: assist in testing sequences as needed.
  - c. CxP: to witness, direct and document testing.
2. Integral Components or Related Equipment Being Tested
  - a. Exhaust fans
3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. This testing shall include the following as applicable:
      - a). Schedules and setpoints are reasonable and appropriate
      - b). Interlocks to building pressurization control
    - 2). Sensor and actuator calibration checks: Sensor and actuator calibration completed by contractor in ICF Calibration document. Random sampling checks by CxP during

functional testing. (BAS readout against hand-held calibrated instrument or observation must be within specified tolerances)

#### D. Fan Coil

1. Parties Responsible to Execute Functional Test
  - a. Controls contractor: operate the controls to activate the equipment as needed.
  - b. CxP: to witness, direct and document testing.
2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
  - a. Fan Coil
3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. This testing shall include the following as applicable:
      - a). Monitor and trend room temperature data
    - 2). Alarms

#### E. Unit Heaters

1. Parties Responsible to Execute Functional Test
  - a. Controls contractor: operate the controls to activate the equipment as needed.
  - b. CxP: to witness, direct and document testing.
2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
  - a. Unit Heaters
3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. This testing shall include the following as applicable:
      - a). Monitor and trend room temperature data
    - 2). Alarms

#### F. Cabinet Unit Heaters

1. Parties Responsible to Execute Functional Test
  - a. Controls contractor: operate the controls to activate the equipment as needed.
  - b. CxA: direct, witness and document testing
2. Integral Components or Related Equipment Being Tested as applicable for the specific unit

- a. Cabinet Unit Heaters
- 3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Commissioning testing shall include but not be limited to testing each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible. Testing shall include but not be limited to the following:
    - 1). Verify that airflow is as per schedule
    - 2). Manipulate terminal devices through all sequences of operation and verify proper operation.
    - 3). Monitor and trend room temperature sensors.
    - 4). All alarms

#### G. Heat Pumps

- 1. Parties Responsible to Execute Functional Test
  - a. Controls contractor: operate the controls to activate the equipment as needed.
  - b. CxP: to witness, direct and document testing.
- 2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
  - a. Dedicated Outside Air Handling Unit
- 3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. This testing shall include the following as applicable:
      - a). Monitor and trend room temperature data
      - b). Device and actuator calibration and stroke checks
      - c). Control parameters and setpoints are reasonable and appropriate
    - 2). Control loops are tuned to eliminate hunting or significant overshoot
    - 3). Alarms

#### H. Air Terminal Boxes

- 1. Parties Responsible to Execute Functional Test
  - a. Controls contractor: operate the controls to activate the equipment as needed.
  - b. CxP: to witness, direct and document testing.
- 2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
  - a. Air Terminal Boxes – Office
- 3. Functions / Modes Required To Be Tested

- a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. This testing shall include the following as applicable:
      - a). Monitor and trend room temperature data
      - b). Device and actuator calibration and stroke checks
      - c). Control parameters and setpoints are reasonable and appropriate
    - 2). Control loops are tuned to eliminate hunting or significant overshoot
    - 3). Alarms
- I. Water Cooled Computer Room Air Conditioning Units
- 1. Parties Responsible to Execute Functional Test
    - a. Controls contractor: operate the controls to activate the equipment as needed.
    - b. CxA: direct, witness and document testing
  - 2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
    - a. Water-Cooled Computer Room Air Conditioning Units
  - 3. Functions / Modes Required To Be Tested
    - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
    - b. Commissioning testing shall include but not be limited to testing each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible. Testing shall include but not be limited to the following:
      - 1). Activate air conditioning unit using remote wall mounted microprocessor control keypad.
      - 2). Check that all dampers modulate freely
      - 3). Verify that condensate drain is functioning properly.
      - 4). Verify cooling capacity
      - 5). Verify smoke detector operation
- J. Chilled Water System
- 1. The cooling tower can be tested integrally with the chiller testing. The cooling tower test requirements are listed elsewhere.
  - 2. Parties Responsible to Execute Functional Test
    - a. Controls subcontractor: operate the controls as needed.
    - b. HVAC mechanical contractor or vendor: assist in testing sequences as needed.
    - c. CxP: to witness, direct and document testing.
  - 3. Integral Components or Related Equipment Being Tested
    - a. Chilled water piping system

- b. Pumps
  - c. Variable Frequency Drives
4. Functions / Modes Required To Be Tested
- a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. This testing shall include the following as applicable:
      - a). Failure and recovery scenarios for pumps
      - b). Device and actuator calibration and stroke checks
      - c). Control parameters and setpoints are reasonable and appropriate
    - 2). Control loops are tuned to eliminate hunting or significant overshoot on system pressure and temperature
    - 3). Alarms

K. Heating Hot Water System

- 1. Parties Responsible to Execute Functional Test
  - a. Controls Subcontractor: operate the controls, to activate the equipment as needed.
  - b. HVAC Mechanical Contractor or vendor: assist in testing sequences as needed.
  - c. CxP: to witness, direct and document testing.
- 2. Integral Components or Related Equipment Being Tested as applicable:
  - a. Heat Exchanger
  - b. Supply pumps
  - c. Heating water piping system
  - d. Variable Frequency Drives
- 3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. This testing shall include the following as applicable:
      - a). Failure and recovery scenarios for pumps
      - b). Staging on and off heat exchangers
      - c). Device and actuator calibration and stroke checks
      - d). Control parameters and setpoints are reasonable and appropriate
      - e). Supply water temperature reset



- 2). Control loops are tuned to eliminate hunting or significant overshoot on system pressure and temperature
- 3). Alarms

L. Steam and Condensate System

1. Parties Responsible to Execute Functional Test
  - a. Controls Contractor: operate the controls, as needed.
  - b. HVAC Mechanical Contractor or vendor: assist in testing sequences.
  - c. CxP: to witness, direct and document testing.
2. Integral Components or Related Equipment Being Tested as applicable:
  - a. Steam/condensate piping system
  - b. Steam/condensate piping specialties
  - c. Heat Exchangers
3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned; including startup, shutdown, component failure, unoccupied & manual modes and power failure. Test functionality of this piece of equipment or system in all control strategies or interlocks with which it is associated. This testing shall include the following as applicable:
      - a). Staging steam valves based on steam demand
      - b). Staging on and off heat exchangers
      - c). Testing steam traps and condensate return pumping units
      - d). Steam pressure control
    - 2). Control loops are tuned to eliminate hunting or significant overshoot on system pressure and temperature
    - 3). Alarms

M. Building Automation System (BAS)

1. Parties Responsible to Execute Functional Test
  - a. Controls Subcontractor: operate the controls to activate the equipment.
  - b. CxP: to witness, direct and document testing.
2. Integral Components or Related Equipment Being Tested as applicable:
  - a. Building Automation System
  - b. Calibration Certification Documents
3. Functions / Modes Required To Be Tested and Test Methods.
  - a. A significant part of the BAS functional testing requirements is the successful completion of the functional tests of equipment the BAS controls or interlocks with. Uncompleted equipment functional tests or outstanding deficiencies shall be completed prior to conclusion of the functional testing of the BAS.
  - b. Integral or stand-alone controls are functionally tested with the equipment they are attached to, including any interlocks with other equipment or systems and thus are

not covered under the BAS testing requirements, except for any integrated functions or interlocks listed below.

- c. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
- d. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
- e. Commissioning testing shall include but not be limited to the following:
  - 1). Power failure and battery backup and power-up restart functions
  - 2). Global commands features
  - 3). Security and access codes
  - 4). Occupant over-rides (manual, telephone, key, keypad, etc.)
  - 5). Scheduling features fully functional and setup, including holidays
  - 6). Date and time setting in central computer and verify field panels read the same time
  - 7). All graphic screens and value readouts completed
  - 8). Communications to remote sites
  - 9). Final as-builts or redlines (per spec) control drawings, final points list, program code, setpoints, schedules, warranties, etc. per specs, submitted for O&M's
  - 10). Alarm notification system and alarm priorities
  - 11). Optimum start-stop functions
  - 12). Auto-tuning disabled

#### N. Test, Adjust and Balance Verification

- 1. Parties Responsible to Execute Functional Test
  - a. TAB contractor: perform checks using test instruments
  - b. Controls subcontractor: operate the controls to activate the equipment.
  - c. CxP: to witness, direct and document testing.
- 2. Integral Components or Related Equipment Being Tested as applicable for the specific unit
  - a. TAB water-side
  - b. TAB air-side
- 3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). A random sample of up to 15% the TAB report data shall be selected for verification (air velocity, air or water flow rate, pressure differential, electrical or sound measurement, etc.). The original TAB contractor will execute the checks, witnessed by the CxP. The TAB contractor will use the same test instruments as used in the original TAB work

### 3.5 DIVISION 26 - ELECTRICAL

#### A. Normal Power Electric Service Distribution

- 1. Parties Responsible to Execute Functional Test
  - a. Electrical Subcontractor: assist in testing sequences, as needed.
  - b. CxP: to witness, direct and document testing.

2. Integral Components or Related Equipment Being Tested
    - a. Switchgear
    - b. Unit Substations
    - c. Distribution Panelboards
  3. Functions / Modes Required To Be Tested
    - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
    - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
    - c. Commissioning testing shall include but not be limited to the following:
      - 1). Infrared scan of connections of select components and connections. Any PPE required for the CxP to comply with arc-flash requirements shall be provided by the contractor. Contractor shall also open and reclose all equipment being scanned.
      - 2). Randomly check trip settings on breakers to confirm they match the settings in the short circuit coordination study
      - 3). Test the power management control sequence for the switchgear
      - 4). Spot check phase balance at panelboards after system is under load. Ensure proper, thorough and accurate identification of load. Trip breakers and validate load identified. Test GFI breakers
      - 5). Spot check circuit labeling by de-energizing circuits while circuit tester is in the receptacle. Labeling shall be checked on the load/receptacle and at the breaker
      - 6). Receptacle Polarity Test: Spot check receptacles installed or reconnected under this contract with a receptacle circuit tester. Tester shall test for open ground, reverse polarity, open hot, open neutral, hot and ground reversed, hot or neutral and hot open
  4. Required Monitoring
    - a. None
  5. Acceptance Criteria
    - a. The normal power system, integral components and related equipment respond to varying parameters appropriately as expected, as specified and according to acceptable operating practice.
- B. Emergency Power Distribution
1. Parties Responsible to Execute Functional Test
    - a. Controls Subcontractor: operate the controls
    - b. Electrical Subcontractor: Provide load banks and all testing instruments and assist in testing sequences and debugging.
    - c. Mechanical Subcontractor: assist in testing sequences and debugging
    - d. CxP: to coordinate, witness, direct and document testing.
  2. Integral Components or Related Equipment Being Tested
    - a. Emergency generator
    - b. Automatic transfer switches
    - c. Emergency Power distribution panelboards and circuits
    - d. Emergency Lighting
    - e. Building Automation System
    - f. Fire Alarm System
  3. Functions / Modes Required To Be Tested

- a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
    - 1). Load banks for testing automatic transfer switches shall be provided by the electrical contractor. The load bank shall be sufficiently sized for the maximum load specified for the automatic transfer switch. One load bank can be used and relocated for each individual test if multiple transfer switches are installed
    - 2). Contractor shall provide all necessary labor and material to connect the load bank to the load side of the transfer switch and then after testing removing same from the project site.
  - c. Commissioning testing shall include but not be limited to the following:
    - 1). Generator safeties and alarms (including high and low oil pressure, high temperature, over-speed, etc.) and interface with BAS
    - 2). Power management control sequence test for loss of normal power, transfer to emergency power then return back to normal power. If authorized by Owner, phase loss scenarios will also be included to confirm specified equipment have phase loss protection.
    - 3). Infrared scan of connections of select components and connections. Any PPE required for the CxP to comply with arc-flash requirements shall be provided by the contractor. Contractor shall also open and reclose all equipment being scanned.
    - 4). Spot check phase balance at panelboards after system is under load. Ensure proper, thorough and accurate identification of load. Trip breakers and validate load identified. Test GFI breakers
    - 5). Spot check circuit labeling by de-energizing circuits while circuit tester is in the receptacle. Labeling shall be checked on the load/receptacle and at the breaker
    - 6). Receptacle Polarity Test: Spot check receptacles installed or reconnected under this contract with a receptacle circuit tester. Tester shall test for open ground, reverse polarity, open hot, open neutral, hot and ground reversed, hot or neutral and hot open
    - 7). BAS sequencing of equipment start-up upon loss and return of power
    - 8). Emergency lighting adequacy for egress routes. Lighting levels for egress paths shall be recorded. Lighting levels for egress paths shall be done at night.
4. Acceptance Criteria
- a. For the conditions, sequences and modes tested, the emergency generator, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

#### C. Lighting Control System

- 1. Parties Responsible to Execute Functional Test
  - a. Electrical Contractor: assist in testing sequences, as needed.
  - b. CxP: to witness, direct and document testing.
- 2. Integral Components or Related Equipment Being Tested
  - a. Lighting Control System
- 3. Functions / Modes Required To Be Tested
  - a. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.

- b. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
- c. Commissioning testing shall include but not be limited to the following:
  - 1). Spot check occupancy sensor placement and sensitivity for activation/deactivation
  - 2). Spot check lighting schedules to ensure they are programmed per the owner direction
  - 3). Check lighting levels
  - 4). For exterior fixtures, simulate night mode to validate function. Measure and record light level to ensure they meet the requirements and are generally provide adequate security. Check for excessive light level fluctuations or dark spots

### 3.6 DIVISION 28 - FIRE ALARM SYSTEM

- A. Parties Responsible to Execute Functional Test
  - 1. Fire Alarm contractor: operate the controls to activate the equipment
  - 2. CxP: to witness, direct and document testing
  - 3. Fire Marshal: to witness, direct and document testing
- B. Integral Components or Related Equipment Being Tested
  - 1. Fire Pump, Alarm System & Components
- C. Functions / Modes Required To Be Tested
  - 1. Testing requirements for commissioning are in addition to and do not replace any testing requirements elsewhere in this Division.
  - 2. Test methods shall include manual, auto, emergency operations and monitoring as applicable and feasible.
  - 3. Testing will be performed concurrent with testing witnessed by Fire Marshal
  - 4. Commissioning testing shall include but not be limited to the following:
    - a. Test equipment shutdown and restart sequence for trouble and supervisory alarms
    - b. Test backup battery capacity per requirements
- D. Required Monitoring
  - 1. None
- E. Acceptance Criteria
  - 1. For the conditions, sequences and modes tested, the fire alarm system, integral components and relate equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

**END OF SECTION 01 91 14**



## SECTION 11 66 23 - GYMNASIUM EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following gymnasium equipment:
  - 1. Basketball equipment.
  - 2. Volleyball equipment.
  - 3. Multi-Sport cage.
  - 4. Group controller and relay panel.
  - 5. Safety pads.
- B. Related Sections include the following:
  - 1. Section 11 66 43 "Interior Electronic Scoreboards" for scoreboard to be mounted to side-folding, side-braced backstop.
  - 2. Section 11 66 53 "Gymnasium Dividers" for divider curtains.

#### 1.3 DEFINITIONS

- A. FIBA: International Basketball Federation (Federation Internationale de Basketball Amateur).
- B. NCAA: The National Collegiate Athletic Association.
- C. NFHS: The National Federation of State High School Associations.
- D. USAV: USA Volleyball.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Provide basketball backboards capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.

2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. LEED Submittals:
1. Product Data for Credit IEQ 4.4: For composite wood products, documentation indicating that products contain no urea formaldehyde.
- C. Shop Drawings: For gymnasium equipment. Include plans, elevations, sections, details, attachments to other work, and the following:
1. Method of field assembly for removable equipment, connections, installation details, mountings, floor inserts, attachments to other work, and operational clearances.
  2. Transport and storage accessories for removable equipment.
- D. Samples for Verification: For the following products:
1. Pad Fabric: Not less than 3 inches square, with specified treatments applied. Mark face of material.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Court layout plans, drawn to scale, and coordinating floor inserts, game lines, and markers applied to finished flooring.
- B. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation including loads, point reactions, and locations for attachment of gymnasium equipment to structure.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium equipment to include in emergency, operation, and maintenance manuals.

#### 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of gymnasium equipment, and divider curtains specified in Section 11 66 53, through a single source from a single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

#### 1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient



temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment.

#### 1.10 COORDINATION

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

#### 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Basketball backboard failures including glass breakage.
    - b. Faulty operation of any individual component or assembled equipment.
  - 2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 1. Extruded Bars, Profiles, and Tubes: **ASTM B 221**.
  - 2. Cast Aluminum: ASTM B 179.
  - 3. Flat Sheet: **ASTM B 209**.
- B. Steel: Comply with the following:
  - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  - 2. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
  - 3. Steel Sheet: ASTM A 1011/A 1011M.
- C. Support Cable: Manufacturer's standard galvanized steel aircraft cable with a breaking strength of **7000 lb**. Provide fittings complying with cable manufacturer's written instructions for size, number, and method of installation.

- D. Support Chain and Fittings: Grade 80 hardened alloy steel chain rated for overhead lifting, ASTM A 391/A 391M, with commercial-quality, hot-dip galvanized steel connectors and hangars.
- E. Castings and Hangers: Malleable iron, ASTM A 47/A 47M, grade required for structural loading.
- F. Softwood Plywood: DOC PS 1, exterior.
- G. Particleboard: ANSI A208.1, made with binder containing no urea formaldehyde.
- H. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.
- I. Grout: Nonshrink, nonmetallic, premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

## 2.2 BASKETBALL EQUIPMENT

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. AALCO Manufacturing.
  - 2. ADP Lemco Inc.
  - 3. Draper Inc.
  - 4. Gared Sports
  - 5. Jaypro Sports, LLC.
  - 6. Performance Sports Systems.
  - 7. Porter Athletic Equipment Company.
- C. General: Provide equipment complying with requirements in FIBA's "FIBA Basketball Rule Book," NCAA's "NCAA Basketball Rule Book," and NFHS's "NFHS Basketball Rule Book."
- D. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.
- E. Overhead-Supported, Forward-Folding Backstop: For use with Basketball Backstops.
  - 1. Folding Type: Provide manufacturer's standard assembly for single-post, forward-folding, front-braced backstops, with hardware and fittings to permit folding.
  - 2. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
    - a. Center-Mast Frame: Welded with side sway bracing.
    - b. Finish: Manufacturer's standard powder-coat finish. Color to be selected by Architect.
- F. Overhead-Supported, Side-Folding Backstop: For use with Electronic Scoreboard specified in section 11 66 43.

1. Folding Type: Provide manufacturer's standard assembly for single-post, side-folding, side-braced backstops, with hardware and fittings to permit folding.
  2. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.
    - a. Provide framing as required to mount electronic scoreboard.
    - b. Center-Mast Frame: Welded with side sway bracing.
    - c. Finish: Manufacturer's standard powder-coat finish. Color to be selected by Architect.
- G. Backstop Safety Device: Designed to limit free fall if support cable, support chain, pulleys, fittings, winch, or related components fail; with mechanical automatic reset; 6000-lb load capacity; one per folding backstop.
- H. Backstop Electric Operator: Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
1. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
  2. Motor Characteristics: Sufficient to start, accelerate, reverse, and operate connected loads at designated speeds within installed environment and with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Comply with NEMA MG 1, and the following:
  3. Voltage: 120 V.
  4. Horsepower: 3/4 hp.
  5. Enclosure: Manufacturer's standard.
  6. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.
  7. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
  8. Phase: One.
  9. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.
- I. Basketball Backboard:
1. Shape and Size:
    - a. Rectangular, 72 by 42 inches width by height.
  2. Backboard Material: With predrilled holes or preset inserts for mounting goals, and as follows:
    - a. Glass: Not less than 1/2-inch-thick, transparent tempered glass. Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, brushed-natural-finish, extruded-aluminum frame, with steel subframe, reinforcement, and bracing and with mounting slots for mounting backboard frame to backboard support framing.
      - 1) Direct Mount: Designed for mounting backboard frame to center mast of backboard framing to maximize relief of stresses on

- backboard frame and glass.
    - 2) Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.
  - 3. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.
- J. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with hole pattern 5 inches o.c. horizontally and 4 inches o.c. vertically for goal attachment.
  - 1. Glass Backboard Goal Mounting Assembly: Goal support framing and reinforcement designed to transmit load from goal to backboard frame and to minimize stresses on glass backboard.
  - 2. Direct Mount: Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard and rigidity and stability of goal are maximized.
- K. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
  - 1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication complying with referenced rules.
  - 2. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
  - 3. Mount: Front.
  - 4. Net Attachment: No-tie loops for attaching net to rim without tying.
  - 5. Finish: Powder-coat finish.
- L. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches long, sized to fit rim diameter, and as follows:
  - 1. Competition Cord: Antiwhip, made from white nylon cord not less than 120- or more than 144-gm thread.
- M. Backboard Safety Pads: Designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by referenced rules.
  - 1. Attachment: Manufacturer's standard.
  - 2. Color: As selected by Architect from manufacturer's full range.
- N. Portable Basketball System: Spring-balanced, height adjustable, portable competition basketball backstop with 10'-8" boom distance (face of backboard to face of base); with backboard, goal, and padding. Provide 2 total.
  - 1. Padding color to be selected from manufacturer's full range.
  - 2. Provide floor anchoring system appropriate for wood floor specified in section 09 64 66.
  - 3. Provide supports for shot clock system specified in section 11 66 43.

## 2.3 VOLLEYBALL EQUIPMENT

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AALCO Manufacturing.
  2. ADP Lemco Inc.
  3. Draper Inc.
  4. Gared Sports
  5. Jaypro Sports, LLC.
  6. Performance Sports Systems.
  7. Porter Athletic Equipment Company.
- B. General: Provide equipment complying with requirements in NFHS's "NFHS Volleyball Rule Book," NCAA's "NCAA Volleyball Rule Book," and USAV's "USA Volleyball Rule Book."
- C. Floor Insert: Solid-brass floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than length required to securely anchor pipe sleeve below finished floor in concrete footing; with anchors designed for securing floor insert to floor substrate indicated; one per post standard.
1. Floor Sleeve: Designed for use with floating and non-floating floors.
  2. Floor Plate: Lockable swivel access cover, designed for use with floating wood floors and to be flush with adjacent flooring. Provide two tool(s) for unlocking access covers.
- D. Post Standards: Removable, paired volleyball post standards and center post standard for multicourt play as indicated. Adjustable, telescoping height. Designed for easy removal from permanently placed floor insert supports. Fabricated from manufacturer's standard metal pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.
1. Nominal Pipe or Tubing Diameter: 3-1/2-inch OD at base.
  2. Telescopic and Net Height Adjuster System: Provide infinitely adjustable system consisting of screw rod, gear, and crank or constant-tension spring and pulley assist and locking device, telescopic post, and fittings for holding net at selected height; designed for height adjustment of post standard to position net at heights indicated.
    - a. Net Heights: Adjustable between age 12 and under net height and boys'/men's volleyball net height; 72 and 100 inches or more.
  3. Height Markers: Clearly marked at regulation play heights for girls/women and boys/men.
- E. Net: 32 feet long and as follows; 1 per pair of paired post standards:
1. Width and Mesh: Competition volleyball net, 39 inches with 4-inch-square knotless mesh made of black nylon string.

- a. Hem Band Edges: White, not less than 2-inch-wide top, bottom, and side bindings; tie offs at top, bottom and midpoint of each side end of net; end sleeves for dowels; and lines with linkage fittings threaded through top and bottom hems of binding. Provide lengths of lines and linkage fittings as required to properly connect to and set up net for post standard spacing indicated on Drawings.
  2. Dowels: Not less than 1/2-inch-diameter fiberglass or 1-inch-diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
  3. Net Antennas: 3/8-inch-diameter, high-tensile-strength, extruded fiberglass or plastic rods, 72 inches long, extending above top hem band of net, with alternating white and red bands according to competition rules. Provide two antennas per net.
  4. Boundary Tape Markers: 2-inch-wide white strip with sleeve for securing net antenna, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.
- F. Net Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip manufacturer's standard-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and manufacturer's standard handle. Mount net tensioner on post standard at side away from court. Provide end post with post top pulley. Provide opposing post with welded steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.
- G. Bottom Net Lock Tightener: Provide manufacturer's standard quick-release-type tension strap, spring-loaded self-locking tensioner, turnbuckle, pulley, or other device and linkage fittings designed to quickly and easily tighten bottom line or net.
- H. Safety Pads: Comply with NCAA, USAV and NFHS requirements. Provide pads consisting of not less than 1-1/4-inch- thick, multiple-impact-resistant polyurethane foam filler covered by puncture- and tear-resistant, not less than 14-oz./sq. yd. nylon-reinforced PVC fabric cover; with fire-test-response characteristics indicated, and lined with fire-retardant liner. Provide pads with hook-and-loop closure or attachments for the following components:
1. Post Standards: Wraparound style, designed to totally enclose each standard to a height of not less than 72 inches; 1 per post.
  2. Fabric Cover Flame-Resistance Ratings: Passes NFPA 701.
  3. Fabric Color: As selected by Architect from manufacturer's full range.
- I. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing volleyball equipment and passing through 36-inch-wide or wider door openings. Fabricate units of welded steel tubing with heavy-duty casters, including not less than two swivel casters. Fabricate wheels from materials that will not damage or mark floors. Provide a single cart capable of storing all components necessary for 3 volleyball courts, including uprights, pads, referee stand, nets, antennas, and balls. Provide number of carts required to support number of courts shown on Drawings.
- J. Referee Stand: Height adjustable platform with non-marring wheels and protective end caps on legs; with safety padding. Able to attach to net post.
1. Basis-of-Design: Performance Sports Systems; 6446 Referee Stand with 6040 Safety Padding. Color to be selected by architect from manufacturer's full range.

## 2.4 BOTTOM-LIFT MULTI-SPORT CAGE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AALCO Manufacturing.
  2. ADP Lemco Inc.
  3. Draper Inc.
  4. Gared Sports.
  5. Jaypro Sports, LLC.
  6. Performance Sports Systems.
  7. Porter Athletic Equipment Company.
- B. Multi Sport Cage: Electrically operated cage including motor, cables, controls, clamps for attachment to building structure, threaded rod supports, and other components required for complete functional installation.
- C. Configuration: Rectangular shape 10 feet high by 12 feet wide by 70 feet long.
- D. Frame: Constructed of 1-5/8 inches diameter steel tubing with 0.109 inch wall thickness. Assemble frame with malleable iron galvanized fittings with case hardened set screws.
- E. Operating mechanism: Drive pipe power winch with 3/4 HP, 110VAC, 60 cycle, single-phase, reversible capacitor with thermal overload protection. Provide with load holding worm gear reducer and integral limit switches to control cage travel. Drive pipe shall rotate in pipe support assemblies.
- F. Attachment: Attach to structural support with beam clamps, hanger brackets, and 1/2 inch diameter threaded rods. Attach at 10 feet centers.
- G. Hoist lines: 1/8 inch diameter steel galvanized cable with 2,000 pounds minimum breaking strength. Space lines at approximately 10 feet.
- H. Netting:
1. Type: 3/4 inch square, knotless, white, polyester mesh.
  2. Material: 3 strands, 1,000 denier polyester with 250 pounds breaking strength.
  3. Minimum weight: 0.031 pounds PSF.
  4. Perimeter of netting sections: Sewn with 3/8 inch polypropylene rope.
  5. Velcro at two corners for access to cage.
  6. Size netting to allow 12 inches of material to lay on floor in use position.

## 2.5 GROUP CONTROLLER

- A. Group Controller: Programmable touch pad system for operation of all electrical devices in this section and in section 11 66 53 "Gymnasium Dividers."
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AALCO Manufacturing.

2. ADP Lemco Inc.
  3. Draper Inc.
  4. Gared Sports.
  5. Jaypro Sports, LLC.
  6. Performance Sports Systems.
  7. Porter Athletic Equipment Company.
- C. Provide quantity of controllers required to operate all equipment, including divider curtains, from 2 separate stations within the Competition/Field House space.
- D. Group Controller screen: 7-inch minimum diagonal size, in color.
- E. Group Controller shall be capable of the following operations:
1. Display equipment layout as directed by Owner.
  2. Direct the operator through choices of single, double, or group operation. A group will consist of 2 to 6 units operating simultaneously.
  3. Operate equipment individually and have custom programming options for multiple equipment configurations, such as 'game day' or 'practice' set-up. Systems not offering multiple operation, system expansion, and reprogramming will not be considered equal products.
  4. Prevent unauthorized operation through use of password-protected access.
  5. Auto shut-off after 30 seconds of non-use.
  6. Contain self-diagnostic programming with the following features:
    - a. Voltage sensing shutdown in case of overload.
    - b. LCD read-out of system alert and recommended maintenance.
  7. The Group Controller must fit into a standard 12 inch high by 12 inch wide by 6 inch deep metal box.
  8. Relay panel may be mounted in a remote location within view of the equipment. The relay panel shall operate on 110V power with 24V screen communication.

## 2.6 SAFETY PADS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. AALCO Manufacturing.
  2. ADP Lemco Inc.
  3. Draper Inc.
  4. Gared Sports.
  5. Jaypro Sports, LLC.
  6. Performance Sports Systems.
  7. Porter Athletic Equipment Company.
- B. Pad Coverings: Provide safety pad fabric covering fabricated from puncture- and tear-resistant, not less than 14-oz./sq. yd PVC-coated polyester or nylon-reinforced PVC fabric treated with fungicide for mildew resistance; with surface-burning characteristics indicated.
- C. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces



fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.

1. Backer Board: Not less than 3/8-inch-thick plywood, mat formed, or composite panel.
2. Fill: Multiple-impact-resistant foam not less than 2-inch-thick polyurethane, 3.5-lb/cu. ft. density .
3. Size: Achieve 5 equal width wall panels per precast panel; roughly 2'-3 1/2" wide by 6'-0" tall.
4. Number of Panel Sections: As indicated, modular panel sections.
5. Installation Method: Concealed mounting Z-clips.
6. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for two color(s).
7. Graphics: Custom graphics as indicated on Drawings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
  1. Verify critical dimensions.
  2. Examine supporting structure and subfloors and footings below finished floor.
  3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked. Locate reinforcements and mark locations.
  4. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly, where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.
- C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
  1. Floor Insert Location: Coordinate location with application of game lines and markers, and core drill floor for inserts after game lines have been applied.
  2. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and type of floor plate.
  3. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.

- D. Floor Insert Setting: Position sleeve in oversized, recessed voids in concrete slabs. Clean voids of debris. Fill void around sleeves with grout, mixed and placed to comply with grout manufacturer's written instructions. Protect portion of sleeve above subfloor from splatter. Verify that sleeves are set plumb, aligned, and at correct height and spacing; hold in position during placement and finishing operations until grout is sufficiently cured. Set insert so top surface of completed unit is flush with finished flooring surface.
- E. Wall Safety Pads: Mount with bottom edge at 6 inches above finished floor.
- F. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed gymnasium equipment to structural support and for properly transferring load to in-place construction.
- G. Connections: Connect automatic operators to building electrical system.
- H. Removable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble removable gymnasium equipment after assembled configuration has been approved by Owner, and store units in location indicated on Drawings.

### 3.3 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

### 3.4 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment. Refer to Section 01 79 00 "Demonstration and Training."

**END OF SECTION 11 66 23**

## **SECTION 11 66 43 - INTERIOR ELECTRONIC SCOREBOARDS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section includes: Interior, electronic, multi-sport multi-purpose basketball/volleyball scoreboards including control center and other accessories for complete functional installation.

#### **1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM) Publications.
- B. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.
- C. National Electrical Code.
- D. Federal Communications Commission, Part 15 Rules & Regulations.
- E. UL and C-UL Standard for Electric Signs.

#### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated, including scoreboards, controls, and accessories. Include descriptions of control functions.
- B. Shop Drawings: Include installation drawings, face layout, dimensions, construction, electrical wiring diagrams, and method of anchorage.
- C. Samples for Initial Selection: Finish Samples, minimum 6 by 6 inches, for each type of product indicated.

#### **1.4 QUALITY ASSURANCE**

- A. Source limitation: Obtain each type of product, and all components including scoreboard, control center, control cable, and other accessories and installation hardware, from single source from single manufacturer.
- B. Manufacturer qualifications: Company specializing in manufacturing electronic scoreboards with 10 years minimum experience.
- C. Scoreboards and other electrical components shall be certified for use in United States by Underwriter Laboratories, (UL), Inc. and shall bear UL Label.
- D. Scoreboards and other electrical components shall be electrically grounded in accordance with National Electrical Code (NEC), Article 600.

## 1.5 WARRANTY

- A. Manufacturer's Warranty: Guarantee to cover defects in materials and workmanship.
  - 1. 5 years parts and factory labor guarantee for scoreboards, wired controls, and accessories.
  - 2. 2 years part and factory labor guarantee for wireless controls and receivers.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Nevco Inc. or a comparable product by manufacturers including, but not limited to, the following:
  - 1. Everbrite, LLC.
  - 2. Gared Sports.
  - 3. OES Scoreboards.
  - 4. Performance Sports Systems.
  - 5. Scoreboards Plus Inc.
  - 6. White Way Sign Co.

### 2.2 MATERIALS

- A. Aluminum face and perimeter frame: Fabricated from minimum 0.050 inch thickness, ASTM B221 aluminum sheet.
- B. Finish: Acrylic polyurethane paint. Color as selected by Architect from manufacturer's standard range.
- C. Electronics: Low voltage, solid state, 2-wire cable, multiplex system, quartz crystal controlled.
  - 1. Provide fiber optic communication interface to reduce threat of damage from electrical storms.
- D. LED (light emitting diode) units: Seven-bar, segmented digits in protective aluminum cover, rated typical life 100,000 hours, and designed to provide excellent visibility from all angles and sides.
- E. Provide location specific universal power cord with plug.
- F. Control cable where required shall be UL listed, 2-wire, type RG-58/U, coaxial cable, 1/4 inch diameter.
- G. Junction boxes where required: Sheet metal box & cover, 4-1/2 x 2-1/8 x 2-1/8 inches min. complying w/ NEMA standards.

## 2.3 SCOREBOARDS

- A. Scoreboard, Type 1: For use at competition basketball court; 2 total.
1. Basis-of-Design Product: Model 2770-ETN.
  2. Type: Interior, multi-purpose basketball/volleyball electronic scoreboard with two integral horns, electronic team names, changeable captions and LED displays for time, scores, period, number of player fouling w/ personal fouls, team fouls, bonus and double bonus indicators, and next possession arrows. No captions shall be applied directly to the face of the scoreboard. All caption plates will be changeable and made of polyvinylchloride with vinyl lettering applied.
    - a. Size: 8 feet long x 6 feet high x 8 inches deep.
    - b. Approximate hanging weight: 130 pounds.
    - c. Captions: 6 inches high:
      - 1) Basic: "Period".
      - 2) Basketball: "Fouls", "T.O.L." and "Player".
      - 3) Volleyball: "Won" and "Game".
    - d. LED displays:
      - 1) Timing: Super Bright Red 13 inches high digits with lit colon.
      - 2) Team scores: Super Bright Amber 13 inches high digits.
      - 3) Period: Super Bright Amber 9 inches high digits.
      - 4) Player number with personal fouls, game, and weight: Super Bright Red 9 inches high digits.
      - 5) Team fouls, games won, and match: Super Bright Amber 9 inches high digits.
      - 6) Next possession: Super Bright Amber arrow for each team.
      - 7) Include bonus and double bonus in the form of a 4 inch Super Bright Red LED "B".
    - e. Wall mounting attachments will be included for 1 location. Second location shall be mounted to side-folding, side-braced backstop.
    - f. Power requirement: All options included: 158 Watts, MAX, 100-240 Volts AC w/ Power Factor Correction.
    - g. Provide each scoreboard or accessory with control cable of length required. Electrical junction boxes, conduits, mounting hardware and other accessories as required for installation are to be provided by others.
  3. Accessories:
    - a. Shot Clock system:
      - 1) Basis-of-Design Product: Model SSC-T5.
      - 2) For main competition basketball court; wireless system with countdown display capable of mounting to top of portable basketball backstop specified in section 11 66 23.
    - b. End of Period Lights: Provide manufacturer's standard LED system that connects to shot clock.
    - c. Indoor Locker Room Clocks: Provide manufacturer's standard LED

display. Capable of wireless connection to scoreboard for game timer display; with master unit capable of wired connection to additional slave units.

- 1) Provide one master unit in Women's Locker Room 1011 with one slave unit in Men's Locker Room 1013.
- 2) Provide one master unit in Official's Locker Room 1009 with two slave units in Visitor's Locker Rooms 1003 and 1004.

B. Scoreboard, Type 2: For use at practice basketball court; 4 total.

1. Basis-of-Design Product: Model 2700-ETN.
2. Type: Interior, multi-purpose basketball/volleyball electronic scoreboard with two integral horns, electronic team names, LED displays for time, scores, period, bonus and double bonus indicators, and next possession arrows. No captions shall be applied directly to the face of the scoreboard. All caption plates will be changeable and made of polyvinylchloride with vinyl lettering applied.
  - a. Size: 8 feet long x 3 feet high x 8 inches deep.
  - b. Approximate hanging weight: 71 pounds.
  - c. Captions: 6 inches high:
    - 1) Basic: "Home", "Guests" and "Period".
  - d. LED displays:
    - 1) Timing: Super Bright Red 13 inches high digits with lit colon.
    - 2) Team scores: Super Bright Amber 13 inches high digits.
    - 3) Period: Super Bright Amber 9 inches high digits.
    - 4) Next possession: Super Bright Amber arrow for each team.
    - 5) Include bonus and double bonus in the form of a 4 inch Super Bright Red LED "B".
  - e. Wall mounting attachments shall be included.
  - f. Power requirement: All options included: 126 Watts, MAX, 100-240 Volts AC w/ Power Factor Correction.
  - g. Provide each scoreboard or accessory with control cable of length required. Electrical junction boxes, conduits, mounting hardware and other accessories as required for installation are to be provided by others.

## 2.4 CONTROL CENTER

A. Type: Wireless, microprocessor based, operator's control center with receiver unit mounted at scoreboard and designed to operate different models of scoreboard by interchange of keyboard overlay; Model MPCW.

1. Unit shall comply with Part 15 of FCC Rules regarding interference.
2. Console: High impact, break-resistant gray plastic, 11 x 9-1/2 x 4-1/8 inches.
3. Features:
  - a. Provide with multiple scoreboard operation.
  - b. Power on-off switch.
  - c. Split and raised 40 key keyboards, internal beeper acknowledging each entry, and bookmark capabilities.

- d. Keyboard overlays for scoreboard or accessory.
  - e. Remote hand-held main time switch with integral horn button.
  - f. Provide with LED displays, lithium cell battery backup to maintain scoreboard memory and time of day, self test mode, power on-off switch, alternate time control.
  - g. Timer features: Time of day display, multiple time out timers with warning, interval horn, upcount auto stop with horn, and 1/10th second display during last minute.
  - h. Dimmer control for scoreboard.
- 4. Receiver: Sturdy impact resistant construction, 6 x 4 x 1.5 inches with 4 inch antenna and mounted at scoreboard.
  - 5. Maximum range: 1,000 feet from control center to receiver.
  - 6. Power adapters: Provide for each control center.
    - a. Input: 120 volts, 0.4 amps, 50/60 Hz.
    - b. Output: 9 volts, 1.67 amps, 15 watts.
  - 7. Provide option of battery supply for control operation if utility power not available.
  - 8. Provide carrying case for control center and hand-held switch; Model CC-3.
    - a. Size: 18-1/2 x 14-1/2 x 6 inches.
    - b. Construction: Double wall, high density black polyethylene with padded interior, mechanical latches, and hinges.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Coordinate scoreboard and control center receiver quantities and junction box locations with Architect and precast panel manufacturer.
- B. Coordinate requirements for electrical power, wall blocking, auxiliary framing & supports, suspension cables and other components to be provided under other Specification Sections to ensure adequate provisions are made for complete, functional installation of scoreboards. Ensure that building roof structure has been designed for loads of suspended scoreboards.
- C. Coordinate scoreboard electrical requirements to ensure proper power source, conduit, wiring and boxes are provided. Prior to installation, verify type and location of power supply.

### 3.2 INSTALLATION

- A. Install scoreboards and accessories in accordance with manufacturer's instructions and approved installation drawings.
- B. Before install field test scoreboards & accessories for operating functions. Ensure that scoreboards accurately perform all operations. Correct deficiencies.
- C. Rigidly mount scoreboards and accessories level and plumb with brackets and fasteners.

- D. Clean exposed surfaces.
- E. Protect scoreboards and finishes from other construction operations.

3.3 DEMONSTRATING AND TRAINING

- A. Provide demonstration and training session for Owner's representative covering operation and maintenance of electronic scoreboard.

**END OF SECTION 11 66 43**



## SECTION 11 66 53 - GYMNASIUM DIVIDERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes:
  - 1. Gymnasium divider curtains.
- B. Related Sections:
  - 1. Section 11 66 23 "Gymnasium Equipment": For programmable touch pad system for operation of all electrical devices in section 11 66 23 "Gymnasium Equipment" and section '11 66 53 "Gymnasium Dividers."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
  - 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For divider curtain fabric, not less than 12 inches square of open mesh , and of opaque fabric.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gymnasium dividers to include in emergency, operation, and maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of gymnasium divider, and gymnasium equipment specified in section 11 66 23, through a single source from single manufacturer.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install gymnasium dividers until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify position for gymnasium dividers.

## 1.7 COORDINATION

- A. Coordinate installation of overhead-supported gymnasium dividers and suspension system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, faulty operation of gymnasium dividers.
  - 2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 1. Extruded Bars, Profiles, and Tubes: **ASTM B 221**.
  - 2. Cast Aluminum: ASTM B 179.
  - 3. Flat Sheet: **ASTM B 209**.
- B. Steel: Comply with the following:
  - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  - 2. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
  - 3. Steel Sheet: ASTM A 1011/A 1011M.
- C. Support Cable: Manufacturer's standard galvanized steel aircraft cable with a breaking strength of **7000 lb**. Provide fittings complying with cable manufacturer's written instructions for size, number, and method of installation.

- D. Castings and Hangers: Malleable iron, ASTM A 47/A 47M, grade required for structural loading.
- E. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.

## 2.2 DIVIDER CURTAINS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Draper Inc.
  - 2. Jaypro Sports, LLC.
  - 3. Performance Sports Systems.
  - 4. Porter Athletic Equipment Co.
- B. Curtain Types Design Criteria:
  - 1. Divider Curtain, Type A: Center Drive Gym Divider Curtain.
  - 2. Divider Curtain, Type B: Gym Divider Curtain model that will allow full height vinyl material with custom graphic, supplied by architect, applied to both sides of curtain with appropriate stencils and vinyl inks. For bidding purposes, see concept image at end of section.
- C. Divider Curtains: Electrically operated, roll up, and as follows:
  - 1. Upper Curtain, Mesh: Woven fabric of 100 percent polyester yarn coated with PVC weighing not less than minimum 6.5 oz./sq. yd.
    - a. Mesh Color: White.
  - 2. Lower Curtain, Solid: Woven polyester coated with PVC, minimum 18 oz./sq. yd, embossed, approximately 8'-8" height above floor (align with top of bleachers.)
    - a. Fabric Color(s): As selected by Architect from manufacturer's full range.
  - 3. Divider Curtain Flame-Resistance Ratings: Passes NFPA 701, inherently and permanently flame resistant.
    - a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or treated with flame-retardant chemicals, and whether it will require retreatment after designated time period or cleaning.
- D. Curtain Fabrication: Fused seams and the following:
  - 1. Top Hem: Reinforce with double thickness mesh for grommets.
  - 2. Bottom Hem for Roll-up Curtains: Floor-length curtains with hems 2 inches above finished floor and with manufacturer's standard 3-1/2- to 4-inch roll-up tube and lifting tape.
- E. Accessories:

1. Grommets: Manufacturer's standard size and spacing, for snaps or S-hooks.
  2. Curtain Battens: Fabricate battens from steel pipe with a minimum number of joints. As necessary for required lengths, connect pipe with drive-fit pipe sleeve not less than 18 inches long, and secure with 4 flush rivets, plug welds, threaded couplings, or another equally secure method. Shop-paint completed pipe battens with black paint.
    - a. Steel Pipe: ASTM A 53/ A 53M, Grade A, standard weight (Schedule 40), black, 1-1/2-inch nominal diameter, unless otherwise indicated.
- F. Divider Curtain Electric Operator: Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
1. Operator Type: Electric motor, worm-gear running-in-oil drive, with chain and sprocket secondary drive.
  2. Motor Characteristics: Sufficient to start, accelerate, reverse, and operate connected loads at designated speeds within installed environment and with indicated operating sequence, and without exceeding nameplate rating or considering service factor. Comply with NEMA MG 1, and the following:
  3. Voltage: 120 V.
  4. Horsepower: 1 hp.
  5. Enclosure: Manufacturer's standard.
  6. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.
  7. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
  8. Phase: One.
  9. Remote Control Station: See section 11 66 23 "Gymnasium Equipment" for programmable touch pad system for operation of all electrical devices in section 11 66 23 "Gymnasium Equipment" and section 11 66 53 "Gymnasium Dividers."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
1. Verify critical dimensions.
  2. Examine supporting structure.
  3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked. Locate reinforcements and mark locations.
  4. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions. Complete field assembly, where required.
- B. Unless otherwise indicated, install gymnasium dividers after other finishing operations, including painting, have been completed.
- C. Gymnasium Dividers, and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
  - 1. Verify clearances for movable components of gymnasium dividers throughout entire range of operation and for access to operating components.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing gymnasium dividers to structural support and for properly transferring load to in-place construction.
- E. Connections: Connect automatic operators to building electrical system.

### 3.3 ADJUSTING

- A. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

### 3.4 CLEANING

- A. After completing gymnasium divider installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium divider components and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium dividers. Refer to Section 01 79 00 "Demonstration and Training."

**END OF SECTION 11 66 53**



**WOLVES**  
JOLIET JUNIOR COLLEGE

## SECTION 12 66 00 - TELESCOPING STANDS

### 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. Wall-attached telescoping stands.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design telescoping stands, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Telescoping stands shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ICC 300 NFPA 102.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for telescoping stands.
- B. Shop Drawings: For telescoping stands in both stacked and extended positions. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Decking: 6-inch-square Samples of finished material.
  - 2. Metal Components: 6-inch-square Sample of each color and finish indicated.
  - 3. Seating: 6-inch-square Sample of each seating material, color, and finish indicated.
  - 4. Signage: Full-size units for row letters, seat numbers, each type of accessibility sign, and custom graphics.

- E. Delegated-Design Submittal: For telescoping stands indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For telescoping stands to include in operation and maintenance manuals.
  - 1. Precautions for cleaning materials and methods that could be detrimental to telescoping stand finishes and performance.

#### 1.7 QUALITY ASSURANCE

##### A. Bidder Qualification

- 1. Bidders are required to be an authorized dealer or manufacturer for equipment proposed which on a day-to-day basis regularly provide the equipment offered. Bidders are further advised that only standard production models or standard options will be acceptable for award. Equipment offered shall be currently manufactured on an active assembly line. The Owner is only interested in proven equipment; provided, installed, and serviced by Authorized Dealers capable of providing references
- 2. Along with bid, bidders must submit a detailed telescoping gym seat assembly layout. Show seat heights, row spacing and rise, aisle widths, open/close dimensions and ADA locations. Total net seats must be indicated on drawings

##### B. Installer Qualifications

- 1. Bleacher installer shall be Factory Certified by the Manufacturer. Proof of Factory Certified Installation Certificate shall be provided along with the Invitation to Bid. Failure to provide this information shall result in rejection of bid.

##### C. Service Capability:

- 1. The Bleacher Contractor must be able to show proof of full time service capability by factory certified technicians directly employed by the Bleacher Contractor. Adequate and satisfactory availability of repair parts and supplies, and ability to meet warranty and service requirements are a requirement of this Invitation to Bid. The Owner reserves the right to satisfy itself by inquiry or otherwise as to bidder's capabilities in this regard. A four (4) to eight (8) hour maximum on-site repair response is required during normal working hours, 8 a.m. to 5 p.m. weekdays (excluding holidays) All Full Time Service Personnel shall be Factory Authorized and Trained. Proof of Service Capability along with a listing of service parts regularly maintained in inventory shall be provided by the successful contractor. Failure to provide this information may result in rejection of bid.



- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Standard: Provide telescoping stands to comply with ICC 300 and NFPA 102.
- F. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- G. Preinstallation Conference: Conduct conference at Project site.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of stands that fail in materials or workmanship within specified warranty period. Manufacturer will also provide all yearly inspections required to comply with ICC 300 and NFPA 102 within specified warranty period.
  - 1. Warranty Period: Five years from the date of Substantial Completion.

## 1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings and construction contiguous with telescoping stands by field measurements before fabrication. Verify locations of walls, columns, and other construction that will interface with operating telescoping stands.
- B. Coordinate quantity, size, and location of cutouts required for installation of electrical devices at first row seating as indicated on Drawings.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Wood:
  - 1. Plywood: APA-grade trademarked, DOC PS 1.
- B. Steel:
  - 1. Structural-Steel Shapes, Plates, and Bars: ASTM A 36/A 36M.
  - 2. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90coating designation.
  - 3. Uncoated Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold-rolled commercial steel), or ASTM A 1011/A 1011M, Designation CS (hot-rolled commercial steel).
  - 4. Tubing: ASTM A 500, cold formed; ASTM A 501, hot formed; or ASTM A 513, mechanical.
- C. Extruded Aluminum: ASTM B 221, alloy as standard for manufacturer.

- D. Polyethylene Plastic: High-density polyethylene; molded, color-pigmented, textured, impact-resistant, structural formulation.

## 2.2 TELESCOPING STANDS

- A. General: Operable systems of multiple-tiered seating on interconnected folding platforms that close, without being dismantled, into a nested stack for storing. Stand units permit opening and closing of adjacent rows, allow individual and collective rows to be locked open for use, and close with vertical faces of upper skirts on the same vertical plane.
- B. Wall-Attached Telescoping Stands : Forward-folding system, in which the bleachers open in the forward direction by initially moving the front row away from the stack to the fully extended position, and the rear of bleacher understructure is permanently attached to wall construction.
  - 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. Hussey Seating Company.
    - b. Interkal LLC.
    - c. Irwin Telescopic Seating Company.
    - d. Sheridan Seating & Gymnasium Equipment.
  - 2. Aisle Type: Foot Level Aisle, front steps, and intermediate aisle steps.
  - 3. Rail Type: Self-storing rail, removable end rails, front railings, rear rails, aisle handrails.
  - 4. Product Criteria:
    - a. Bank Length (3) at 99'-6"
    - b. Aisle Widths 4 aisles at 4'-6" each
    - c. Number of Tiers 10
    - d. Row Spacing 32"
    - e. Row Rise +/- 9 5/8"
    - f. Open Dimension +/- 26' - 5 5/16"
    - g. Closed Dimension +/- 4' - 2"
    - h. Overall Unit Height +/- 8' - 7 7/8"
    - i. Net Capacity +/- 542 excluding recoverable ADA.
  - 5. Operation: Automatic, friction-type, integral power unit.
    - a. Limit Switches: Automatically stop integral power system when telescoping stands reach fully opened or closed positions.
    - b. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at 10 feet, mounted under telescoping seating for audio and visual warning during integral power operation.
    - c. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.
    - d. Remote Control: Portable pendant control.

## 2.3 COMPONENTS

- A. Benches: Seats and skirts.
  - 1. Material: Molded polyethylene plastic with contour surfaces.
    - a. Color: As selected by Architect from manufacturer's standard.
  - 2. Bench Height: Not less than 16 inches or more than 18 inches.
  - 3. Bench Depth: 12 inches.
- B. Wheelchair-Accessible Seating: Locate retractable truncated benches to provide wheelchair-accessible seating at locations indicated on Drawings.
  - 1. Equip tiers adjacent to wheelchair-accessible seating with front rails as required by referenced safety standard.
- C. Deck: Plywood, 5/8 inch thick.
  - 1. Finish: Polyethylene textured overlay bonded to substrate with exterior glue.
    - a. Color: As selected by Architect from manufacturer's standard colors.
- D. Risers: Steel sheet with manufacturer's standard, rust-inhibiting coating or hot-dip galvanized finish.
- E. Safety Rails: Structural steel, finished with manufacturer's standard powder coat system.
  - 1. Self-storing mid-aisle handrails located at centerline of each vertical aisle with seating on both sides.
  - 2. End rails (guards) that are removable.
  - 3. Back rails (guards) along rear of units where required by referenced safety standard.
  - 4. Removable front rails (guards) along front of units where required by referenced safety standard.
  - 5. Removable rails around accessible seating cutouts and truncations.
  - 6. Color: As selected by Architect from manufacturer's standard colors .
- F. Understructure: Structural steel.
  - 1. Finish: Manufacturer's standard rust-inhibiting finish.
  - 2. Color: Black.
- G. Support Column Wheels: Nonmarring, soft, rubber-face wheel assembly under each support column.
  - 1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but no fewer than four per column or less than 3-1/2 inches in diameter and 1 inch wide.
- H. Fasteners: Vibration proof, in manufacturer's standard size and material.

## 2.4 ACCESSORIES

- A. Wheelchair-Accessible Seating:

1. Provide a black full surround skirting 1/2" off the floor for safety and improved aesthetics.
  2. Provide a removable belt barrier with or without signage for the rear of each truncated bench area to assist with seating identification.
- B. Front Aisle Steps: Provide at each vertical aisle location front aisle step. Front steps shall engage with front row to prevent accidental separation or movement. Steps shall be fitted with non-skid rubber feet. End caps shall have full radius on all edges.
- C. Non-Slip Tread: Provide an adhesive-backed, abrasive, non-slip tread surface at front edge of each aisle location .
- D. Foot Level Aisles: Provide deck level full width vertical aisles located as indicated.
- E. Intermediate Aisle Steps: Intermediate aisle steps shall be of boxed fully enclosed type construction. End caps shall have full radius on all edges. Step shall have non-skid surface.
- F. Intermediate Aisle Handrails: Provide single pedestal mount handrails 34" high with terminating mid rail. Handrails shall be attached to the socket and shall rotate 90\* for easy storage in socket. Aisle handrails that are detached from the socket for storage are unacceptable.
- G. Self Storing End Rails: Provide steel self-storing 42" high above seat, end rail with tubular supports and intermediate members designed with 4" sphere passage requirements.
- H. Safety End Closure Curtain: Provide end closure curtains to prevent access to the underside of the bleacher, with full-bleed graphic to be supplied by architect. Color of curtain to be selected from manufacturer's full range.
- I. Top Seat Flush Filler: Provide at top seat level a flush filler board mounted between top seat and rear wall. Flush filler board shall be constructed of 4/4" nominal thickness Southern pine Grade "B & B" with black color polyethylene coating.
- J. Safety Accessories: Provide the following safety features:
1. Coin Round or Roll all edges of exposed metal on top and underneath Bleacher to eliminate sharp edges. Provide safety ease edges, coined edges, or rounded edges for the bleacher understructure components as follows. Diagonal or X braces and deck support or deck stabilizers. Systems provided with sharp edges or corners, to be rounded off in the field and field painted.
  2. Provide plastic end cap on nose metal at Bank ends to close off edges to prevent spectator injury.
  3. Provide plastic end cap on back of deck supports to prevent spectator injury.
  4. On first row, provide front and side skirt boards anywhere there is an exposed end to prevent players/balls from sliding underneath the first row.
- K. Signage:
1. Row letters at each row end.
  2. Seat numbers on each bench.
  3. Accessibility signs at each accessible space.
  4. Custom graphics, supplied by architect, on safety end closure curtains.
  5. Graphics on face of benches when in the closed position.

- a. Base Bid: No graphics.
- b. Alternate Bid A: Colored bench seats to form letters with shadows; text to be supplied by architect. For bidding purposes, assume text will read as 'WOLVES'.
- c. Alternate Bid B: Custom graphic of school logo or mascot, permanently bonded to face of bench seats. Basis-of-Design: Hussey Seating Company; XtremeLogo, with graphic to be supplied by architect.

## 2.5 FABRICATION

- A. Fabricate understructure from structural-steel members in size, spacing, and form required to support design loads specified in referenced safety standard.
- B. Weld understructure to comply with applicable AWS standards.
- C. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.
- D. Form exposed sheet metal with flat, flush surfaces, level and true in line, and without cracking and grain separation.
- E. Seating Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair the usefulness of seating units.
  - 1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas where telescoping stands are to be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install telescoping stands to comply with referenced safety standard and manufacturer's written instructions.

### 3.3 ADJUSTING AND CLEANING

- A. On completion of installation, lubricate, test, and adjust each telescoping stand unit so that it operates according to manufacturer's written operating instructions.

- B. Clean installed telescoping stands on exposed and semiexposed surfaces. Touch up shop-applied finishes or replace components as required to restore damaged or soiled areas.

#### 3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain telescoping stands.

**END OF SECTION 12 66 00**

## SECTION 21 05 00 - BASIC FIRE SUPPRESSION REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Requirements applicable to all Division 21 Sections. Also refer to Division 1 - General Requirements.
- B. All materials and installation methods shall conform to the applicable standards, guidelines and codes referenced in the specification section.

#### 1.2 ALTERNATES

- A. Alternate #1: Add Storage 1015 to fire protection zone 1. Refer to 1/FP2.00 for more information.
- B. Alternate #2: Add Storage 1015 to fire protection zone 1. Refer to 2/FP2.00 for more information.
- C. Alternate #3: Add Storage 1015 and Storage 1016 to fire protection zone 1. Refer to 3/FP2.00 for more information.

#### 1.3 COORDINATION DRAWINGS

- A. Definitions:
  - 1. Coordination Drawings: A compilation of the pertinent layout and system drawings that show the sizes and locations, including elevations, of system components and required access areas to ensure that no two objects will occupy the same space.
    - a. Mechanical trades shall include, but are not limited to, mechanical equipment, ductwork, fire protection systems, plumbing piping, hydronic piping, and any item that may impact coordination with other disciplines.
    - b. Electrical trades shall include, but are not limited to, electrical equipment, conduit 1.5" and larger, conduit racks, cable trays, pull boxes, transformers, raceway, busway, lighting, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    - c. Technology trades shall include, but are not limited to, technology equipment, racks, conduit 1.5" and larger, conduit racks, cable trays, ladder rack, pull boxes, raceway, ceiling-mounted devices, and any item that may impact coordination with other disciplines.
    - d. Maintenance clearances and code-required dedicated space shall be included.
    - e. The coordination drawings shall include all underground, underfloor, in-floor, in chase, and vertical trade items.
  - 2. The contractors shall use the coordination process to identify the proper sequence of installation of all utilities above ceilings and in other congested areas, to ensure an orderly and coordinated end result, and to provide adequate access for service and maintenance.

B. Participation:

1. The contractors and subcontractors responsible for work defined above shall participate in the coordination drawing process.
2. One contractor shall be designated as the Coordinating Contractor for purposes of preparing a complete set of composite electronic CAD coordination drawings that include all applicable trades, and for coordinating the activities related to this process. The Coordinating Contractor for this project shall be the Mechanical Contractor.
  - a. The Coordinating Contractor shall utilize personnel familiar with requirements of this project and skilled as draftspersons/CAD operators, competent to prepare the required coordination drawings.
3. Electronic CAD drawings shall be submitted to the Coordinating Contractor for addition of work by other trades. KJWW will provide electronic file copies of ventilation drawings for contractor's use if the contractor signs and returns an "Electronic File Transfer" waiver provided by KJWW. KJWW will not consider blatant reproductions of original file copies an acceptable alternative for coordination drawings.

C. Drawing Requirements:

1. The file format and file naming convention shall be coordinated with and agreed to by all contractors participating in the coordination process and the Owner.
  - a. Scale of drawings:
    - 1.) General plans: 1/4 Inch = 1'-0" (minimum).
    - 2.) Mechanical, electrical, communication rooms, and including the surrounding areas within 10 feet: 1/2 Inch = 1'-0" (minimum).
    - 3.) Shafts and risers: 1/2 Inch = 1'-0" (minimum).
    - 4.) Sections of shafts and mechanical and electrical equipment rooms: 1/4 Inch = 1'-0" (minimum).
    - 5.) Sections of congested areas: 1/2 Inch = 1'-0" (minimum).
2. Ductwork layout drawings shall be the baseline system for other components. Ductwork layout drawings shall be modified to accommodate other components as the coordination process progresses.
3. There may be more drawings required for risers, top and bottom levels of mechanical rooms, and shafts.
4. The minimum quantity of drawings will be established at the first coordination meeting and sent to the A/E for review. Additional drawings may be required if other areas of congestion are discovered during the coordination process.

D. General:

1. Coordination drawing files shall be made available to the A/E and Owner's Representative. The A/E will only review identified conflicts and give an opinion, but will not perform as a coordinator.



2. A plotted set of coordination drawings shall be available at the project site.
3. Coordination drawings are not shop drawings and shall not be submitted as such.
4. The contract drawings are schematic in nature and do not show every fitting and appurtenance for each utility. Each contractor is expected to have included in his/her bid sufficient fittings, material, and labor to allow for adjustments in routing of utilities made necessary by the coordination process and to provide a complete and functional system.
5. The contractors will not be allowed additional costs or time extensions due to participation in the coordination process.
6. The contractors will not be allowed additional costs or time extensions for additional fittings, reroutings or changes of duct size, that are essentially equivalent sizes to those shown on the drawings and determined necessary through the coordination process.
7. The A/E reserves the right to determine space priority of equipment in the event of spatial conflicts or interference between equipment, piping, conduit, ducts, and equipment provided by the trades.
8. Changes to the contract documents that are necessary for systems installation and coordination shall be brought to the attention of the A/E.
9. Access panels shall preferably occur only in gypsum board walls or plaster ceilings where indicated on the drawings.
  - a. Access to mechanical, electrical, technology, and other items located above the ceiling shall be through accessible lay-in ceiling tile areas.
  - b. Potential layout changes shall be made to avoid additional access panels.
  - c. Additional access panels shall not be allowed without written approval from the A/E at the coordination drawing stage.
  - d. Providing additional access panels shall be considered after other alternatives are reviewed and discarded by the A/E and the Owner's Representative.
  - e. When additional access panels are required, they shall be provided without additional cost to the Owner.
10. Complete the coordination drawing process and obtain sign off of the drawings by all contractors prior to installing any of the components.
11. Conflicts that result after the coordination drawings are signed off shall be the responsibility of the contractor or subcontractor who did not properly identify their work requirements, or installed their work without proper coordination.
12. Updated coordination drawings that reflect as-built conditions may be used as record documents.

## 1.4 QUALITY ASSURANCE

### A. Contractor's Responsibility Prior to Submitting Pricing Data:

1. The Contractor is responsible for constructing complete and operating systems. The Contractor acknowledges and understands that the Contract Documents are a two-dimensional representation of a three-dimensional object, subject to human interpretation. This representation may include imperfect data, interpreted codes, utility guidelines, three-dimensional conflicts, and required field coordination items. Such deficiencies can be corrected when identified prior to ordering material and starting installation. The Contractor agrees to carefully study and compare the individual Contract Documents and report at once in writing to the Design Team any deficiencies the Contractor may discover. The Contractor further agrees to require each subcontractor to likewise study the documents and report at once any deficiencies discovered.
2. The Contractor shall resolve all reported deficiencies with the Architect/Engineer prior to awarding any subcontracts, ordering material, or starting any work with the Contractor's own employees. Any work performed prior to receipt of instructions from the Design Team will be done at the Contractor's risk.

### B. Qualifications:

1. Only products of reputable manufacturers are acceptable.
2. All Contractors and subcontractors shall employ only workers skilled in their trades.

### C. Compliance with Codes, Laws, Ordinances:

1. Conform to all requirements of the City of Joliet, IL Codes, Laws, Ordinances and other regulations having jurisdiction.
2. Conform to all State Codes.
3. If there is a discrepancy between the codes and regulations and these specifications, the Architect/Engineer shall determine the method or equipment used.
4. If the Contractor notes, at the time of bidding, any parts of the drawings or specifications that do not comply with the codes or regulations, he shall inform the Architect/Engineer in writing, requesting a clarification. If there is insufficient time for this procedure, he shall submit with his proposal a separate price to make the system comply with the codes and regulations.
5. All changes to the system made after letting of the contract, to comply with codes or requirements of Inspectors, shall be made by the Contractor without cost to the Owner.
6. If there is a discrepancy between manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
7. All rotating shafts and/or equipment shall be completely guarded from all contact. Partial guards and/or guards that do not meet all applicable OSHA standards are not acceptable. Contractor is responsible for providing this guarding if it is not provided with the equipment supplied.

D. Permits, Fees, Taxes, Inspections:

1. Procure all applicable permits and licenses.
2. Abide by all laws, regulations, ordinances, and other rules of the State or Political Subdivision where the work is done, or as required by any duly constituted public authority.
3. Pay all charges for permits or licenses.
4. Pay all fees and taxes imposed by the State, Municipal and/or other regulatory bodies.
5. Pay all charges arising out of required inspections by an authorized body.
6. Pay all charges arising out of required contract document reviews associated with the project and as initiated by the Owner or authorized agency/consultant.
7. Where applicable, all fixtures, equipment and materials shall be approved or listed by Underwriter's Laboratories, Inc.

E. Examination of Drawings:

1. The drawings for the fire protection work are completely diagrammatic, intended to convey the scope of the work and to indicate the general arrangements and locations of equipment, outlets, etc., and the approximate sizes of equipment.
2. Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pipes and ducts to best fit the layout of the job.
3. Scaling of the drawings is not sufficient or accurate for determining these locations.
4. Where job conditions require reasonable changes in indicated arrangements and locations, such changes shall be made by the Contractor at no additional cost to the Owner.
5. Because of the scale of the drawings, certain basic items, such as fittings, boxes, valves, unions, etc., may not be shown, but where required by other sections of the specifications or required for proper installation of the work, such items shall be furnished and installed.
6. If an item is either on the drawings or in the specifications, it shall be included in this contract.
7. Determination of quantities of material and equipment required shall be made by the Contractor from the documents. Where discrepancies arise between drawings, schedules and/or specifications, the greater number shall govern.
8. Where used in fire protection documents, the word "furnish" shall mean supply for use, the word "install" shall mean connect complete and ready for operation, and the word "provide" shall mean to supply for use and connect complete and ready for operation.
  - a. Any item listed as furnished shall also be installed, unless otherwise noted.

- b. Any item listed as installed shall also be furnished, unless otherwise noted.

F. Field Measurements:

- 1. Verify all pertinent dimensions at the job site before ordering any materials or fabricating any supports, pipes or ducts.

G. Electronic Media/Files:

- 1. Construction drawings for this project have been prepared utilizing Revit.
- 2. Contractors and Subcontractors may request electronic media files of the contract drawings and/or copies of the specifications. Specifications will be provided in PDF format.
- 3. Upon request for electronic media, the Contractor shall complete and return a signed "Electronic File Transmittal" form provided by KJWW.
- 4. If the information requested includes floor plans prepared by others, the Contractor will be responsible for obtaining approval from the appropriate Design Professional for use of that part of the document.
- 5. The electronic contract documents can be used for preparation of shop drawings and as-built drawings only. The information may not be used in whole or in part for any other project.
- 6. The drawings prepared by KJWW for bidding purposes may not be used directly for ductwork layout drawings or coordination drawings.
- 7. The use of these CAD documents by the Contractor does not relieve them from their responsibility for coordination of work with other trades and verification of space available for the installation.
- 8. The information is provided to expedite the project and assist the Contractor with no guarantee by KJWW as to the accuracy or correctness of the information provided. KJWW accepts no responsibility or liability for the Contractor's use of these documents.

1.5 SUBMITTALS

- A. Submittals shall be required for the following items, and for additional items where required elsewhere in the specifications or on the drawings.

- 1. Submittals list:

<u>Referenced Specification Section</u>	<u>Submittal Item</u>
21 13 00	Sprinkler Systems
21 13 00	Fire Protection Equipment
Refer to Drawings	Fire Protection Material List Items

- B. General Submittal Procedures: In addition to the provisions of Division 1, the following are required:

1. Transmittal: Each transmittal shall include the following:
  - a. Date
  - b. Project title and number
  - c. Contractor's name and address
  - d. Division of work (e.g., fire protection, etc.)
  - e. Description of items submitted and relevant specification number
  - f. Notations of deviations from the contract documents
  - g. Other pertinent data
  
2. Submittal Cover Sheet: Each submittal shall include a cover sheet containing:
  - a. Date
  - b. Project title and number
  - c. Architect/Engineer
  - d. Contractor and subcontractors' names and addresses
  - e. Supplier and manufacturer's names and addresses
  - f. Division of work (e.g., fire protection, etc.)
  - g. Description of item submitted (using project nomenclature) and relevant specification number
  - h. Notations of deviations from the contract documents
  - i. Other pertinent data
  - j. Provide space for Contractor's review stamps
  
3. Composition:
  - a. Submittals shall be submitted using specification sections and the project nomenclature for each item.
  - b. Individual submittal packages shall be prepared for items in each specification section. All items within a single specification section shall be packaged together where possible. An individual submittal may contain items from multiple specifications sections if the items are intimately linked (e.g., pumps and motors).
  - c. All sets shall contain an index of the items enclosed with a general topic description on the cover.
  
4. Content: Submittals shall include all fabrication, erection, layout, and setting drawings; manufacturers' standard drawings; schedules; descriptive literature, catalogs and brochures; performance and test data; wiring and control diagrams; dimensions; shipping and operating weights; shipping splits; service clearances; and all other drawings and descriptive data of materials of construction as may be required to show that the materials, equipment or systems and the location thereof conform to the requirements of the contract documents.
  
5. Contractor's Approval Stamp:
  - a. The Contractor shall thoroughly review and approve all shop drawings before submitting them to the Architect/Engineer. The Contractor shall stamp, date and sign each submittal certifying it has been reviewed.
  - b. Unstamped submittals will be rejected.

- c. The Contractor's review shall include, but not be limited to, verification of the following:
    - 1.) Only approved manufacturers are used.
    - 2.) Addenda items have been incorporated.
    - 3.) Catalog numbers and options match those specified.
    - 4.) Performance data matches that specified.
    - 5.) Electrical characteristics and loads match those specified.
    - 6.) Equipment connection locations, sizes, capacities, etc. have been coordinated with other affected trades.
    - 7.) Dimensions and service clearances are suitable for the intended location.
    - 8.) Equipment dimensions are coordinated with support steel, housekeeping pads, openings, etc.
    - 9.) Constructability issues are resolved (e.g., weights and dimensions are suitable for getting the item into the building and into place, etc.).
  - d. The Contractor shall review, stamp and approve all subcontractors' submittals as described above.
  - e. **The Contractor's approval stamp is required on all submittals. Approval will indicate the Contractor's review of all material and a complete understanding of exactly what is to be furnished. Contractor shall clearly mark all deviations from the contract documents on all submittals. If deviations are not marked by the Contractor, then the item shall be required to meet all drawing and specification requirements.**
6. Submittal Identification and Markings:
- a. The Contractor shall clearly mark each item with the same nomenclature applied on the drawings or in the specifications.
  - b. The Contractor shall clearly indicate the size, finish, material, etc.
  - c. Where more than one model is shown on a manufacturer's sheet, the Contractor shall clearly indicate exactly which item and which data is intended.
  - d. All marks and identifications on the submittals shall be unambiguous.
7. Schedule submittals to expedite the project. Coordinate submission of related items.
8. Identify variations from the contract documents and product or system limitations that may be detrimental to the successful performance of the completed work.
9. Reproduction of contract documents alone is not acceptable for submittals.
10. Incomplete submittals will be rejected without review. Partial submittals will only be reviewed with prior approval from the Architect/Engineer.
11. Submittals not required by the contract documents may be returned without review.

12. The Architect/Engineer's responsibility shall be to review one set of shop drawing submittals for each product. If the first submittal is incomplete or does not comply with the drawings and/or specifications, the Contractor shall be responsible to bear the cost for the Architect/Engineer to recheck and handle the additional shop drawing submittals.
13. Submittals shall be reviewed and approved by the Architect/Engineer **before** releasing any equipment for manufacture or shipment.
14. Contractor's responsibility for errors, omissions or deviation from the contract documents in submittals is not relieved by the Architect/Engineer's approval.

C. Electronic Submittal Procedures:

1. Distribution: Email submittals as attachments to all parties designated by the Architect/Engineer, unless a web-based submittal program is used.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
  - a. Submittal file name: 21 XX XX.description.YYYYMMDD
  - b. Transmittal file name: 21 XX XX.description.YYYYMMDD
5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files shall be transmitted via a pre-approved method.

1.6 SCHEDULE OF VALUES

- A. The requirements herein are in addition to the provisions of Division 1.
- B. Format:
  1. Use AIA Document Continuation Sheets G703 or another similar form approved by the Owner and Architect/Engineer.
  2. Submit in Excel format.
  3. Support values given with substantiating data.
- C. Preparation:
  1. Itemize the cost for each of the following:
    - a. Overhead and profit.
    - b. Bonds.
    - c. Insurance.
    - d. General Requirements: Itemize all requirements.

2. Itemize work required by each specification section and list all providers. All work provided by subcontractors and major suppliers shall be listed on the Schedule of Values. List each subcontractor and supplier by company name.
    - a. Contractor's own labor forces.
    - b. All subcontractors.
    - c. All major suppliers of products or equipment.
  3. Break down all costs into:
    - a. Material: Delivered cost of product with taxes paid.
    - b. Labor: Labor cost, excluding overhead and profit.
  4. For each line item having an installed cost of more than \$5,000, break down costs to list major products or operations under each item. At a minimum, provide material and labor cost line items for the following:
    - a. Each piece of equipment requiring shop drawings (e.g., backflow preventer, etc.) using the project nomenclature (BFP-1, etc.).
    - b. Each sprinkler zone. In addition, break down the material and labor based on geography (building, floor, wing and/or phase).
    - c. Commissioning
    - d. Record drawings
    - e. Punchlist and closeout
- D. Update Schedule of Values when:
1. Indicated by Architect/Engineer.
  2. Change of subcontractor or supplier occurs.
  3. Change of product or equipment occurs.

#### 1.7 CHANGE ORDERS

- A. A detailed material and labor takeoff shall be prepared for each change order, along with labor rates and markup percentages. Change orders with inadequate breakdown will be rejected.
- B. Change order work shall not proceed until authorized.

#### 1.8 EQUIPMENT SUPPLIERS' INSPECTION

- A. The following equipment shall not be placed in operation until a competent installation and service representative of the manufacturer has inspected the installation and certified that the equipment is properly installed, adjusted and lubricated; that preliminary operating instructions have been given; and that the equipment is ready for operation:
  1. Fire Seal Systems
- B. Contractor shall arrange for and obtain supplier's on-site inspection(s) at proper time(s) to assure each phase of equipment installation and/or connection is in accordance with the manufacturer's instructions.
- C. Submit copies of start-up reports to the Architect/Engineer and include copies of Owner's Operation and Maintenance Manuals.



## 1.9 PRODUCT DELIVERY, STORAGE, HANDLING & MAINTENANCE

- A. Exercise care in transporting and handling to avoid damage to materials. Store materials on the site to prevent damage. Keep materials clean, dry and free from harmful conditions. Immediately remove any materials that become wet or that are suspected of becoming contaminated with mold or other organisms.
- B. Keep all bearings properly lubricated and all belts properly tensioned and aligned.
- C. Coordinate the installation of heavy and large equipment with the General Contractor and/or Owner. If the Mechanical Contractor does not have prior documented experience in rigging and lifting similar equipment, he/she shall contract with a qualified lifting and rigging service that has similar documented experience. Follow all equipment lifting and support guidelines for handling and moving.
- D. Contractor is responsible for moving equipment into the building and/or site. Contractor shall review site prior to bid for path locations and any required building modifications to allow movement of equipment. Contractor shall coordinate his/her work with other trades.

## 1.10 WARRANTY

- A. Provide one-year warranty, unless otherwise noted, to the Owner for all fixtures, equipment, materials, and workmanship.
- B. The warranty period for all work in this Division of the specifications shall commence on the date of final acceptance, unless a whole or partial system or any separate piece of equipment or component is put into use for the benefit of any party other than the installing contractor with prior written authorization. In this instance, the warranty period shall commence on the date when such whole system, partial system or separate piece of equipment or component is placed in operation and accepted in writing by the Owner.
- C. Warranty requirements shall extend to correction, without cost to the Owner, of all Work found to be defective or nonconforming to the contract documents. The Contractor shall bear the cost of correcting all damage resulting from defects or nonconformance with contract documents.

## 1.11 INSURANCE

- A. Contractor shall maintain insurance coverage as set forth in Division 0 of these specifications.

## 1.12 MATERIAL SUBSTITUTION

- A. Where several manufacturers' names are given, the manufacturer for which a catalog number is given is the basis for job design and establishes the quality required.
- B. Equivalent equipment manufactured by the other named manufacturers may be used. Contractor shall ensure that all items submitted by these other manufacturers meet all requirements of the drawings and specifications, and fits in the allocated space.
- C. Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Architect/Engineer not later than ten days prior to the bid opening.

- D. This Contractor assumes all costs incurred as a result of using the offered material, article or equipment, on his part or on the part of other Contractors whose work is affected.
- E. This Contractor may list voluntary add or deduct prices for alternate materials on the bid form. These items will not be used in determining the low bidder.
- F. All material substitutions requested later than ten (10) days prior to bid opening must be listed as voluntary changes on the bid form.

#### 1.13 LEED REQUIREMENTS

- A. This project is pursuing a LEED Certified certification in accordance with USGBC LEED Rating System for New Construction Version 2009. The Contractor shall provide all services and documentation necessary to achieve this rating.

#### 1.14 PROJECT COMMISSIONING

- A. The Contractor shall work with the Commissioning Agent (CxA) as described in Section 21 08 00, and provide all services necessary for compliance with LEED Prerequisite EAp1 and Fundamental Commissioning.

### PART 2 - PRODUCTS

NOT APPLICABLE

### PART 3 - EXECUTION

#### 3.1 JOBSITE SAFETY

- A. Neither the professional activities of the Architect/Engineer, nor the presence of the Architect/Engineer or his or her employee and subconsultants at a construction site, shall relieve the Contractor and other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. The Architect/Engineer and his or her personnel have no authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The Contractor is solely responsible for jobsite safety. The Architect/Engineer and the Architect/Engineer's consultants shall be indemnified and shall be made additional insureds under the Contractor's general liability insurance policy.

#### 3.2 EXCAVATION, FILL, BACKFILL, COMPACTION

- A. General:
  - 1. Prior to the commencement of any excavation or digging, the Contractor shall verify all underground utilities with the regional utility locator. Provide prior notice to the locator before excavations. Contact information for most regional utility locaters can be found by calling 811.
  - 2. The Contractor shall do all excavating, filling, backfilling and compacting associated with his work.

B. Excavation:

1. Make all excavations to accurate, solid, undisturbed earth, and to proper dimensions.
2. Where excavations are made in error below foundations, concrete of same strength as specified for the foundations or thoroughly compacted sand-gravel fill, as determined by the Architect/Engineer, shall be placed in such excess excavations. Place thoroughly compacted, clean, stable fill in excess excavations under slabs on grade, at the Contractor's expense.
3. Trim bottom and sides of excavations to grades required for foundations.
4. Protect excavations against frost and freezing.
5. Take care in excavating not to damage surrounding structures, equipment or buried pipe. Do not undermine footing or foundation.
6. Perform all trenching in a manner to prevent cave-ins and risk to workmen.
7. Where original surface is pavement or concrete, the surface shall be saw cut to provide clean edges and assist in the surface restoration.
8. Where satisfactory bearing soil for foundations is not found at the indicated levels, the Architect/Engineer or their representative shall be notified immediately, and no further work shall be done until further instructions are given by the Architect/Engineer or their representative.

C. Dewatering:

1. Contractor shall furnish, install, operate and remove all dewatering pumps and pipes needed to keep trenches and pits free of water.

D. Underground Obstructions:

1. Known underground piping, foundations, and other obstructions in the vicinity of construction are shown on the drawings. Use great care in making installations near underground obstruction.
2. If objects not shown on the drawings are encountered, remove, relocate, or perform extra work as directed by the Architect/Engineer.

E. Fill and Backfilling:

1. No rubbish or waste material is permitted for fill or backfill.
2. Provide all necessary sand for backfilling.
3. Dispose of the excess excavated earth as directed.
4. Backfill materials shall be suitable for required compaction, clean and free of perishable materials and stones greater than 4 inches in diameter. Water shall not be permitted to rise in unbackfilled trenches. No material shall be used for backfilling that contains frozen earth, debris or earth with a high void content.
5. Backfill all trenches and excavations immediately after installing pipes, or removal of forms, unless other protection is provided.

6. Around piers and isolated foundations and structures, backfill and fill shall be placed and consolidated simultaneously on all sides to prevent wedge action and displacement. Fill and backfill materials shall be spread in 6 inch uniform horizontal layers with each layer compacted separately to required density.
7. Lay all piping on a compacted bed of sand at least 3 inches deep. Backfill around pipes with sand, 6 inch layers, and compact each layer.
8. Use sand for backfill up to grade for all piping under slabs or paved areas. All other piping shall have sand backfill to 6 inches above the top of the pipe.
9. Place all backfill above the sand in uniform layers not exceeding 6 inches deep. Each layer shall be placed, then carefully and uniformly tamped, to eliminate lateral or vertical displacement.
10. Where the fill and backfill will ultimately be under a building, floor or paving, each layer of fill shall be compacted to 95% of the maximum density determined by AASHTO Designation T-99 or ASTM Designation D-698. Moisture content of soil at time of compaction shall not exceed plus or minus 2% of optimum moisture content determined by AASHTO T-99 or ASTM D-698 test.

### 3.3 ARCHITECT/ENGINEER OBSERVATION OF WORK

- A. The Contractor shall provide seven (7) calendar days notice to the Architect/Engineer prior to:
  1. Covering exterior walls, interior partitions and chases.
  2. Installing hard or suspended ceilings and soffits.
- B. The Architect/Engineer will have the opportunity to review the installation and provide a written report noting deficiencies requiring correction. The Contractor's schedule shall account for these reviews and show them as line items in the approved schedule.
- C. Above-Ceiling Final Observation
  1. All work above the ceilings must be complete prior to the Architect/Engineer's review. This includes, but is not limited to:
    - a. Pipe wall penetrations are sealed.
    - b. Pipe identification is installed.
    - c. Branch piping in the location of sprinklers shall be dropped to the ceiling.
  2. In order to prevent the Above-Ceiling Final Observation from occurring too early, the Contractor shall review the status of the work and certify, in writing, that the work is ready for the Above-Ceiling Final Observation.
  3. It is understood that if the Architect/Engineer finds the ceilings have been installed prior to this review and prior to 7 days elapsing, the Architect/Engineer may not recommend further payments to the contractor until such time as full access has been provided.

### 3.4 PROJECT CLOSEOUT

- A. The following paragraphs supplement the requirements of Division 1.
- B. Final Jobsite Observation:
  - 1. In order to prevent the Final Jobsite Observation from occurring too early, the Contractor is required to review the completion status of the project and certify that the job is ready for the final jobsite observation.
  - 2. Attached to the end of this section is a typical list of items that represent the degree of job completeness expected prior to requesting a review.
  - 3. Upon Contractor certification that the project is complete and ready for a final observation, the Contractor shall sign the attached certification and return it to the Architect/Engineer so that the final observation can be scheduled.
  - 4. It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineer's additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.
- C. Before final payment is authorized, this Contractor must submit the following:
  - 1. Operation and maintenance manuals with copies of approved shop drawings.
  - 2. Record documents including reproducible drawings and specifications.
  - 3. A report documenting the instructions given to the Owner's representatives complete with the number of hours spent in the instruction. The report shall bear the signature of an authorized agent of This Contractor and shall be signed by the Owner's representatives.
  - 4. Inspection report by the State Fire Marshal of the fire protection system.
  - 5. Start-up reports on all equipment requiring a factory installation inspection or start-up.
  - 6. Provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections. Deliver to project site and place in location as directed; receipt by Architect/Engineer required prior to final payment approval.

### 3.5 OPERATION AND MAINTENANCE MANUALS

- A. General:
  - 1. Provide an electronic copy of the O&M manuals as described below for Architect/Engineer's review and approval. The electronic copy shall be corrected as required to address the Architect/Engineer's comments. Once corrected, electronic copies and paper copies shall be distributed as directed by the Architect/Engineer.
  - 2. Approved O&M manuals shall be completed and in the Owner's possession prior to Owner's acceptance and at least 10 days prior to instruction of operating personnel.

B. Electronic Submittal Procedures:

1. Distribution: Email the O&M manual as attachments to all parties designated by the Architect/Engineer.
2. Transmittals: Each submittal shall include an individual electronic letter of transmittal.
3. Format: Electronic submittals shall be in PDF format only. Scanned copies, in PDF format, of paper originals are acceptable. Submittals that are not legible will be rejected. Do not set any permission restrictions on files; protected, locked, or secured documents will be rejected.
4. File Names: Electronic submittal file names shall include the relevant specification section number followed by a description of the item submitted, as follows. Where possible, include the transmittal as the first page of the PDF instead of using multiple electronic files.
  - a. O&M file name: O&M.div21.contractor.YYYYMMDD
  - b. Transmittal file name: O&Mtransmittal.div21.contractor.YYYYMMDD
5. File Size: Electronic file size shall be limited to a maximum of 4MB. Larger files shall be divided into files that are clearly labeled as "1 of 2", "2 of 2", etc.
6. Provide the Owner with an approved copy of the O&M manual on compact discs (CD), digital video discs (DVD), or flash drives with a permanently affixed label, printed with the title "Operation and Maintenance Instructions", title of the project and subject matter of disc/flash drive when multiple disc/flash drives are required.
7. All text shall be searchable.
8. Bookmarks shall be used, dividing information first by specification section, then systems, major equipment and finally individual items. All bookmark titles shall include the nomenclature used in the construction documents and shall be an active link to the first page of the section being referenced.

C. Operation and Maintenance Instructions shall include:

1. Title Page: Include title page with project title, Architect, Engineer, Contractor, all subcontractors, and major equipment suppliers, with addresses, telephone numbers, website addresses, email addresses and point of contacts. Website URLs and email addresses shall be active links in the electronic submittal.
2. Table of Contents: Include a table of contents describing specification section, systems, major equipment, and individual items.
3. Copies of all final approved shop drawings and submittals. Include Architect's/Engineer's shop drawing review comments. Insert the individual shop drawing directly after the Operation and Maintenance information for the item(s) in the review form.
4. Copy of final approved test and balance reports.
5. Copies of all factory inspections and/or equipment startup reports.
6. Copies of warranties.

7. Schematic wiring diagrams of the equipment that have been updated for field conditions. Field wiring shall have label numbers to match drawings.
8. Dimensional drawings of equipment.
9. Capacities and utility consumption of equipment.
10. Detailed parts lists with lists of suppliers.
11. Operating procedures for each system.
12. Maintenance schedule and procedures. Include a chart listing maintenance requirements and frequency.
13. Repair procedures for major components.
14. List of lubricants in all equipment and recommended frequency of lubrication.
15. Instruction books, cards, and manuals furnished with the equipment.

### 3.6 SYSTEM COMMISSIONING

- A. The fire protection systems shall be complete and operating. System start-up, testing, balancing, and satisfactory system performance is the responsibility of the Contractor. This includes calibration and adjustments of all controls, noise level adjustments and final comfort adjustments as required.
- B. All operating conditions and control sequences shall be tested during the start-up period. Test all interlocks, safety shutdowns, controls, and alarms.
- C. The Contractor, subcontractors, and equipment suppliers shall have skilled technicians to ensure that all systems perform properly. If the Architect/Engineer is requested to visit the job site for trouble shooting, assisting in start-up, obtaining satisfactory equipment operation, resolving installation and/or workmanship problems, equipment substitution issues or unsatisfactory system performance, including call backs during the warranty period, through no fault of the design; the Contractor shall reimburse the Owner on a time and materials basis for services rendered at the Architect/Engineer's standard hourly rates in effect when the services are requested. The Contractor shall pay the Owner for services required that are product, installation or workmanship related. Payment is due within 30 days after services are rendered.

### 3.7 RECORD DOCUMENTS

- A. The following paragraph supplements Division 1 requirements:

Contractor shall maintain at the job site a separate and complete set of fire protection drawings and specifications on which he shall clearly and permanently mark in complete detail all changes made to the fire protection systems.
- B. Mark drawings to indicate revisions to piping size and location, both exterior and interior; including locations of other control devices, and other units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned from column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located; Change Orders; concealed control system devices.

- C. Before completion of the project, a set of reproducible fire protection drawings will be given to the Contractor for transfer of all as-built conditions from the paper set maintained at the job site. All marks on reproducibles shall be clear and permanent.
- D. Mark specifications to show approved substitutions; Change Orders, and actual equipment and materials used.
- E. Record changes daily and keep the marked drawings available for the Architect/Engineer's examination at any normal work time.
- F. Upon completing the job, and before final payment is made, give the marked-up drawings to the Architect/Engineer.

### 3.8 PAINTING

- A. Paint all equipment that is marred or damaged prior to the Owner's acceptance. Paint and color shall match original equipment paint and shall be obtained from the equipment supplier if available.
- B. Equipment in finished areas that will be painted to match the room decor will be painted by others. Should this Contractor install equipment in a finished area after the area has been painted, he shall have the equipment and all its supports, hangers, etc., painted to match the room decor.
- C. Equipment cabinets, casings, covers, metal jackets, etc., in equipment rooms or concealed spaces, shall be furnished in standard or prime finish, free from scratches, abrasions, chips, etc.
- D. Equipment in occupied spaces, or if standard to the unit, shall have a baked primer with baked enamel finish coat free from scratches, abrasions, chips, etc. If color option is specified or is standard to the unit, this Contractor shall, before ordering, verify with the Architect/Engineer his color preference and furnish this color.
- E. Paint all equipment in unfinished areas such as boiler room, mechanical spaces, storage room, etc., furnished by this Contractor. Equipment furnished with a factory coat of paint and enamel need not be painted, provided the factory applied finish is not marred or spattered. If so, equipment shall be refinished with the same paint as was factory applied.
- F. After surfaces have been thoroughly cleaned and are free of oil, dirt, and other foreign matter; paint all pipes and equipment with the following:
  - 1. Bare Metal Surfaces - Apply one coat of primer suitable for the metal being painted. Finish with two coats of Alkyd base enamel paint.
  - 2. Color of paint shall be per the Architect.
- G. In accordance with LEED EQc4.2: Low-Emitting Materials - Paints and Coatings, all paints and coatings used on the interior of the building must comply with the following criteria:
  - 1. Architectural paints and coatings applied to interior walls and ceilings must not exceed the volatile organic compound (VOC) content limits established in Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.



2. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit of 250 g/L (2 lb./gal) established in Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.
3. Clear wood finishes, floor coatings, stains, primers, sealers, and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.

### 3.9 ADJUST AND CLEAN

- A. Thoroughly clean all equipment and systems prior to the Owner's final acceptance of the project. Clean all foreign paint, grease, oil, dirt, labels, stickers, and other foreign material from all equipment.
- B. Clean all areas where moisture is present. Immediately report any mold, biological growth, or water damage.
- C. Remove all rubbish, debris, etc., accumulated during construction from the premises.

### 3.10 SPECIAL REQUIREMENTS

- A. Contractor shall coordinate the installation of all equipment, valves, etc., with other trades to maintain clear access area for servicing.
- B. All equipment shall be installed in such a way to maximize access to parts needing service or maintenance. Review the final field location, placement, and orientation of equipment with the Owner's designated representative prior to setting equipment.
- C. Installation of equipment or devices without regard to coordination of access requirements and confirmation with the Owner's designated representative will result in removal and reinstallation of the equipment at the Contractor's expense.
- D. In accordance with LEED EQc4.1, Low-Emitting Materials - Adhesives and Sealants, all adhesives and sealants used on the interior of the building must comply with the following requirements:
  1. Adhesives, sealants, and sealant primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168.
  2. Aerosol adhesives must comply with Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000.

### 3.11 IAQ MAINTENANCE FOR OCCUPIED FACILITIES UNDER CONSTRUCTION

- A. Contractors shall make all reasonable efforts to prevent construction activities from affecting the air quality of the occupied areas of the building or outdoor areas near the building. These measures shall include, but not be limited to:
  1. All contractors shall endeavor to minimize the amount of contaminants generated during construction. Methods to be employed shall include, but not be limited to:
    - a. Minimizing the amount of dust generated.
    - b. Reducing solvent fumes and VOC emissions.
    - c. Maintain good housekeeping practices, including sweeping and periodic dust and debris removal. There should be no visible haze in the air.

2. Request that the Owner designate an IAQ representative.
3. Review and receive approval from the Owner's IAQ representative for all IAQ-related construction activities and negative pressure containment plans.
4. Inform the IAQ representative of all conditions that could adversely impact IAQ, including operations that will produce higher than normal dust production or odors.
5. Schedule activities that may cause IAQ conditions that are not acceptable to the Owner's IAQ representative during unoccupied periods.
6. Request copies of and follow all of the Owner's IAQ and infection control policies.
7. Unless no other access is possible, the entrance to construction site shall not be through the existing facility.
8. To minimize growth of infectious organisms, do not permit damp areas in or near the construction area to remain for over 24 hours.
9. In addition to the criteria above, provide measures as recommended in the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction".

### 3.12 CONSTRUCTION WASTE MANAGEMENT

- A. This Contractor shall comply with all construction and demolition waste disposal and recycling requirements outlined in LEED MRc2: Construction Waste Management (follow latest edition at the time of bidding or as referenced in these specifications).
  1. This Contractor shall coordinate with the Construction Manager to develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or co-mingled.
  2. The Contractor shall track waste disposal and recycling efforts throughout the construction process for all materials associated with this Contractor's scope of work. The Contractor shall provide this information to the Construction Manager so that it can be incorporated with similar information from all other contractors for the project.
    - a. Calculations for waste and recycled material can be done by weight or volume, but they must be consistent throughout the project. The Contractor shall coordinate with the Construction Manager to establish the preferred calculation method and report the results accordingly.
    - b. Excavated soil and land-clearing debris do not count towards the waste disposal or recycled material.
  3. At a minimum, 75% of the construction and demolition debris for this project must be recycled or salvaged.

**END OF SECTION 21 05 00**

READINESS CERTIFICATION PRIOR TO FINAL JOBSITE OBSERVATION

In order to prevent the final job observation from occurring too early, we require that the Contractor review the completion status of the project and, by copy of this document, certify that the job is indeed ready for the final job observation. The following is a typical list of items that represent the degree of job completeness expected prior to your requesting a final job observation.

1. Penetrations fire sealed and labeled in accordance with specifications.
2. Fire protection system operational.
3. Pipes labeled.

Accepted by:

Prime Contractor \_\_\_\_\_

By \_\_\_\_\_ Date \_\_\_\_\_

Upon Contractor certification that the project is complete and ready for a final job observation, we require the Contractor to sign this agreement and return it to the Architect/Engineer so that the final observation can be scheduled.

It is understood that if the Architect/Engineer finds the job not ready for the final observation and that additional trips and observations are required to bring the project to completion, the costs incurred by the Architect/Engineers for additional time and expenses will be deducted from the Contractor's contract retainage prior to final payment at the completion of the job.

\* \* \* \* \*



## SECTION 21 05 03 - THROUGH PENETRATION FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Through-Penetration Firestopping.

#### 1.2 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.
- B. Installer: Individuals performing work shall be certified by the manufacturer of the system selected for installation.

#### 1.3 REFERENCES

- A. UL 723 - Surface Burning Characteristics of Building Materials
- B. ANSI/UL 1479 - Fire Tests of Through Penetration Firestops
- C. UL Fire Resistance Directory Through Penetration Firestop Systems (XHEZ)
- D. Warnock Hersey - Directory of Listed Products
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- F. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops
- G. The Building Officials and Code Administrators National Building Code
- H. Wisconsin Administrative Code
- I. 2003 International Building Code.
- J. NFPA 5000 – Building Construction Safety Code

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store, protect and handle products on site. Accept material on site in factory containers and packing. Inspect for damage. Protect from deterioration or damage due to moisture, temperature changes, contaminants, or other causes. Follow manufacturer's instructions for storage.
- B. Install material prior to expiration of product shelf life.

#### 1.5 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
  - 1. Fire-resistance-rated walls including fire partitions, fire barriers, and smoke barriers.
  - 2. Fire-resistance-rated horizontal assemblies including floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
  2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings:
    - a. Floor penetrations located outside wall cavities.
    - b. Floor penetrations located outside fire-resistance-rated shaft enclosures.
- C. For through-penetration firestop systems exposed to light, traffic, moisture, or physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. For through-penetration firestop systems in air plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.
- F. In accordance with LEED EQc4.1, Low-Emitting Materials - Adhesives and Sealants, all adhesives and sealants used on the interior of the building must comply with the following requirements:
1. Adhesives, sealants and sealant primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168.
  2. Aerosol adhesives must comply with Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000.

## 1.6 MEETINGS

- A. Pre-installation meeting: A pre-installation meeting shall be scheduled and shall include the Construction Manager, all Contractors associated with the installation of systems penetrating fire barriers, Firestopping Manufacturer's Representative, and the Owner.
1. Review foreseeable methods related to firestopping work.
  2. Tour representative areas where firestopping is to be installed; inspect and discuss each type of condition and each type of substrate that will be encountered, and preparation to be performed by other trades.

## 1.7 WARRANTY

- A. Provide one year warranty on parts and labor.
- B. Warranty shall cover repair or replacement of firestop systems which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, general durability, or appear to deteriorate in any manner not clearly specified by the manufacturer as an inherent quality of the material.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers. All firestopping systems installed shall be provided by a single manufacturer.
1. 3M; Fire Protection Products Division.
  2. Hilti, Inc.
  3. RectorSeal Corporation, Metacaulk.
  4. Tremco; Sealant/Weatherproofing Division.
  5. Johns-Manville.
  6. Specified Technologies Inc. (S.T.I.)
  7. Spec Seal Firestop Products
  8. AD Firebarrier Protection Systems

### 2.2 THROUGH PENETRATION FIRESTOP SYSTEMS

- A. Provide materials and systems classified by or listed by Warnock Hersey to provide firestopping equal to time rating of construction being penetrated.
- B. All firestopping materials shall be free of asbestos, lead, PCB's, and other materials that would require hazardous waste removal.
- C. Firestopping shall be flexible to allow for normal penetrating item movement due to expansion and contraction.
- D. Firestopping systems for plumbing and wet pipe sprinkler piping shall be moisture resistant.
- E. Provide firestopping systems capable of supporting floor loads where systems are exposed to possible floor loading or traffic.
- F. Provide firestopping systems allowing continuous insulation for all insulated pipes.
- G. Provide firestopping systems classified by UL or listed by Warnock Hersey for penetrations through all fire rated construction. Firestopping systems shall be selected from the UL or listed by Warnock Hersey Fire Resistance Directory Category XHEZ based on substrate construction and penetrating item size and material and shall fall within the range of numbers listed:
1. Non-Combustible Framed Walls - 1 or 2 Hour Rated  
F Rating = Wall Rating  
T Rating = 0

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	WL 0000-0999*
Metallic Pipe or Conduit	WL 1000-1999
Non-Metallic Pipe or Conduit	WL 2000-2999
Electrical Cables	WL 3000-3999
Cable Trays	WL 4000-4999
Insulated Pipes	WL 5000-5999
Bus Duct and Misc. Electrical	WL 6000-6999

<u>Penetrating Item</u>	<u>UL System No.</u>
Duct without Damper and Misc. Mechanical	WL 7000-7999
Multiple Penetrations	WL 8000-8999

2. Concrete or Masonry Floors and Walls - 1 or 2 Hour Rated  
 F Rating = Wall/Floor Rating  
 T Rating (Floors) = Floor Rating

<u>Penetrating Item</u>	<u>UL System No.</u>
No Penetrating Item	CAJ 0000-0999*
Metallic Pipe or Conduit	CAJ 1000-1999
Non-Metallic Pipe or Conduit	CAJ 2000-2999
Electrical Cables	CAJ 3000-3999
Cable Trays	CAJ 4000-4999
Insulated Pipes	CAJ 5000-5999
Bus Duct and Misc. Electrical	CAJ 6000-6999
Duct without Damper and Misc. Mechanical	CAJ 7000-7999
Multiple Penetrations	CAJ 8000-8999

\*Alternate method of firestopping is patching opening to match original rated construction.

- H. Any opening in walls or floors not covered by the listed series of numbers shall be coordinated with the firestopping manufacturer.
- I. Any openings in floors or walls not described in the UL or listed by Warnock Hersey Fire Resistance Directory, or outlined in manufacturer's information shall be sealed in a manner agreed upon by the Firestopping Manufacturer, Owner, and the Authority Having Jurisdiction.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Ensure all surfaces that contact seal materials are free of dirt, dust, grease, oil, rust, or loose materials. Clean and repair surfaces as required. Remove laitance and form-release agents from concrete.
- B. Ensure substrate and penetrating items have been permanently installed prior to installing firestopping systems. Ensure penetrating items have been properly spaced and have proper clearance prior to installing firestopping systems.
- C. Surfaces to which sealing materials are to be installed must meet the selected UL or Warnock Hersey system substrate criteria.
- D. Prime substrates where recommended in writing by through-penetration firestop system manufacturer. Confine primer to area of bond.

### 3.2 INSTALLATION

- A. In existing construction, provide firestopping of openings prior to and after installation of penetrating items. Remove any existing coatings on surfaces prior to firestopping



installation. Temporary firestopping shall consist of packing openings with fire resistant mineral wool for the full thickness of substrate, or an alternate method approved by the Authority Having Jurisdiction. All openings shall be temporarily firestopped immediately upon their installation and shall remain so until the permanent UL or listed by Warnock Hersey listed firestopping system is installed.

- B. Install penetration seal materials in accordance with printed instructions of the UL or Warnock Hersey Fire Resistance Directory and with the manufacturer's printed application instructions.
- C. Install dams as required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Remove combustible damming after appropriate curing.

### 3.3 CLEANING AND PROTECTING

- A. Clean excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not cause damage.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

### 3.4 INSPECTION

- A. All penetrations shall be inspected by the manufacturer's representative to ensure proper installation.
- B. Access to firestop systems shall be maintained for examination by the Authority Having Jurisdiction at their request.
- C. Proceed with enclosing through-penetration firestop system with other construction only after inspection reports are issued and firestop installations comply with requirements.
- D. The contractor shall allow for visual destructive review of 5% of installed firestop systems (minimum of one) to prove compliance with specifications and manufacturer's instructions and details. Destructive system removal shall be performed by the contractor and witnessed by the engineer and manufacturer's factory representative. The engineer shall have sole discretion of which firestop system installations will be reviewed. The contractor is responsible for all costs associated with this requirement including labor and material for removing and replacing the installed firestop system. If any firestop system is found to not be installed per manufacturer's specific instructions and details, all firestop systems are subject to destructive review and replacement at the engineer's discretion and the contractor's expense.

**END OF SECTION 21 05 03**



## SECTION 21 05 29 - FIRE SUPPRESSION SUPPORTS AND ANCHORS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Hangers, Supports, and Associated Anchors.
- B. Equipment Bases and Supports.
- C. Sleeves and Seals.
- D. Flashing and Sealing of Equipment and Pipe Stacks.
- E. Cutting of Openings.
- F. Escutcheon Plates and Trim.

#### 1.2 QUALITY ASSURANCE

- A. Support Sprinkler Piping in conformance with NFPA 13.

#### 1.3 REFERENCES

- A. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.
- B. NFPA 13 - Standard for the Installation of Sprinkler Systems.

### PART 2 - PRODUCTS

#### 2.1 HANGER RODS

- A. Hanger rods for single rod hangers shall conform to the following:

Pipe Size	Hanger Rod Diameter Column #1
2" and smaller	3/8"
2-1/2" through 3-1/2"	1/2"
4" and 5"	5/8"
6"	3/4"

Column #1: Steel pipe.

- B. Rods for double rod hangers may be reduced one size. Minimum rod diameter is 3/8 inches.
- C. Hanger rods and accessories used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

#### 2.2 PIPE HANGERS AND SUPPORTS

- A. All pipe hangers, clamps, and supports shall conform to Manufacturers Standardization Society MSS-SP-58.

- B. Support and laterally brace vertical pipes at every floor level in multi-story structures, and more frequently when required by applicable codes, but never at intervals over 15 feet. Support vertical pipes with riser clamps installed below hubs, couplings or lugs. Provide sufficient flexibility to accommodate expansion and contraction without compromising fire barrier penetrations and other fixed takeoff locations.

Acceptable Products:

Anvil - Fig. CT121  
 Cooper/B-Line - Fig. B3373CT  
 Erico - Model 510  
 Nibco/Tolco - Fig. 82

- C. Unless otherwise indicated, hangers shall be as follows:

1. Clevis Type:

Service: Bare Metal Pipe

Acceptable Products: Bare Steel Pipe

Anvil Fig. 260  
 Cooper/B-Line Fig. 3100  
 Erico Model 400  
 Nibco/Tolco Fig. 1

2. Adjustable Swivel Ring Type:

Service: Bare Metal Pipe - 4 inches and Smaller

Acceptable Products: Bare Steel Pipe

Anvil Fig. 69  
 Cooper/B-Line Fig. B3170NF  
 Erico Model FCN  
 Nibco/Tolco Fig. 200

- D. Support may be fabricated from U-Channel strut or similar shapes. Piping less than 4" in diameter shall be secured to strut with clamps of proper design and capacity as required to maintain spacing and alignment. Strut shall be independently supported from hanger drops or building structure. Size and support shall be per manufacturer's installation requirements for structural support of piping. Clamps shall not interrupt piping insulation.

1. Strut used in mechanical spaces or otherwise dry areas shall have ASTM B633 electro-plated zinc finish.

- E. Unless otherwise indicated, pipe supports for use with struts shall be as follows:

1. Clamp Type:

Service: Bare Metal Pipe

- a. Pipes subject to expansion and contraction shall have clamps slightly oversized to allow limited pipe movement.

Acceptable Products: Bare Steel Pipe

Unistrut Fig. P1100 or P2500  
 Cooper/B-Line Fig. B2000 or B2400  
 Nibco/Tolco Fig. A-14 or 2STR

- F. Unless otherwise shown, upper attachments for hanger rods or support struts shall be as follows:
1. Beam Clamps:

<u>Acceptable Products:</u>	
Anvil	Fig. 228, 292
Cooper/B-Line	Fig. B3054
Erico	Model 360
Nibco/Tolco	Fig. 329
  2. Concrete Anchors: Fasten to concrete using cast-in or post-installed anchors designed per the requirements of Appendix D of ACI 318-02. Post-installed anchors shall be qualified for use in cracked concrete by ACI-355.2.
  3. Masonry Anchors: Fasten to concrete masonry units with expansion anchors or self-tapping masonry screws. For expansion anchors into hollow concrete block, use sleeve-type anchors designed for the specific application. Do not fasten in masonry joints. Do not use powder actuated fasteners, wooden plugs, or plastic inserts.
- G. Wall supports shall be used where vertical height of structure exceeds minimum spacing requirements. Install wall supports at same spacing as hangers or strut supports along vertical length of pipe runs.
- H. Welding:
1. Unless otherwise noted, hangers, clips, and auxiliary support steel may be welded in lieu of bolting, clamping, or riveting to the building structural frame. Take adequate precautions during all welding operations for fire prevention and for protecting walls and ceilings from being damaged by smoke.

## 2.3 FOUNDATIONS, BASES, AND SUPPORTS

- A. Basic Requirements:
1. Furnish and install supports (not specifically indicated on the Drawings or in the Specifications of either the General Construction or Mechanical work as provided by another Contractor) for mechanical equipment.
  2. All steel supports shall receive a prime coat of zinc chromate or red metal primer. After completion of work, give steel supports a final coat of gray enamel.
- B. Supports:
1. Provide sufficient clips, inserts, hangers, racks, rods, and auxiliary steel to securely support all suspended material, equipment and conduit without sag.
- C. Grout:
1. Grout shall be non-shrinking premixed (Master Builders Company "Embecco"), unless otherwise indicated on the drawings or approved by the Architect/Engineer.
  2. Use Mix No. 1 for clearances of 1" or less, and Mix No. 2 for all larger clearances.

3. Grout around pipes, at pipe sleeves, etc., and where shown on the drawings.

#### 2.4 OPENINGS IN FLOORS, WALLS AND CEILINGS

- A. Coordinate all openings with other Contractors.
- B. Hire the proper tradesman and furnish all labor, material and equipment to cut openings in or through existing structures, or openings in new structures that were not installed, or additional openings. Repair all spalling and damage to the satisfaction of the Architect/Engineer. Make saw cuts before breaking out concrete to ensure even and uniform opening edges.
- C. Said cutting shall be at the complete expense of each Contractor. Failure to coordinate openings with other Contractors shall not exempt the Contractor from providing openings at his expense.
- D. Do not cut structural members without written approval of the Architect or Structural Engineer.

#### 2.5 PIPE SLEEVES AND LINTELS

- A. Each Contractor shall provide pipe sleeves and lintels for all openings required for the Contractor's work in masonry walls and floors, unless specifically shown as being by others.
- B. Fabricate all sleeves from standard weight black steel pipe or as indicated on the drawings. Provide continuous sleeve. Cut or split sleeves are not acceptable.
- C. Fabricate all lintels for masonry walls from structural steel shapes or as indicated on the drawings. Have all lintels approved by the Architect or Structural Engineer.
- D. Sleeves through the floors on exposed risers shall be flush with the ceiling, with planed squared ends extending 1" above the floor in unfinished areas, and flush with the floor in finished areas, to accept spring closing floor plates.
- E. Sleeves shall not penetrate structural members or masonry walls without approval from the Structural Engineer. Sleeves shall then comply with the Engineer's design.
- F. Install all sleeves concentric with pipes. Secure sleeves in concrete to wood forms. This Contractor is responsible for sleeves dislodged or moved when pouring concrete.
- G. Size sleeves large enough to allow expansion and contraction movement. Provide continuous insulation wrapping.

#### 2.6 ESCUTCHEON PLATES AND TRIM

- A. Fit escutcheons to all insulated or uninsulated exposed pipes passing through walls, floors, or ceilings of finished rooms.
- B. Escutcheons shall be heavy gauge, cold rolled steel, copper coated under a chromium plated finish, heavy spring clip, rigid hinge and latch.
- C. Install galvanized steel (unless otherwise indicated) trim strip to cover vacant space and raw construction edges of all rectangular openings in finished rooms. This includes duct and pipe openings.

## 2.7 PIPE PENETRATIONS

- A. Seal all pipe penetrations. Seal non-rated walls and floor penetrations with grout or caulk. Backing material may be used.
- B. Seal fire rated wall and floor penetrations with fire seal system as specified.

## 2.8 PIPE ANCHORS

- A. Provide all items needed to allow adequate expansion and contraction of all piping. All piping shall be supported, guided, aligned, and anchored as required.
- B. Repair all piping leaks and associated damage. Pipes shall not rub on any part of the building.

## 2.9 FINISH

- A. Prime coat exposed steel hangers and supports. Hangers and supports in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

# PART 3 - EXECUTION

## 3.1 FIRE SUPPRESSION SUPPORTS AND ANCHORS

- A. General Installation Requirements:
  - 1. Install all items per manufacturer's instructions.
  - 2. Coordinate the location and method of support of piping systems with all installations under other Divisions and Sections of the Specifications.
  - 3. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- B. Supports Requirements:
  - 1. Where building structural steel is fireproofed, all hangers, clamps, auxiliary steel, etc., which attach to it shall be installed prior to application of fireproofing. Repair all fireproofing damaged during pipe installation.
  - 2. Furnish, install and prime all auxiliary structural steel for support of piping systems that are not shown on the Drawings as being by others.
  - 3. Install hangers and supports complete with lock nuts, clamps, rods, bolts, couplings, swivels, inserts and required accessories.
  - 4. Hangers for horizontal piping shall have adequate means of vertical adjustment for alignment.
- C. Pipe Requirements:
  - 1. Support all piping and equipment, including valves, strainers, and other specialties and accessories to avoid objectionable or excessive stress, deflection, swaying, sagging or vibration in the piping or building structure during erection, cleaning, testing and normal operation of the systems.

2. Do not, however, restrain piping to cause it to snake or buckle between supports or to prevent proper movement due to expansion and contraction.
  3. Support piping at equipment and valves so they can be disconnected and removed without further supporting the piping.
  4. Piping shall not introduce strains or distortion to connected equipment.
  5. Parallel horizontal pipes may be supported on trapeze hangers made of structural shapes and hanger rods; otherwise, pipes shall be supported with individual hangers.
  6. Trapeze hangers may be used where ducts interfere with normal pipe hanging.
  7. Provide additional supports where pipe changes direction, adjacent to flanged valves and strainers, at equipment connections and heavy fittings.
  8. Provide at least one hanger adjacent to each joint in grooved end steel pipe with mechanical couplings.
- D. Provided the installation complies with all loading requirements of truss and joist manufacturers, the following practices are acceptable:
1. Loads of 100 lbs. or less may be attached anywhere along the top or bottom chords of trusses or joists with a minimum 3' spacing between loads.
  2. Loads greater than 100 lbs. must be hung concentrically and may be hung from top or bottom chord, provided one of the following conditions is met:
    - a. The hanger is attached within 6" from a web/chord joint.
    - b. Additional L2x2x1/4 web reinforcement is installed per manufacturer's requirements.
  3. It is prohibited to cantilever a load using an angle or other structural component that is attached to a truss or joist in such a fashion that a torsional force is applied to that structural member.
  4. If conditions cannot be met, coordinate installation with truss or joist manufacturer and contact Architect/Engineer.
- E. Do not exceed 25 lbs. per hanger and a minimum spacing of 2'-0" on center when attaching to metal roof decking (limitation not required with concrete on metal deck). This 25 lbs. load and 2'-0" spacing include adjacent electrical and architectural items hanging from deck. If the hanger restrictions cannot be achieved, supplemental framing off steel framing will need to be added.
- F. Do not exceed the manufacturer's recommended maximum load for any hanger or support.
- G. Spacing of Hangers shall not exceed the compressive strength of the insulation inserts, and in no case shall exceed the following:

	<u>Pipe Material</u>	<u>Maximum Spacing</u>
1.	Steel (Std. Weight or Heavier – Liquid Service):	
	1-1/4" & under	7'-0"
	1-1/2"	9'-0"



	<u>Pipe Material</u>	<u>Maximum Spacing</u>
	2"	10'-0"
	2-1/2"	11'-0"
	3"	12'-0"
	4" & larger	12'-0"

2. Installation of hangers shall conform to MSS SP-58 and applicable NFPA standards.

**END OF SECTION 21 05 29**



## SECTION 21 05 53 - FIRE SUPPRESSION IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Identification of products installed under Division 21.

#### 1.2 REFERENCES

- A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. 3M, Bunting, Calpico, Craftmark, Emedco, Kolbi Industries, Seton, W.H. Brady, Marking Services.

#### 2.2 MATERIALS

- A. All pipe markers shall conform to ANSI A13.1. Marker lengths and letter sizes shall be at least the following:

<u>O.D. of Pipe</u>	<u>Marker Length</u>	<u>Size of Letters</u>
Up to and including 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"

Brass tags may be used for outside diameters under 3/4".

- B. Aluminum Nameplates: Black enamel background with natural aluminum border and engraved letters furnished with two mounting holes and screws.
- C. Brass Tags: Brass background with engraved black letters. Tag size minimum 1-1/2" square or 1-1/2" round.
- D. Plastic Pipe Markers: Semi-rigid plastic, preformed to fit around pipe or pipe covering; indicating flow direction and fluid conveyed.
- E. Vinyl Pipe Markers: Colored vinyl with permanent pressure sensitive adhesive backing.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install all products per manufacturer's recommendations.
- B. Degrease and clean surfaces to receive adhesive for identification materials.
- C. Valves:
  - 1. All valves shall have numbered tags.

2. Secure tags with heavy duty key chain and brass "S" link or with mechanically fastened plastic straps.
3. Attach to handwheel or around valve stem. On lever operated valves, drill the lever to attach tags.
4. Number all tags and show the service of the pipe.
5. Provide two sets of laminated 8-1/2" x 11" copies of a valve directory listing all valves, with respective tag numbers, uses, and locations. The directory shall be reviewed by the Owner and Architect/Engineer prior to laminating final copies. Laminated copies shall have brass eyelet in at least one corner for easy hanging.

D. Pipe Markers:

1. Adhesive Backed Markers: Use Brady Style 1, 2, or 3 on pipes 3" diameter and larger. Use Brady Style 4, 6, or 8 on pipes under 3" diameter. Similar styles by other listed manufacturers are acceptable. Secure all markers at both ends with a wrap of pressure sensitive tape completely around the pipe.
2. Snap-on Markers: Use Seton "Setmark" on pipes up to 5-7/8" OD. Use Seton "Setmark" with nylon or Velcro ties for pipes 6" OD and over. Similar styles by other listed manufacturers are acceptable.
3. Apply markers and arrows in the following locations where clearly visible:
  - a. At each valve.
  - b. On both sides of walls that pipes penetrate.
  - c. At least every 20 feet along all pipes.
  - d. On each riser and each leg of each "T" joint.
  - e. At least once in every room and each story traversed.

E. Equipment:

1. All equipment not easily identifiable such as controls, relays, gauges, etc.; and all equipment in an area remote from its function shall have nameplates or plastic tags listing name, function, and drawing symbol. Do not label exposed equipment in public areas.
2. Fasten nameplates or tags with stainless steel self-tapping screws or permanently bonding cement.

### 3.2 SCHEDULE

A. Pipes to be marked:

Pipe Service	Lettering Color	Background Color
Fire Protection Water	White	Red
Sprinkler Water	White	Red

- B. All piping downstream of the fire protection backflow preventer, upstream of sprinkler zone valves, standpipe piping, and combination sprinkler standpipe piping shall be labeled Fire Protection Water. All piping downstream of sprinkler zone valves shall be labeled Sprinkler Water.

**END OF SECTION 21 05 53**



## SECTION 21 08 00 - COMMISSIONING OF FIRE PROTECTION

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Commissioning is the process for ensuring that the Fire Protection System is installed and performs interactively according to the basis of design criteria and meets the building operational performance expectations as defined in the sequences of operations. The process also provides adequate documentation of installation, start-up and functional testing and ensures that the Owner's maintenance personnel are adequately trained. It provides for discovery of system operational performance deficiencies prior to substantial completion while the responsible contractors can provide a timely response. It establishes testing and communication protocols in an effort to advance the Fire Protection System from installation to complete dynamic operation and optimization.
- B. The commissioning process involves all the parties involved in the design and construction process as well as the Owner and the Commissioning Provider (CxP). Primary elements of Commissioning during the construction, acceptance and warranty phases of the project include:
  - 1. Verify applicable equipment and systems are installed in accordance with manufacturers' instructions and contract documents and receive adequate operational start-up checkout by installing contractors.
  - 2. Demonstrate functional operational performance of equipment and systems in the commissioning program.
  - 3. Verify O&M documentation submitted is complete.
  - 4. Verify Owner's maintenance personnel are adequately trained in accordance with specified training plan requirements.
  - 5. Verify systems are interacting and performing optimally in accordance with the system sequence of operations.
  - 6. Furnish labor and material to accomplish fire protection system commissioning and systems' testing as specified herein and other related sections.

#### 1.2 RELATED SECTIONS

- A. Section 01 9113 – General Commissioning Requirements.
- B. Section 01 9114 – Functional Testing Requirements
- C. Division 21 Sections pertaining to the Fire Protection Systems included in the commissioning program.

#### 1.3 SUBMITTALS

- A. Refer to Section 01 91 13 for commissioning submittal requirements. Provide copies of commissioning submittal requirements to the CxP, in addition to the copies required by the Owner and Design Professional.

#### 1.4 COORDINATION

- A. The installation schedule for the components, equipment & systems included in the commissioning program shall be such that the commissioning requirements can be met without impacting the construction schedule. Commissioning Functional Performance Testing and/or Functional Performance Testing and report from the Provider having jurisdiction is a requirement for Substantial Completion.

- B. All maintenance points for components installed by the contractor (or sub-contractors) for building systems servicing shall be flagged utilizing construction marker ribbons if the maintenance point is located where multiple trades will be installing systems, unobstructed access from floor level shall be maintained. Refer to Section 01 9113 for additional information on maintenance/service point access.

## PART 2 - PRODUCTS

### 2.1 TEST EQUIPMENT

- A. Trade contractors shall provide all specialized tools, test equipment, and instruments required to execute startup, checkout, field calibration and functional performance testing of equipment under their contract.
- B. Test equipment shall be of sufficient quality and accuracy (great accuracy than specified for component) to test and/or measure system performance according to specified tolerances. Test equipment is to have calibrated within the previous 12 months. Calibration shall be NIST traceable. Equipment shall be re-calibrated when dropped or damaged. Calibration tags shall be affixed or certificates be readily available.
- C. Datalogging equipment or software required to test equipment will be provided by the CxP, but shall not become the property of the Owner.

## PART 3 - EXECUTION

### 3.1 COMMISSIONING

- A. General Requirements. For additional information regarding general commissioning requirements refer to Section 01 91 13.
- B. Installation contractors shall be responsible for executing and documenting equipment installation, start-up and check out for systems and equipment. Contractors shall also be responsible for executing and documenting prefunctional performance tests. Both of these documents are required prior to the CxP scheduling the functional performance test. Contractors shall also be responsible for providing training for the Owner's maintenance personnel in accordance with project requirements.
- C. Installation Certification Forms (ICF) for each type of equipment and system shall be provided to the installation contractors by the CxP for use by the contractors in documenting the installation and start-up of equipment in the commissioning program.
- D. For equipment and system components requiring a manufacturer's representative for installation verification and start-up, manufacturer documentation of these activities shall be attached to the checklists provided by the CxP.
- E. Prefunctional Performance Test procedures for each type of equipment and system shall be provided to the installation contractors by the CxP for use by the contractor in documenting the performance of the prefunctional performance test. Refer to Section 01 9114 for further information.
- F. Completed Start-up checklists and prefunctional performance test documentation for all pieces of equipment shall be submitted by contractors to the CxP through the General Contractor prior to the scheduling of the final Functional Performance Test that is witnessed by the Fire Marshal. The CxP may elect to witness the test along with the Fire Marshal or separately.



### 3.2 TRAINING

- A. Contractor responsible for the installation of the system shall coordinate the participation of other sub-contractors and manufacturer's representatives in the training program in accordance with requirements of other sections of the project specifications.

### 3.3 OPERATIONS AND MAINTENANCE DATA

- A. Contractor responsible for the installation of the system shall provide operations and maintenance manuals in accordance with requirements of other sections of the project specifications.

### 3.4 GENERAL SYSTEM TESTING CRITERIA

- A. Functional Performance Testing
  - 1. Refer to Sections 01 91 13 - General Commissioning Requirements and 01 91 14 - Functional Testing Requirements. Installation contractor shall be responsible for providing authorized manufacturer's representatives to demonstrate the operational capabilities of the equipment & systems.

**END OF SECTION 21 08 00**



## SECTION 21 13 00 - FIRE PROTECTION SYSTEMS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Pipe, Fittings, Valves, and Connections for Fire Protection System.
- B. Wet-Pipe Sprinkler System.

#### 1.2 QUALITY ASSURANCE

- A. Welding Materials and Procedures: Conform to ASME Code.
- B. Equipment and Components: Bear UL label or marking.
- C. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body. Pressure rating shall match specified pipe system pressure rating. Remanufactured valves are not acceptable.
- D. Specialist Firm: Company specializing in sprinkler systems with minimum three years experience.
- E. Sprinkler design drawings submitted by the contractor shall be designed, certified, and shall include the NICET certification block or the Professional Engineer seal of the fire protection designer. Fire protection designer shall be NICET Level III or Level IV certified or be a licensed Professional Engineer.

#### 1.3 REFERENCES

- A. ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
- B. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300.
- C. ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.
- D. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- E. ANSI/ASME B16.9 - Factory-made Wrought Steel Butt-Welding Fittings.
- F. ANSI/ASME B16.11 - Forged Steel Fittings, Socket-Welding and Threaded.
- G. ANSI/ASME B16.25 - Butt-Welding Ends.
- H. ANSI/ASME B36.10 - Welded and Seamless Wrought Steel Pipe.
- I. ANSI/ASME Section 9 - Welding and Brazing Qualifications.
- J. ANSI/ASTM A47 - Malleable Iron Castings.
- K. ANSI/ASTM A135 - Electric-Resistance-Welded Steel Pipe.
- L. ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings.
- M. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.

- N. ASME - Boiler and Pressure Vessel Code - Section IX, Welding and Brazing Requirements.
- O. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
- P. AWS A5.8 - Brazing Filler Metal.
- Q. AWS B2.2 - Standard for Brazing Procedure and Performance Qualification.
- R. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.
- S. IBC - International Building Code.
- T. MSS SP-73 - Brazing Joints for Wrought and Cast Copper Alloy Solder Joint and Pressure Fittings.
- U. NFPA 101 - Life Safety Code,
- V. NFPA 13 - Installation of Sprinkler Systems.
- W. NFPA 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- X. UL - Underwriter's Laboratory Fire Protection Equipment Directory.

#### 1.4 EXTRA STOCK

- A. Provide metal storage cabinet, wrenches for each sprinkler type, and extra sprinklers per NFPA 13 and applicable building code.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store valves and sprinklers in shipping containers, with labels in place.
- B. Provide temporary protective coating on iron and steel valves.
- C. Maintain temporary end caps and closures in place until installation.

#### 1.6 SYSTEM DESCRIPTION

- A. System shall cover building areas noted.
- B. System shall interface with building fire alarm system. Provide all required wiring.
- C. Provide wet pipe sprinkler system(s) to NFPA 13 and building code requirements as required by Owner's insurance company and as shown on the drawings.
- D. Provide a Fire Department connection.

#### 1.7 REGULATORY REQUIREMENTS

- A. All material, equipment, and installation shall be approved by the Authorities Having Jurisdiction and the Owner's Insurance Company.
- B. The Authorities Having Jurisdiction and the Owner's Insurance Company shall have precedence over the drawings and specifications in case of discrepancies.

- C. The entire installation shall comply with all applicable codes.

#### 1.8 SYSTEM DESIGN

- A. Design and install a complete, hydraulically calculated wet-pipe sprinkler system for the entire building.
- B. Provide all required equipment and accessories.
- C. System shall include a 5 psi allowance for future decrease in available pressure and an allowance for inside and outside hose streams.
- D. Provide monitor switches on all shutoff valves.
- E. Install sprinkler riser in location shown on drawings or as approved by the Architect/Engineer.

#### 1.9 COORDINATION DRAWINGS

- A. Reference Coordination Drawings article in Section 21 05 00 for required fire protection systems electronic CAD drawings to be provided to Coordinating Contractor for inclusion into composite coordination drawings.

#### 1.10 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturers' operation and maintenance data. Include written maintenance data on components of system, servicing requirements, and record drawings.

#### 1.11 JOB CONDITIONS

- A. Fire Protection Contractor shall determine the flow and pressure available at the service connection. The Fire Protection Contractor is responsible to verify this information and make all tests required. Base all pipe sizing and hydraulic calculations on flow test data no older than 18 months.
- B. Pipe sizing shown on drawings for service entrance and main risers is preliminary for coordination purposes only. Contractor is responsible for final sizing from hydraulic calculations.

### PART 2 - PRODUCTS

#### 2.1 PIPE AND FITTINGS

- A. Steel Pipe (Inside Building-Above Grade):
  - 1. Pipe: 2" and Under - Schedule 40, black steel, ASTM A53. Threaded and coupled or flanged.
  - 2. Joints: 2" and under - screwed or flanged.
  - 3. Fittings: Screwed - cast iron, 125 lb., black, ANSI/ASME B16.4 or malleable iron, 150 lb., black, ANSI/ASME B16.3. Flanged-cast iron, 125 lb., ANSI/ASME B16.1.
- B. Steel Pipe (Inside Building-Above Grade):
  - 1. Pipe: 2-1/2" and Over - Schedule 10, black steel, grooved, ASTM A135.

2. Joints: Mechanically coupled grooved.
3. Fittings: 500 lb. WOG, black, malleable iron, ASTM A47.
4. Plain end fittings and couplings are not acceptable.

## 2.2 FLEXIBLE SPRINKLER HOSE WITH THREADED END FITTINGS

- A. UL listed per UL 2443.
- B. Construction:
  1. Hose:
    - a. Type 304 stainless steel.
    - b. Straight or elbow hose - maximum six (6)-foot hose length.
    - c. 1/2" or 3/4" outlet.
    - d. 175 psi rated pressure.
    - e. Leak-tested minimum 7/8".
    - f. Minimum 7/8" hose.
    - g. O-ring sealed joints are not acceptable.
  2. Ceiling Bracket:
    - a. Zinc plated or galvanized steel – 24" and 48" sizes.
    - b. Flexible hose attachment: Open hub or set screw.
  3. Unit may be prepackaged with sprinkler head.
- C. Acceptable Manufacturers: FlexHead Industries, Victaulic Aquaflex.

## 2.3 UNIONS AND COUPLINGS

- A. Unions: 175 psi malleable iron for threaded ferrous piping.
- B. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, designed to permit some angular and longitudinal deflection; "C" shaped composition sealing gasket, steel bolts, nuts, and washers. 175 psi, ASTM A47. Plain end fittings and couplings are not acceptable. Rolled groove couplings for Schedule 10 pipe. Cut groove couplings for Schedule 40 pipe. Couplings shall be enamel coated for wet systems. Acceptable Manufacturers: Victaulic, ITT, Grinnell, Central, Star Fittings.
- C. Coupling gaskets for wet systems shall be Grade "E" EDPM Type A.

## 2.4 VALVE OPERATORS

- A. Provide handwheels for gate valves. Provide gear operators for butterfly valves.

## 2.5 VALVE CONNECTIONS

- A. Provide all connections to match pipe joints. Valves shall be same size as pipe.

## 2.6 BACKFLOW PREVENTERS

- A. Provide backflow preventers as required by code and as specified on the drawings.

## 2.7 EQUIPMENT

- A. Equipment shall be as scheduled on the drawings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION - PIPING

#### A. General Installation Requirements:

1. Coordinate piping and sprinkler locations with all other trades. Ductwork, diffusers and light fixture locations shall have priority over sprinkler piping and sprinklers.
2. Ream pipe and tube ends to full inside diameter. Remove burrs. Remove scale and foreign material, inside and outside, before assembly.
3. Die cut screw joints with full cut standard taper pipe threads.
4. Coat threads with pipe joint compound or wrap with Teflon tape.
5. Locate piping to minimize obstruction of other work.
6. Route piping in concealed spaces above finished ceiling.
7. Use full and double lengths of pipe wherever possible.
8. Slope all piping for complete drainage. Install auxiliary drains for all trapped piping per NFPA 13.
9. Reducers are generally not shown. Where pipe sizes change at tee, the tee shall be the size of the largest pipe shown connecting to it.
10. Comply with manufacturer's installation instructions.

#### B. Steel Piping:

1. In steel piping, main sized saddle branch connections or direct connection of branches to main is permitted if main is one pipe size larger than the branch for up to 6" mains and if main is two pipe sizes larger than branch for 8" and larger mains. Do not project branch pipes into main pipes.

#### C. Wall/Floor Penetration:

1. Provide sleeves when penetrating floors and walls.
2. Fire seal all pipe and sleeve penetrations (both wall and floor) to maintain fire separation required without restraining pipe.

#### D. Installation Requirements in Electrical Rooms:

1. Do not install piping or other equipment above electrical switchboards or panelboards. This includes a dedicated space extending 25 feet from the floor to the structural ceiling with width and depth equal to the equipment. Fire protection equipment dedicated to the electrical equipment room or space may be installed above equipment if other alternatives are not available.

E. Hangers and Supports:

1. Provide hangers and supports as required by NFPA 13 and UL, with the following exceptions:
  - a. Do not use powder driven devices, explosive devices, wooden plugs, or plastic inserts.
  - b. Do not install fasteners to carry the load in tension, unless absolutely necessary.

F. Exposed Piping:

1. Install chrome plated steel escutcheons where exposed pipes penetrate walls or floors.

3.2 INSTALLATION - VALVES

A. Install gate valves with stems upright or horizontal, not inverted.

B. Backflow Preventer:

1. Units shall be field tested and tagged in accordance with manufacturer's instructions by a certified tester before initial operation.
2. Install unit between 12" and 60" above finish floor.

C. Shutoff Valve:

1. Provide drain valves at main shutoff valves, low points of piping and apparatus.

3.3 INSTALLATION - EQUIPMENT

A. Coordinate piping and sprinkler locations with all other trades. Ductwork, diffusers and light fixture locations shall have priority over system equipment and sprinklers.

B. Fire Department Connection:

1. Locate fire department connection in an accessible location as approved by the local fire department with sufficient clearance from walls, obstructions, and adjacent Siamese connectors to allow full swing of fire department wrench handle.

C. Alarm Bell:

1. Locate outside alarm bell on building wall as shown on drawings.
2. Wire all bells, flow switches and supervisory switches to fire alarm system. All wiring shall be in conduit and meet the requirements of the electrical specifications.

D. Test Valves:

1. Install test valves where required. Pipe to outdoors or drain. Test connection shall have flow equivalent to the smallest K-factor sprinkler.



E. Sprinklers:

1. Locate sprinklers to clear lights, ducts and diffusers. Do not run sprinkler pipes through ducts. Ductwork has priority over sprinkler pipes. Offset pipes as needed.
2. Center sprinklers in two directions in ceiling tiles and provide offsets as required in areas with 2'x4' ceiling tiles, centering using a 2'x2' ceiling pattern is acceptable.
3. Do not allow concealed sprinkler cover plates to be painted. Sprinkler cover plates are to be factory painted only. Do not field paint.
4. Apply strippable or paper covers so concealed sprinkler cover plates do not receive field paint finish.

3.4 SYSTEMS CLEANING AND TESTING

A. General Requirement:

1. All water used for testing and remaining in the piping system shall be obtained from a potable water source.

B. Underground Piping:

1. Flush all underground piping with minimum flow equal to the system design flow but not less than the following:
  - a. 390 gpm for 4" pipes.
  - b. 880 gpm for 6" pipes.
  - c. 1560 gpm for 8" pipes.
2. Branches from new underground mains to sprinkler risers shall be flushed out through two 2-1/2" hoses (with flow through open hose butts) attached to the riser with 4" temporary piping. Flushing through the drain of an alarm check or dry pipe valve is not acceptable.

C. Interior Piping:

1. Verify adequate water flow at the inspector's test connection.
2. Flush all interior piping to remove scale and other foreign material before placing system into service.
3. Hydrostatically test the entire interior piping system at a minimum of 200 psig or 50 psig in excess of the normal system working pressure for systems subjected to pressures in excess of 150 psig. Maintain test pressure for 2 hours without loss of pressure.

D. Fire Alarm System:

1. Test the alarm system by operating the inspector's test connection or the alarm test valves. Verify that the building fire alarm system activates.
2. Adjust all monitor switches for proper operation.

**END OF SECTION 21 13 00**