**CITY OF KENOSHA, WISCONSIN**
**PUBLIC WORKS DEPARTMENT**
**KENOSHA PUBLIC LIBRARY – UPTOWN LOFT RTU PACKAGE**
**PROPOSAL NOTICE #07-23**

ISSUED: TUESDAY, JULY 25,2023

Sealed proposals will be accepted by the City of Kenosha, in the Department of Finance, Municipal Office Building, 625 52nd Street, Room 208, Kenosha, WI, 53140 until **TUESDAY, AUGUST 15, 2023** at **2:30** P.M. for the procurement and storage of the following equipment all in accordance with City of Kenosha standard terms and conditions, and the specifications contained herein:

**BID FOR:** **1. RTU package consisting of the equipment Per Project Specifications (230030, 230513, & 237413).**

Proposals must be sealed and submitted on the attached proposal form and returned clearly marked with the scheduled date and time of opening. Proposals received after the date and time of opening will not be considered. All proposals shall be submitted in a sealed envelope carrying the following information: proposing firm's name, firm address, proposal description, proposal notice number and date and time of proposal opening. Proposals submitted via facsimile or through other electronic means will not be accepted.

Vendors shall furnish complete manufacturer specifications and manufacturers descriptive literature describing in detail the equipment that is proposed.

Any questions regarding these specifications should be directed to the architect in writing: Kristin Richardson, Engberg Anderson Architects, kristinr@engberganderson.com

Inquiries regarding the proposal process and submittal can be directed to Mr. Lemuel Gomez, Purchasing Coordinator, at 262-653-4180.

Bidders shall promptly notify the Architect of any ambiguity, inconsistency, or error, which they may discover upon examination of the Bid Documents, site, or local conditions.

Bidders requiring clarification or interpretation of the Bid Documents shall make a request to the Architect no later than 5 calendar days prior to the date on which bids are due. All requests shall be in written form transmitted by email. All responses shall be in a written format, available for all bidders and published with the final Addenda. No oral interpretation of the Bid Documents will be made.

Clarification to all Bidders shall be by Addendum, issued no later than 3 calendar days prior to the date on which bids are due.

In the even that conflicts exist within the bid documents, Bidders shall include in their bid the item(s) of higher value and/or quantity or the most restrictive method on

installation. The Architect shall provide final interpretation and directions after Contract award.

Receipt of Addenda: It is the responsibility of all bidders to verify any addenda identified on the website before submitting their bid. It shall be conclusively presumed that all bids submitted are based on the final version of the Bid and Contract Documents which shall include all addenda.

Materials, products, and equipment described in the Bid Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

Request for Substitution shall be submitted to the Architect no later than 10 calendar days prior to the date on which bids are due. Approvals, if granted, shall appear in the Addendum issued no later than 7 calendar days prior to the date on which bids are due.

Request for Substitutions shall include the following:

1. Name of material or equipment originally specified.

2. Description of proposed substitution including:

    a. Drawings.
    b. Performance or test data.
    c. Other relevant data.

3. Description of changes in other materials or equipment or other portions of the Work, including that of other contracts, made necessary by the incorporation of the substitution.

Burden of proof of merit of the proposed substitution is on the proposer. The Architect's decision of approval or disapproval is final.

The City of Kenosha reserves the right to award contract to the most qualified proposer. The City reserves the right to accept or reject any or all proposals or to accept any proposal that is considered the most advantageous to the City of Kenosha.

The City of Kenosha is exempt from Federal Excise Tax and State Sales Tax, therefore, proposals should be made exclusive of these taxes. A Tax Exemption Certificate will be furnished to the successful vendor.

State delivery date on the proposal form or the number of days from receipt of purchase order.

This proposal assumes that the Vendor will receive and store all equipment as identified in the product specifications.

Unit shall be new, unused and of the current model year.

Award will be made within thirty (30) days of scheduled opening to the lowest responsive responsible vendor meeting or exceeding City of Kenosha specifications, providing proposals are received within budgetary amounts.

SPECIFICATIONS CAN BE FOUND AT THE END OF THIS BID FORM

EACH BID SHALL INCLUDE:

A. THIS BID FORM.

B. PRELIMINARY EQUIPMENT/PRODUCT SHOP DRAWINGS.

C. MANUFACTURER'S EXTENDED EQUIPMENT/PRODUCT WARRANTY OF FIVE YEARS FROM THE DATE OF COMMISSIONING AND STARTUP.

D. THE BIDDER AGREES TO SUPPLY, STORE AND DELIVER THE EQUIPMENT/PRODUCTS LISTED ABOVE PER THE PROJECT SPECIFICATIONS FOR THE SUM OF:

_____ Dollars

($_____).

THE BIDDER AGREES TO:

1. Hold this bid open for a Minimum of 30 calendar days after bid opening date or as required in the project manual.

2. Enter into and execute a contract with the City of Kenosha if awarded on the basis of this bid.

THE BIDDER ACKNOWLEDGES PROPOSAL #07-23 HAS BEEN RECEIVED AND ALL COSTS THERETO ARE INCLUDED IN THE BID SUM.

It is the responsibility of all bidders to verify any addenda identified on the website before submitting their bid. It shall be conclusively presumed that all bids submitted are based on the final version of the Bid and Contract Documents which shall include all addenda issued prior to bids being due.

1. Addendum _____ , dated _____.
2. Addendum _____ , dated _____.
3. Addendum _____ , dated _____.

THE BIDDER MAKES THE FOLLOWING REPRESENTATIONS AND CERTIFICATIONS:

A. The Bidder is not barred from contracting with any unit of state or local government as a result of violating the bid rigging or bid rotating provisions.

B. The Bidder is not barred from contracting with the State of Wisconsin as a result of a bribery conviction.

Respectfully submitted by

Firm: _____

Signature: _____

Print Name:_____

Address: _____

Telephone: _____ FAX:_____

E-mail: _____

Date: _____

Engberg Anderson ARCHITECTS

# Project Manual

## Kenosha Public Library

Uptown Lofts – RTU Package

6204 22nd Avenue
Kenosha, Wisconsin 53143

Engberg Anderson Project No. 223546.00 07/25/2023

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## KENOSHA PUBLIC LIBRARY – UPTOWN LOFTS RTU PACKAGE



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Inquiries regarding the proposal process and submittal can be directed to Mr. Lemuel Gomez, Purchasing Coordinator, at 262-653-4186.

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Materials, products, and equipment described in the Bid Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

Request for Substitution shall be submitted to the Architect no later than 10 calendar days prior to the date on which bids are due. Approvals, if granted, shall appear in the Addendum issued no later than 7 calendar days prior to the date on which bids are due.

Request for Substitutions shall include the following:

1. Name of material or equipment originally specified.

2. Description of proposed substitution including:

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Unit shall be new, unused and of the current model year.

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SPECIFICATIONS CAN BE FOUND AT THE END OF THIS BID FORM

EACH BID SHALL INCLUDE:

A. THIS BID FORM.

B. PRELIMINARY EQUIPMENT/PRODUCT SHOP DRAWINGS.

C. MANUFACTURER'S EQUIPMENT/PRODUCT WARRANT(IES) PER PROJECT SPECIFICATIONS FROM THE DATE OF STARTUP.

D. THE BIDDER AGREES TO SUPPLY, STORE AND DELIVER THE EQUIPMENT/PRODUCTS LISTED ABOVE PER THE PROJECT SPECIFICATIONS FOR THE SUM OF:

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2. Enter into and execute a contract with City of Kenosha if awarded on the basis of this bid.

THE BIDDER ACKNOWLEDGES PROPOSAL # 07-23 HAS BEEN RECEIVED AND ALL COSTS THERETO ARE INCLUDED IN THE BID SUM.

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1. Addendum _____ , dated _____.
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B. The Bidder is not barred from contracting with the State of Wisconsin as a result of a bribery conviction.

Respectfully submitted by

Firm: _____

Signature: _____

Print Name:_____

Address: _____

Telephone: _____ FAX:_____

E-mail: _____

Date: _____

# SECTION 011000 - SUMMARY

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. Section Includes:
1. Project information.
2. Schedule
3. Work covered by Contract Documents.
4. Work under Owner's separate contracts.
5. Specification and Drawing conventions.

### 1.3 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

### 1.4 PROJECT INFORMATION

A. Project Identification: Kenosha Public Library – Uptown Lofts RTU Package
1. Project Location: 6204 22nd Avenue, Kenosha, WI 53143

B. Owner: Kenosha Public Library – City of Kenosha
1. Owner's Representative: Lemuel Gomez, Purchasing Coordinator
a. Phone: 262-653-4186
b. Email: lgomez@kenosha.org

C. Architect: Engberg Anderson Architects
1. Architect's Representative: Kristin Richardson, Project Manager
a. Email: kristinr@engberganderson.com

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:
1. Mechanical Engineer: RTM Engineering Consultants

## 1.5 SCHEDULE

A. Time is of the essence; process of procurement shall proceed immediately upon contract award. Separate contract for Tenant Space Buildout and installation of RTU, further outlined below under "Owner's Separate Contracts" shall be Substantially Complete in March 2024.

## 1.6 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
   1. Procurement, storage and delivery to jobsite of specified RTU equipment and other Work indicated in the Contract Documents, including but not limited to startup coordination and training.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

## 1.7 WORK UNDER OWNER'S SEPARATE CONTRACTS

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

B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract. Completion of that work will depend on successful completion of timely preparatory Work under this Contract.
   1. Tenant Space Buildout for interior buildout of library tenant space at Uptown Lofts. Work shall include the installation of RTU purchased under this contract.

## 1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
   3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.

4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

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

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION (Not Used)

**END OF SECTION 011000**

# SECTION 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 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.

   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 to meet other Project requirements but may offer advantage to Contractor or Owner.

### 1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying 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 form acceptable to Architect.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

      a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.

b. Coordination of 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 substitutions 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 as well as 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 substitutions 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 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.

## 1.7 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. Substitution request is fully documented and properly submitted.
    c. Requested substitution will not adversely affect Contractor's construction schedule.
    d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    e. Requested substitution is compatible with other portions of the Work.
    f. Requested substitution has been coordinated with other portions of the Work.
    g. Requested substitution provides specified warranty.
    h. 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: Not allowed.

## PART 2 - PRODUCTS (Not Used)

## 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 supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

### 1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect 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 Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, 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 Architect.

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 acceptable to Architect.

## 1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on form included in Project Manual.

## 1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. 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 012900 - PAYMENT PROCEDURES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

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

B. Related Requirements:
   1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

### 1.3 DEFINITIONS

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

### 1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

   1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

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

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

      a. Project name and location.
      b. Owner's name.
      c. Owner's Project number.

d. Name of Architect.
e. Architect's Project number.
f. Contractor's name and address.
g. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:

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

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

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

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

6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

## 1.5 APPLICATIONS FOR PAYMENT

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

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

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

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

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

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

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

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

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

c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

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

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

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment and subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

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

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

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Sustainable design action plans, including preliminary project materials cost data.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.

17. Data needed to acquire Owner's insurance.

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

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

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

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

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION (Not Used)

**END OF SECTION 012900**

# SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

## 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 provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

### 1.3 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner ,Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

### 1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project

site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

## 1.5 GENERAL COORDINATION PROCEDURES

A. Coordination of Multiple Contracts: Each contractor shall cooperate with Project coordinator, who shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

## 1.6 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Architect and Construction Manager.
5. Architect's Project number.
6. Date.
7. Name of Contractor.
8. RFI number, numbered sequentially.
9. RFI subject.
10. Specification Section number and title and related paragraphs, as appropriate.
11. Drawing number and detail references, as appropriate.
12. Field dimensions and conditions, as appropriate.
13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
14. Contractor's signature.
15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716.

1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architectof additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

## 1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Architect's Data Files Not Available: Architect will not provide Architect's BIM model or CAD drawing digital data files for Contractor's use during construction.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

## 1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Responsibilities and personnel assignments.
b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long lead items.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFIs.
j. Procedures for testing and inspecting.
k. Procedures for processing Applications for Payment.
l. Distribution of the Contract Documents.
m. Submittal procedures.
n. Sustainable design requirements.
o. Preparation of Record Documents.
p. Use of the premises and existing building.
q. Work restrictions.
r. Working hours.
s. Owner's occupancy requirements.
t. Responsibility for temporary facilities and controls.
u. Procedures for moisture and mold control.
v. Procedures for disruptions and shutdowns.
w. Construction waste management and recycling.
x. Parking availability.
y. Office, work, and storage areas.

z. Equipment deliveries and priorities.
aa. First aid.
bb. Security.
cc. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION (Not Used)

**END OF SECTION 013100**

# SECTION 013300 - SUBMITTAL PROCEDURES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

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

### 1.2 DEFINITIONS

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

### 1.3 SUBMITTAL SCHEDULE

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

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: 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 Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required 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 final release or approval.
g. Scheduled dates for purchasing.
h. Scheduled date of fabrication.
i. Scheduled dates for installation.
j. Activity or event number.

## 1.4 SUBMITTAL FORMATS

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

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

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

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

## 1.5 SUBMITTAL PROCEDURES

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

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

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

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

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

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 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.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.

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

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

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

## 1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

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

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

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

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

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

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

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.

d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

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

C. 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.

D. 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.

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

F. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

G. Test and Research Reports:

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

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

## 1.7 CONTRACTOR'S REVIEW

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

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

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

## 1.8 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.

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

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

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

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

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

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

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION (Not Used)

**END OF SECTION 013300**

# SECTION 016000 - PRODUCT REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. The Work of This Section Includes: Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

### 1.2 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. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluating Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

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

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

## 1.3 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. Resolution of Compatibility Disputes between Multiple Contractors:

a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products will be used.

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

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is inconspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

a. Name of product and manufacturer.

b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

## 1.4 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

## 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

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 that products are undamaged and properly protected.

C. Storage:

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

8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

## 1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections are to 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 standard warranty form furnished by individual manufacturer for a particular product and issued in the name of Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of Owner or endorsed by manufacturer to 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 in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

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

# PART 2 - PRODUCTS

## 2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by Architect, whose determination is final.

B. Product Selection Procedures:

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

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

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

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

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

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

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

    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

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

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

a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

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

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

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

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

E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

1. Select products for which sustainable design documentation submittals are available from manufacturer.

## 2.2 COMPARABLE PRODUCTS

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

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
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.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

1. Architect's Approval of Submittal: Marked with approval notation from Architect's action stamp. See Section 013300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

## PART 3 - EXECUTION (Not Used)

**END OF SECTION 016000**

# SECTION 017700 - CLOSEOUT PROCEDURES

## PART 1 - GENERAL

### 1.1 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. List of incomplete items.
4. Submittal of Project warranties.
5. Final cleaning.

### 1.2 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

### 1.3 ACTION SUBMITTALS

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

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

C. Certified List of Incomplete Items: Final submittal at Final Completion.

### 1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest-control inspection.

### 1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

## 1.6 SUBSTANTIAL COMPLETION PROCEDURES

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

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

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

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

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

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

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.

8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

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

## 1.7 FINAL COMPLETION PROCEDURES

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

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

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

## 1.8 LIST OF INCOMPLETE ITEMS

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

1. Organize list of spaces in sequential order,, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

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

4. Submit list of incomplete items in the following format:
    a. PDF Electronic File: Architect will return annotated file.

## 1.9 SUBMITTAL OF PROJECT WARRANTIES

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

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

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

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

1. Submit on digital media acceptable to Architect.

E. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or

installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

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

## PART 2 - PRODUCTS

### 2.1 MATERIALS

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

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

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

### 3.2 CORRECTION OF THE WORK

A. Complete repair and restoration operations required by "Correction of the Work" Article in Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

**END OF SECTION 017700**

# SECTION 017823 - 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 manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:
1. Section 013300 "Submittal Procedures" for submitting copies of submittals for 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. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect. Enable 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 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 will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

## 1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

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

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

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

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

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

## 1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

## 1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor 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.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

## 1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.

4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

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

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

## 1.11 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

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

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION (Not Used)

**END OF SECTION 017823**

# SECTION 23 00 30 - ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This section specifies the basic requirements for electrical components which are an integral part of packaged mechanical equipment and variable speed drives. These components include, but are not limited to factory installed motors, starters, and disconnect switches furnished as an integral part of packaged mechanical equipment.

B. Specific electrical requirements (i.e. horsepower and electrical characteristics) for mechanical equipment are scheduled on the Drawings.

### 1.2 REFERENCES

A. NEMA Standards MG 1: Motors and Generators.

B. NEMA Standard ICS 2: Industrial Control Devices, Controllers, and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. Comply with National Electrical Code (NFPA 70) current adopted edition.

Work and materials shall conform to and be executed, inspected and tested in accordance with the latest adopted edition of the National Electric Code and with the governing rules and regulations of federal, state and local governmental agencies. References to "NEC" within the Division 23 Sections shall be considered synonymous to this electrical code.

### 1.3 SUBMITTALS

A. General: Submit the following in accordance with Division 23 Section "Basic Division 23 Requirements."

### 1.4 ACTION SUBMITTALS

A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

B. Provide variable speed drives from a single manufacturer, regardless of manufacturers' OEM packaging agreements.

1.5 QUALITY ASSURANCE

A. Electrical components and materials shall be UL labeled.

B. Nationally Recognized Testing Laboratory and NEMA Compliance (NRTL): Electrical components/materials shall be labeled by a NRTL. The term "NRTL" shall be as defined in OSHA Regulation 1910.7.

**PART 2 - PRODUCTS**

2.1 STARTERS, ELECTRICAL DEVICES, AND WIRING

A. Motor Starter Characteristics:

Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations which shall have proper NEMA class and division.

1. All enclosures installed in parking decks or other areas subject to exposure to salt-spray shall be Type 316 stainless steel.
2. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.

B. Manual Switches Shall Have:

Pilot lights and extra positions for multi-speed motors.

1. Overload Protection: Solid-state overload relays.

C. Magnetic Starters:

Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.

1. Trip-free thermal overload relays, each phase.
2. Interlocks, pneumatic switches and similar devices as required for coordination with control requirements of other Division 23 sections.
3. Built-in 120 volts control circuit transformer, fused from line side, where service exceeds 240 volts.
4. Externally operated manual reset.
5. Under-voltage release or protection.

D. Motor Connections:

Flexible metal conduit, except where plug-in electrical cords are specifically indicated. Liquid-tight flexible metal conduit shall be used in damp or wet locations.

E. Disconnect Switches:

Fusible switches: fused, (Class RK-1) each phase; heavy duty; horsepower rated; non-teasible quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; ground wire lug brazed to enclosure; capacity and characteristics as indicated.

1. Non-Fusible Switches: For equipment 2 horsepower and smaller, shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than 2 horsepower, switches shall be the same as fusible type.

2. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations which shall have proper NEMA class and division.
3. Amps Interrupting Capacity (AIC): Match fuse or upstream protection device.

## 2.2 VARIABLE SPEED DRIVES

A. General: Variable torque AC drive consisting of a solid state adjustable frequency controller (AFC) and a performance matched energy efficient motor. The manufacturer shall provide, coordinate, and start-up the drive package to ensure both proper application of the motor to the controller and to the system. The variable speed drive shall be fully digital pulse with modulation (PWM) utilizing very large scale integration (VLSI) techniques, as well as surface mount technology for increased reliability. The entire VSD Package including all options shall be in one common cabinet with the entire assembly UL approved and listed.

B. Adjustable Frequency Controller: Shall convert service voltage, three phase, 60 hertz utility power to adjustable voltage/frequency, three phase, AC power for stepless motor control 10 percent to 110 percent of base speed.

C. Designed and constructed to operate within the following service conditions:

Elevation: To 3,300 feet without derating.
1. Ambient Temperature Range: 0 degrees C to 40 degrees C.
2. Atmosphere: Non-condensing relative humidity to 95 percent.
3. AC Line Voltage Variation: -10 percent to +10 percent and +/-2 percent frequency.
4. Ride-through power sags up to 500 mSec without a controller trip.

D. AFC shall be selected to be compatible with motor maximum FLA nameplate rating. All components shall be horsepower rated.

E. Circuits shall provide time derivative variable voltage and variable current protection for semi-conductors. AFC shall be capable of starting into a rotating load without delay. Protective circuits shall cause instantaneous trip (IET) should any of the following faults occur:

110 percent of controller maximum sine wave current rating is exceeded for longer than one (1) minute.
1. Output phase to phase short circuit condition.
2. Total ground fault protection under any operating condition.
3. High input line voltage.
4. Low input line voltage.
5. Loss of input phase.
6. External fault (this protective circuit shall permit by means of terminal strip, wiring of remote N.C. safety contacts such as high duct static pressure, fire or smoke safety, etc., to shut down the drive).

F. The following adjustments shall be available in the controller:

Maximum Frequency: (15 to 120 Hz) factory set at 60 Hz.
1. Minimum Frequency: (5 to 60 Hz) factory set at 6 Hz.
2. Adjustable Acceleration: (0.1 to 360 seconds) factory set at 20 seconds.
3. Adjustable Deceleration: (0.1 to 360 seconds) factory set at 20 seconds.
4. Volts/Hertz ratio factory set for service voltage at 60 Hz.
5. Voltage offset or boost factory set at 100 percent torque.

6. Current limit (50 percent to 100 percent sine wave current rating) factory set at 100 percent current.

G. Door mounted operator control of AFC shall be furnished with a micro-processor based command center with a membrane keypad which allows auto/manual, start/stop, manual speed control, programming, and visual display of the units operating parameters. The microprocessor system shall be password protected and provide full monitoring, control, and diagnostics.

In automatic mode, controller shall follow an external signal and respond to remote start-stop contact wired to terminal strip and all safety interlocks.

1. Digital display shall be door mounted to indicate power on, drive faults, motor running and external faults.
2. While in auto mode the controller shall attempt to three automatic restarts (user selectable) after a power outage, drive fault or external fault. If drive does not successfully come back on line after the programmed tries it shall remain off on IET until operator diagnoses cause of shut down and manually re-establishes drive operation in the bypass or AFC mode of operation.
3. Integral annunciator contact for customer remote indication of drive fault conditions.
4. An integral "External Fault" protective shutdown circuit shall be provided for interface of firestat, smoke detectors, duct high limit pressure switches, etc. These safety interlocks shall provide shutdown of the system while operating the VFD or By-pass mode.
5. Voltage, current and frequency display: Shall be provided to digitally indicate the output voltage, output frequency and output current.
6. Built-in Diagnostics: Shall provide a quick means for monitoring the different signals within the AFC for start-up and troubleshooting. The diagnostics shall indicate internal and external faults and provide digital display of inverter system faults.

H. Input Power Parameters:

The variable frequency controller shall accept 208/230 volts AC three phase, 60 Hz for 230V services, and 460 volts AC three phase, 60 Hz for 460 volts series. Variations of up to +/- 10 percent of line voltage and +/-2 Hz of line frequency shall be permitted without the drive shutting down on a fault.

1. The drive input circuitry shall not generate line notches or large voltage transients on the incoming line.

I. Compliance to the Latest Edition of IEEE 519:

The VSD manufacturer shall provide calculations, specific to this installation, showing total harmonic voltage distortion is less than 3 percent. Input line filters shall be sized and provided as required by the VSD manufacturer to ensure compliance with the latest edition of IEEE Standard 519, Guide for Harmonic Control and Reactive Compensation for Static Power Converters. The acceptance of this calculation must be completed prior to VSD installation.

1. The VSD manufacturer shall provide drives with load-side line reactors to 3% or better total harmonic distortion when the load-side feeder length is 35 feet or greater.
2. Prior to installation, the VSD manufacturer shall provide the estimated total harmonic distortion (THD) caused by the VSDs. The results shall be based on a computer aided circuit simulation of the total actual system, with information obtained from the power provided and the user.

J. Enclosure:

1. Interior: Shall require front access only with both top and bottom cable entry possible and shall be NEMA 1 design.

2. Exterior or Wet Locations: NEMA Type 4X.

K. General options/modifications shall be designed to fit in the standard enclosure while maintaining the AFC UL listing. The complete unit as a total assembly shall be UL approved and labeled.

L. General Options/Modifications shall include:

Isolated Process Control Interface: Shall enable the AFC to follow a 0-5, 1-5, 4-20, 10-50, ma; 0-4, 0-8, 0-10 VDC grounded or ungrounded signal from a process controller.

1. Input line reactors to provide additional line inductance which reduces nuisance trips from line surges, line notching and voltage distortion. (Refer to compliance with IEEE 519 parameters above).
2. Motor Overload: Shall contain a thermal overload relay designed to protect one AC motor operated on AFC output from extended overload operation. This shall be designed to mount internal to the AFC enclosure.
3. Provide communication card to facilitate communication with the Building Automation System (BAS). All drive parameters shall be available to the BAS through the communication card.
4. Bypass Systems:
   a. Bypass Operation: Safely transfers motor between power converter output and bypass circuit, manually, automatically, or both. Selector switches set modes and indicator lights indicate mode selected. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.
   b. Bypass Mode: Field-selectable automatic or manual, allows local and remote transfer between power converter and bypass contactor and retransfer, either via manual operator interface or automatic-control system feedback.
   c. Bypass Controller: Factory wired and tested two-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.
      1) Bypass Contactor: Load-break, IEC-rated contactor.
      2) Output Isolating Contactor: Non-load-break, IEC-rated contactor.
      3) Isolating Switch and fuses: Non-load-break switch and fuses upstream of power converter to permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.
      4) Phase protection of motor while operating in bypass mode.
      5) Designed for standalone operation when key pad selector switch is in "Hand" or "Automatic". Maintain serial communications while operating in bypass mode even if the VFD is removed for service.
      6) Omit bypass motor controllers for VFDs as designated on the "Equipment Electrical Schedule" on the drawings.
   d. Bypass Contactor Configuration: Full-voltage (across-the-line) or Reduced-voltage (autotransformer) type as scheduled on the "Equipment Electrical Schedule" on the drawings.
      1) NORMAL/BYPASS selector switch.
      2) HAND/OFF/AUTO selector switch.
      3) NORMAL/TEST Selector Switch: Allows testing and adjusting of VFD while the motor is running in the bypass mode.

M. Quality Assurance Controls, Procedures, and Tests:

Integrated circuits tests shall include 168 hours burn-in screening at 145 degrees C according to MIL-STD-8813B, stabilization baking and temperature cycling from 150 degrees C to -40 degrees C.

1. Small signal semi-conductors shall be lot samples HTRB per MIL-STD-105D (1 percent AGL).
2. All SCR device assemblies of individual heatsink construction shall be electrically curve traced. Each assembly shall be loaded to 125 percent of its rated full load amperes and run for five minutes.
3. Electronic printed circuit board assemblies shall be temperature cycled for 24 hours between 5 degrees C and 85 degrees C.
4. AFC shall be functionally tested under motor load and then cycled under load for several hours.

N. Manufacturers: Subject to compliance with requirements, provide variable speed drives of one of the following:
1. Asea Brown Boveri.
2. Eaton Electrical Sector; Eaton Corporation.
3. Yaskawa Electric America, Inc
4. Danfoss

**PART 3 - EXECUTION**

3.1 WIRING

A. All field wiring connections under 120V shall utilize WAGO connectors.

3.2 CLOSEOUT PROCEDURES

A. Provide services of manufacturer's technical representative for one (1) 4-hour day to instruct Owner's personnel in operation and maintenance of variable speed drives.

Schedule training with Owner; provide at least seven (7) days' notice to Contractor and Engineer of training date.

END OF SECTION 23 00 30

# SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on AC power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

### 1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

## PART 2 - PRODUCTS

### 2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

### 2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

### 2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficiency, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Enclosure:

1. Provide total-enclosed, fan-cooled (TEFC) enclosures for motors installed outside, in roof mounted equipment or exposed to environments with relative humidity exceeding 60% for more than 5 hours per annum.
2. Open, drip proof (ODP) motors for all other applications.

H. Temperature Rise: One class below associated insulation rating class.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Speed Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
4. Shaft Grounding: All motors operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge electrical shaft currents within the motor and/or its bearings. Motors up to 100 HP shall be provided with a minimum of one shaft grounding ring installed either on the drive end or non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the manufacturer's recommendations. Shaft grounding bearing protection ring shall be AEGIS Model SGR.

C. Severe-Duty Motors: Comply with current edition of IEEE 841, with 1.15 minimum service factor.

D. Efficiency:

1. Motors which are 3-phase and 1 hp or larger (nonhermetic) must be NEMA design B and meet the following premium levels of nominal efficiency at full load. The motors must be tested in accordance with IEEE Standard 112 test method B and NEMA MG-1-12-53A.
2. Minimum Motor Efficiencies:

| **OPEN DRIP-PROOF (ODP)** | | | |
|---|---|---|---|
| | Speed (RPM) | | |
| Motor | 1200 | 1800 | 3600 |
| Size (HP) | NEMA Nominal Efficiency | | |
| 1 | 82.5% | 85.5% | 77.0% |
| 1.5 | 86.5% | 86.5% | 84.0% |
| 2 | 87.5% | 86.5% | 85.5% |
| 3 | 88.5% | 89.5% | 85.5% |
| 5 | 89.5% | 89.5% | 86.5% |
| 7.5 | 90.2% | 91.0% | 88.5% |
| 10 | 91.7% | 91.7% | 89.5% |
| 15 | 91.7% | 93.0% | 90.2% |
| 20 | 92.4% | 93.0% | 91.0% |
| 25 | 93.0% | 93.6% | 91.7% |

| **TOTALLY ENCLOSED FAN-COOLED (TEFC)** | | | |
|---|---|---|---|
| | Speed (RPM) | | |
| Motor | 1200 | 1800 | 3600 |
| Size (HP) | NEMA Nominal Efficiency | | |
| 1 | 82.5% | 85.5% | 77.0% |
| 1.5 | 87.5% | 86.5% | 84.0% |
| 2 | 88.5% | 86.5% | 85.5% |
| 3 | 89.5% | 89.5% | 86.5% |
| 5 | 89.5% | 89.5% | 88.5% |
| 7.5 | 91.0% | 91.7% | 89.5% |
| 10 | 91.0% | 91.7% | 90.2% |
| 15 | 91.7% | 92.4% | 91.0% |
| 20 | 91.7% | 93.0% | 91.0% |
| 25 | 93.0% | 93.6% | 91.7% |

2.5 STANDARD SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.6 ELECTRICALLY COMMUTATED (ECM) MOTORS

A. Motor assembly shall be designed for use on direct drive centrifugal fans or pumps. Motors shall be ECM, variable-speed, DC, brushless motors specifically designed for use with single or three-phase 60 hertz electrical input. Motor shall be complete with and operated by a single-phase or three-phase integrated controller/inverter that operates the wound stator and senses rotor position to electronically commutate the stator. All motors shall be designed for synchronous rotation. Motor rotor shall be permanent magnet type with near zero rotor losses. Motor shall have built-in soft start and soft speed change ramps. Motor shall be able to be mounted with shaft in horizontal or vertical orientation. Motor shall be permanently lubricated with ball bearings. Motor shall be direct coupled to the fan blower or pump. Motor shall maintain a minimum of 80 percent efficiency over its entire operating range. Provide both manual and remote speed control for adjustment of the fan airflow or pump water flow setpoint. Inductors shall be provided to minimize harmonic distortion and line noise. Motor shall be designed to overcome reverse rotation without affecting life expectancy.

B. Motor manufacturer shall provide a factory installed PWM controller for manual and remote controlled speed adjustment. The manual PWM controller shall be field adjustable with a standard screwdriver. The PWM controller shall also be capable of receiving a 0-10 Vdc signal from the DDC controller to control the fan or pump speed. When the manual PWM controller is used, the factory shall preset the speed for air or water flow as shown on the equipment schedules.

C. The ECM Programming Process shall be iterative process of developing constants for the ECM motor to operate at the optimum efficiency and provide pressure independent air or water flow.

D. The minimum and maximum fan or pump curves shall be determined based on minimum and maximum rpm of the ECM motor. The motor manufacturer interface unit plots rpm versus torque of the motor and determines the difference between measured venture CFM and the ECM calculated CFM equals zero. Once the CFM difference is zero, or as close to zero as possible, the ECM constants are saved for that unit's airflow characteristics.

1. The remote PWM voltage signal shall be calibrated to provide 100 percent flow at full voltage (10.0V) and minimum flow at minimum voltage (1.0V). The calibrated PWM controller shall allow the ECM motor to operate with remote signal to ensure pressure independent operation of the motor with any DDC controller.
2. Controller shall also provide manual controlled PWM signal using two on-board potentiometers.

E. ECM Programming Process extends from the lab to the ISO 9001:2000 certified factories where individual ECM motors are programmed with the appropriate ECM program for each order.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

# SECTION 23 74 13 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:
   1. Direct-expansion cooling.
   2. Gas furnace.
   3. Economizer outdoor- and return-air damper section.
   4. Integral, space temperature controls.
   5. Roof curbs.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 7 Sections for roof curbs, and roof penetrations.
   2. Division 23 Section "Common Motor Requirements for HVAC Equipment".
   3. Division 23 Section 230030 "Electrical Requirements for Mechanical Equipment".
   4. Division 26 Sections for power supply wiring including field-installed disconnect, and required electrical devices.

C. Products furnished, but not installed, under this Section include roof curbs for rooftop air conditioners.

### 1.2 DEFINITIONS

A. DDC: Direct-digital controls.

B. ECM: Electrically commutated motor.

C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

D. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTU's. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

E. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged outdoor, central- station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

F. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

G. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

H. VVT: Variable-air volume and temperature.

### 1.3 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity, locate, and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For rooftop air conditioners to include in emergency, operation, and maintenance manuals.

E. Warranties: Special warranties specified in this Section.

F. Startup Reports: Indicate results of startup and testing requirements. Submit copies of checklists.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of rooftop air conditioners and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. 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.

C. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

D. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Comply with NFPA 54 for gas-fired furnace section.

F. ARI Certification: Units shall be ARI certified and listed.

G. ARI Compliance for Units with Capacities 135,000 Btuh and More: Rate rooftop air-conditioner capacity according to ARI 340/360, "Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment."

1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate size, location, and installation of rooftop air-conditioner manufacturer's roof curbs and equipment supports with roof installer.

1. Coordinate installation of restrained vibration isolation roof-curb rails.

C. Coordinate size and location of roof openings.

D. Coordinate electrical power requirements.

E. Coordinate natural gas requirements.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace, parts and labor with no cost to the owner, components of rooftop air conditioners that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years

from date of Substantial Completion.
2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than 10 years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than five years from date of Substantial Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than five years from date of Substantial Completion.
5. Warranty Period for Variable-Speed Fan Motors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
6. Warranty Period for Electronic Thermostats: Manufacturer's standard, but not less than ten years from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match product installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fan Belts: One set for each belt-drive fan.
   2. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.1 ROOFTOP AIR CONDITIONERS

A. Manufacturers:
   1. AAON, Inc.
   2. Daikin Applied
   3. YORK, a Johnson Controls Company
   4. Johnson Controls, Inc.
   5. Carrier Corporation, a unit of United Technologies Corp.

B. Description: Factory assembled and tested; designed for exterior installation; consisting of compressor, indoor and outside refrigerant coils, indoor fan and outside coil fan, refrigeration and temperature controls, filters, and dampers. Unit to be configured for horizontal discharge and intake for supply and return air.

C. Casing: Manufacturer's standard galvanized sheet metal construction with exterior enamel paint finish, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 2 inch-thick thermal insulation with solid galvanized steel liner, knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs.

D. Indoor Fan: Forward curved, centrifugal, direct driven, grease- lubricated ball bearings, and motor. Mount fan and motor assembly on base with spring isolators having 2-inch deflection.
   1. Variable speed drive: refer to Division 23 Section 230030 "Electrical Requirements for Mechanical Equipment" for drive requirements.

E. Exhaust/Relief: Electric modulating damper.

F. Return-Relief-Air Fan: Airfoil plug, centrifugal, direct driven, grease-lubricated ball bearings, and motor. Mount fan and motor assembly on base with spring isolators having 2-inch deflection.
   1. Variable speed drive: refer to Division 23 Section 230030 "Electrical Requirements for Mechanical Equipment" for drive requirements.

G. Outside Coil Fan: Propeller type, directly driven by permanently lubricated motor.

H. Refrigerant Coils: Aluminum-plate fin and seamless copper tube in galvanized-steel casing with equalizing-type vertical distributor and thermal expansion valve; tested to 450 psig and leak tested to 300 psig with air under water. Insulate coil section

I. Compressors: Number as scheduled hermetic scroll compressors with integral vibration isolators, internal overcurrent and over-temperature protection, internal pressure relief, and crankcase heaters. Each unit shall have at least one variable speed compressor on one circuit and multiple compliant fixed speed scroll compressors on the other.

J. Refrigeration System:
   1. Compressors.
   2. Outside coil and fan.
   3. Indoor coil and fan.
   4. Check valves.
   5. Expansion valves with replaceable thermostatic elements.
   6. Refrigerant dryers.
   7. High-pressure switches.
   8. Low-pressure switches.
   9. Thermostats for coil freeze-up protection during low-ambient temperature operation or loss of air.
   10. Independent refrigerant circuits.
   11. Brass service valves installed in discharge and liquid lines.
   12. Charge of refrigerant.
   13. Timed Off Control: Automatic-reset control shuts compressor off after five minutes.
   14. Refrigerant Circuits: Interlaced refrigerant-coil circuiting with circuit for each compressor.
   15. Capacity Control: Cylinder unloaders with steps as scheduled.
   16. Compressor Motor Overload Protection: Manual reset.
   17. Antirecycling Timing Device: Prevents compressor restart for five minutes after shutdown.
   18. Adjustable, Low-Ambient, and Head-Pressure Control: Designed to operate at temperatures as low as 0 degrees F by cycling outside coil fans and controlling speed of last fan of each circuit.
   19. Oil-Pressure Switch: Designed to shut down compressors on low oil pressure.

K. Pre-Filters: UL Class I, 4-inch-thick, high-efficiency, throwaway filters in filter rack; with 25 to 35 percent dust-spot efficiency (MERV 14) and 90 percent average arrestance.

L. Heat Exchanger: Stainless steel construction for natural-gas-fired burners with the following controls:
   1. Redundant dual gas valve with manual shutoff.
   2. Fully modulating gas valve with turn-down ratio of at least 5:1.
   3. Direct-spark pilot ignition.
   4. Electronic flame sensor.
   5. Induced-draft blower.
   6. Flame rollout switch.
   7. Low limit switch.

O. Economizer: Return- and outside-air dampers with neoprene seals, outside-air filter, and hood.
   1. Damper Motor: Fully modulating spring return with adjustable minimum position.
   2. Control: Electronic-control system uses mixed-air temperature and selects between outside-air and return-air enthalpy to adjust mixing dampers.
   3. Relief Damper: Fully modulating spring return, controlled to maintain building pressure.
   4. Leakage: Maximum leakage 2.5 percent at nominal airflow of 400 cfm per ton with 1-inch w.g pressure differential.

P. Power Connection: RTU shall have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection. Refer to Division-26 for unit-mounted disconnect.

Q. Unit Controls: Solid-state control board, display panel, and components contain at least the following features:
   1. Indoor fan on/off delay.
   2. Default control to ensure proper operation after power interruption.

3. Service relay output.
4. Unit diagnostics and diagnostic code storage.
5. Field-adjustable control parameters.
6. Economizer control and economizer fault detection.
7. Minimum outside air flow set point.
8. Outside air flow.
9. Gas valve delay between first- and second-stage firing.
10. Indoor-air quality control with carbon dioxide sensor.
11. Low-ambient control, allowing operation down to 0 degrees F.
12. Hot gas reheat coil control
13. Minimum run time.
14. Night setback mode.
15. Return-air temperature limit.
16. Smoke alarm with smoke detector installed in supply and return air.
17. Low-refrigerant pressure control.
18. Digital display of outside temperature, supply-air temperature, return-air temperature, economizer damper position, indoor-air quality, and control parameters.
19. Variable-Air-Volume Control: Variable-frequency drive controls supply-air static pressure.
20. Building pressure set point.
21. Building pressure.

R. Control Interface: Install stand-alone control module providing BACnet link between unit controls and DDC temperature-control system.

S. Temperature Control: Factory-installed, demand-oriented, solid-state microprocessor-based controller which will monitor and control the unit in a stand alone mode or as directed by a building automation system. Provide a minimum of two cooling steps and modulating heating control.

1. The rooftop control panel will have a human interface panel with a clear English LCD display and keypad for monitoring, setting, editing and controlling.
2. The unit controls will perform the following control strategies:
   a. Unoccupied Mode: The rooftop heating and cooling controls will modulate to maintain the discharge air temperature set point. Minimum outside air damper position will be zero percent open.
   b. Night Setback: Maintain user-defined unoccupied heating and cooling set points. The outdoor air damper will remain closed for night setback operation (unless economizing for zone cooling). The fan will operate in the automatic control mode.
   c. Purge/Night Economizer: The purge mode will turn on the fan and enable the economizer during unoccupied hours to cool a zone using cool outside air. Through Time of Day Scheduling, the operator will specify when the purge mode occurs. During the purge mode, the economizer will be enabled while mechanical outside cooling and heating are disabled.
   d. Transition from Unoccupied to Occupied: When the unit transitions from the unoccupied operation to occupied operation, start-up or morning warm-up mode will be activated.
   e. Startup Mode: During the Startup mode, heating and cooling are enabled for the Rooftop. On Variable Air Volume units, the transition from the Unoccupied to the Startup mode may initiate the Morning Warm-up mode, if the space temperature is below the Morning Warm- up set point. On both Constant Volume and Variable Air Volume units, the outside air damper will remain closed, unless economizing, until the zone's scheduled occupied time.
   f. Morning Warm-up (CV and VAV Units): When the Rooftop changes from the Unoccupied to the occupied mode; the unit may enter the Morning Warm-up mode. The Morning Warm-up mode will be initiated if the Morning Warm-up sensor value is less

than the Morning Warm-up set point. The economizer will be kept closed and the selected zone is heated. The Morning Warm-up set point will be based on one specific zone designated by the operator or based on an average zone temperature.

g. Occupied Operation: When the rooftop unit is controlled to the occupied mode, all rooftop unit functions will be enabled. Variable Air Volume units will operate in supply air temperature control mode, and Constant Volume units will operate under zone temperature control.

h. Cooling/Economizer: During the Occupied cooling mode of operation the economizer, if available, and mechanical cooling are used to control the zone temperature. If the enthalpy of the outside air is appropriate to use free cooling the economizer will be used to satisfy the zone temperature. If more cooling is then required, compressors will be staged on as necessary. Minimum On/Off timing of the compressors will prevent rapid cycling.
   1) At outdoor air conditions above the enthalpy control setting, mechanical cooling only will be used and the fresh air dampers will remain at, or return to minimum position.

i. Supply Air Set point (Variable Air Volume Units): The supply air set point for each rooftop unit will be defined by the user or reset automatically based on an outdoor air or zone temperature.

j. Burner: The burner will modulate to maintain the discharge air temperature set point.

k. Economizer Control (CV and VAV Units): If poor outdoor air conditions exist, the unit will lockout all economizers. On constant volume units, the controller will also set the minimum economizer position to maintain a minimum outdoor air flow (cfm). On VAV units, as the supply fan modulates down, the minimum economizer position will also be reset to compensate for the reduction in total airflow.

l. Timed Override: When a Timed Override is initiated by the user, the rooftop unit will return to its normal occupied mode for a period of time as specified at the unit. When the Timed Override period has ended, the unit will automatically return to its unoccupied cycle.

m. Space Pressure Control: (return/relief air fan) The space pressure control will modulate the relief damper to maintain the space pressure set point.

n. Supply Air Pressure Control (VAV Units): Modulate the variable speed drive based on the static pressure sensor located in the supply air duct. The microprocessor will also read the status on the supply air sensor and display the pressure reading on the status screen.

o. Return Air Fan Control (VAV Units): Modulate the variable speed drive based on the static pressure sensor located in the return air discharge plenum. The microprocessor will also read the status on the return air sensor and display the pressure reading on the status screen.

3. Diagnostic's and Alarms: Individual rooftop diagnostic and alarm statuses will include the following items for each rooftop unit:
   a. Supply air temperature sensor failure.
   b. Auxiliary temperature sensor failure.
   c. Outdoor air temperature sensor failure.
   d. Occupied zone cool/heat set point failure.
   e. Supply air pressure sensor failure.
   f. Outside air humidity sensor failure.
   g. Evaporator temperature sensor failure (each circuit).
   h. Condenser Temperature sensor failure (each circuit).
   i. Morning warm-up zone sensor fail.
   j. Heat failure.
   k. Unoccupied zone cool/heat set point failure.

l. Supply air pressure set point failure.
m. Space static pressure set point failure.
n. Space pressure sensor failure.
o. Return air temperature sensor failure.
p. Return air humidity sensor failure.
q. Unit communications loss.
r. Heat communications failure.
s. Supply air temperature cool/heat set point fail.
t. Dirty filter.
u. Economizer fault.

T. Optional Accessories:
1. Cottonwood Filter: Provide cottonwood filter as manufactured by Air Solution Company or prior approved equal for condenser coil protection.

2.2 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C 1071, Type I or II.
b. Thickness: 2 inches.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Curb Height: 14 inches.

2.3 VARIABLE SPEED DRIVES

A. Refer to drawings for fan motors controlled by variable speed drives. Variable speed fan motor drives will be provided by the rooftop unit manufacture, and internally factory mounted in RTU for supply and return/relief fans.

B. See Section 230030 "Electrical Requirements for Mechanical Equipment" for requirements.

2.4 MOTORS

A. General requirements for motors are specified in Division 23 Section "Common Motor Requirements For HVAC Equipment".
B. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

C. Controllers, electrical devices, and wiring are specified in Division 26 Sections.

2.5 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant

Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

C. Fan Balancing: Fans shall be factory balanced and AMCA Certified to meet ANSI S2.19 grade G6.3 requirements. Filter-in vibration measurements shall not exceed 0.15 in/second peak at the fan RPM.

2.2 CAPACITIES AND CHARACTERISTICS

A. Supply-Air Fan:
1. Fan Type: Belt-driven, double width, forward curved, centrifugal.
2. Airflow: 9,000 cfm.
3. External Static Pressure: 1.5 inches wg.
4. Fan Speed: Variable.
5. Motor Horsepower: 10.

B. Supply-Air Refrigerant Coil:
1. Total Cooling Capacity: 221.03 MBH.
2. Sensible Cooling Capacity: 172.79.
3. Entering-Air Dry-Bulb Temperature: 74.6 deg F.
4. Entering-Air Wet-Bulb Temperature: 61.7 deg F.
5. Coil Leaving-Air Dry-Bulb Temperature: 55.0 deg F.
6. Coil Leaving-Air Wet-Bulb Temperature: 52.4 deg F.
7. Unit Leaving-Air Dry-Bulb Temperature: 56.8 deg F.
8. Refrigerant Type: R-410A.
9. Minimum Outdoor Airflow: 1500 cfm.

C. Outdoor-Air Refrigerant Coil:
1. Ambient-Air Temperature: 95 deg F.

D. Compressors:
1. Energy Efficiency Ratio (EER): 9.8.

E. Gas Furnace:
1. Airflow: 3500 cfm.
2. Minimum AFUE: 80 percent.
3. Minimum Input: 300 MBH.
4. Minimum Output: 243 MBH.
5. Entering-Air Temperature: 37.8 deg F.
6. Minimum Air-Temperature Rise: 40 deg F.

F. Electrical Characteristics for Single-Point Connection:
1. Voltage: 208 V.
2. Phase: 3.
3. Hertz: 60.
4. Minimum Circuit Ampacity: 154 A.
5. Maximum Overcurrent Protection: 175 A.

## PART 3 - EXECUTION

3.1 STORAGE AND DELIVERY

A. Supplier shall receive and store equipment at the supplier's location until the installing contractor is ready to receive the unit on site with no additional cost to owner. Supplier may submit an invoice for unit only when the equipment is received by the supplier. Supplier shall make the unit available for inspection by the owner prior to payment. Supplier may submit additional invoice for remaining portions of the contract after delivery to site, unit startup and completion of owner training.

B. Supplier shall provide delivery of unit from the supplier's location to the project site. Delivery to site shall be done on flatbed truck or trailer. Supplier shall be responsible for loading the equipment at the supplier's location and delivering it to the project site on a date coordinated with the installing contractor. Equipment for unloading equipment at the project site shall be provided by the installing contractor.

3.2 INSTALLATION

A. Install units' level and plumb, maintaining manufacturer's recommended clearances.

B. Curb Support: Install roof curb on roof structure, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Conditioners and Ducts." Install and secure rooftop air conditioners on curbs and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.
   1. Gas Piping: Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.
   2. Cooling Coil Condensate Drain Piping: Install trap and extend condensate drain to the nearest roof drain unless indicated on the drawings.

C. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
   1. Connect supply and return ducts to rooftop unit with flexible duct connectors specified in Division 23 Section "Duct Accessories."

D. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.

E. Ground equipment according to Division 26 Section "Grounding and Bonding."

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A andUL 486B.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field-testing. Report results in writing.

B. Perform the following field quality-control tests and inspections and prepare test reports:
   1. After installing rooftop air conditioners and after electrical circuitry has been energized, test units for compliance with requirements.
   2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove malfunctioning units, replace with new units, and retest as specified above.

3.5 STARTUP SERVICE

A. Engage a factory service representative to perform startup service. The service

representative shall be trained at the factory for startup service.

3.6 ADJUSTING

A. Adjust initial temperature and humidity set points.
B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.7 DEMONSTRATION

A. Provide services of manufacturer's technical representative for one (1) 8-hour day to instruct Owner's personnel in operation and maintenance of unit.
B. Schedule training with Owner; provide at least seven (7) days' notice to Contractor and Engineer of training date.

END OF SECTION