PROJECT MANUAL

Edinburg Consolidated Independent School District

BL GARZA MIDDLE SCHOOL & TRANSPORTATION SHOP ROOFING IMPROVEMENTS
ECISD CSP NO. 23-73

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Architect:

ERO ARCHITECTS

P.O. Box 720428 McAllen, Texas 78504

ERO Project No. 24039 | June 11,2025

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SECTION 00 01 01
PROJECT TITLE PAGE

PROJECT MANUAL FOR:

Edinburg Consolidated Independent School District
BL GARZA MIDDLE SCHOOL & TRANSPORTATION SHOP ROOFING IMPROVEMENTS

ARCHITECTS PROJECT NUMBER: 24039

OWNER'S PROJECT NUMBER: 23-73

PROJECT LOCATION:

BL GARZA MIDDLE SCHOOL
1202 Mon Mack Rd
Edinburg, TX 78541

TRANSPORTATION SHOP
1015 E Schunior St
Edinburg, TX 78541

PREPARED BY:
ERO ARCHITECTS

END OF DOCUMENT

SECTION 00 01 02
PROJECT INFORMATION

PART 1 GENERAL

1.1 PROJECT IDENTIFICATION

A. Project Name: **BL GARZA MIDDLE SCHOOL & TRANSPORTATION SHOP ROOFING IMPROVEMENTS**
B. Project Number: ECISD CSP # 23-73 and ERO 24039
C. The Owner, hereinafter referred to as Edinburg Consolidated Independent School District (ECISD).
D. Edinburg Consolidated Independent School District's Project Manager: Ramon Villalobos

1.2 PROJECT DESCRIPTION

A. Summary Project Description: Provide labor, material and equipment related to Roof replacement of BL Garza, and Transportation Shop.
B. Contract Scope: Roof Remediation

1.3 PROJECT CONSULTANTS

A. The Architect, hereinafter referred to as ERO Architects.
   1. Address: PO Box 720428
   2. City, State, Zip: McAllen, Texas 78504.
   3. Phone/ Fax : 956.661.0400 / 956.661.0401.
   4. E-mail : www.eroarchitects.com.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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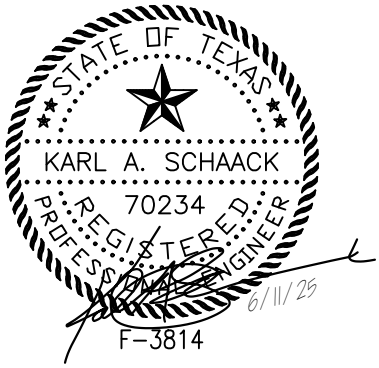
SEALS PAGE

ARCHITECTURE

OCTAVIO CANTU AIA **ERO ARCHITECTS** **PO BOX 70428** **MCALLEN** **TEXAS 78504**	

ENVELOPE CONSULTANT

KARL A. SCHAACK, P.E. **PRICE CONSULTING INC** **211 HIGHLAND CROSS DRIVE** **HOUSTON** **TEXAS 77073**	

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END OF DOCUMENT

SECTION 01 10 00
SUMMARY

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

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

B. Related Sections include Division 01 Section “Temporary Facilities and Controls” for limitations and procedures governing temporary use of Owner's facilities.

1.02 PROJECT INFORMATION

A. Project Identification: BL GARZA MIDDLE SCHOOL
1. Project Location : 1202 Mon Mack Rd, Edinburg TX 78541

B. Project Identification: TRANSPORTATION ANNEX
1. Project Location: 1015 E Schunior St, Edinburg TX 78541

C. Owner: EDINBURG CONSOLIDATED SCHOOL DISTRICT
1. Address: 411 N 8th Ave, Edinburg TX 78539
2. Telephone: 956-289-2300

D. Architect: ERO Architects.
1. Address: P.O Box 720428 McAllen, Texas 78504
2. Telephone: 956-661-0400
3. Contact: Manuel Zamora (mzamora@goero.com)

E. Contractor: A Contractor will be selected under the procedures required for “Competitive Sealed Proposals” as required by the State of Texas.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the Re-Roof of City of Mission’s City Hall Building. Approximately 23,000 SF of Single Ply Roofing, and 5,200 SF of metal roofing. The Project will be located in Mission, Texas.

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

1.04 WORK UNDER SEPARATE CONTRACTS

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

DIVISION 21 - FIRE SUPPRESSION (NOT APPLICABLE)

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END OF DOCUMENT

1.05 ACCESS TO SITE

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

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

1.06 COORDINATION WITH OCCUPANTS

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

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

1.07 WORK RESTRICTIONS

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

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

B. On-Site Work Hours: Limit work in the existing building to hours permitted by authorities having jurisdiction.

C. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

D. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

E. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.08 SPECIFICATION AND DRAWING CONVENTIONS

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

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

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

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

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

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings 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 APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 21 00
ALLOWANCES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include contingency allowances.

1.02 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.03 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.04 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.05 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.06 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.02 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.03 SCHEDULE OF ALLOWANCES

A. **Allowance No. 1 BL GARZA MIDDLE SCHOOL:** Owner's Contingency Allowance: Include the stipulated sum of **FORTY THOUSAND** and no/100 dollars ($ 40,000.00) for use by the Owner for improvements of the Project.

B. **Allowance No. 2 TRANSSPORTATION SHOP:** Designer's Contingency Allowance: Include the stipulated sum of **EIGHTEEN THOUSAND** and no/100 dollars ($ 18,000.00) for use by the Designer and Owner for improvements of the Project.

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.02 DEFINITIONS

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

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

1.03 PROCEDURES

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

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

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

C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 SCHEDULE OF ALTERNATES

A. BL Garza Middle School:

1. Alternate No. 1: Re Roof of high roofs identified on plans as (Area A, & Area B) w**ith *modified bitumen* roofing** will be considered as alternates and priced individually.

2. Alternate No. 2: New Coping will be considered as alternate.

B. **Transportation Annex:**

1. Alternate No. 1: Installation of reinforced thermoplastic (TPO) single-ply membrane roofing system, related membrane flashings, insulation board, and other accessories over existing metal panel roof system.

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections include:

1. Division 01 Section “Allowances” for products selected under an allowance.
2. Division 01 Section “Product Requirements” for requirements for submitting comparable product submittals for products by listed manufacturers.

1.02 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.03 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form approved by Owner.
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.

1.04 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.

1.05 PROCEDURES

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

1.06 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Requested substitution provides sustainable design characteristics that specified product provided for compliance with sustainability requirements.
c. Substitution request is fully documented and properly submitted.
d. Requested substitution will not adversely affect Contractor's construction schedule.

e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 75 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Requested substitution provides sustainable design characteristics that specified product provided for compliance with sustainability requirements.
e. Substitution request is fully documented and properly submitted.
f. Requested substitution will not adversely affect Contractor's construction schedule.
g. Requested substitution has received necessary approvals of authorities having jurisdiction.
h. Requested substitution is compatible with other portions of the Work.
i. Requested substitution has been coordinated with other portions of the Work.
j. Requested substitution provides specified warranty.
k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 25 00.01
SUBSTITUTION REQUEST FORM

SUBSTITUTION REQUEST FORM

Refer to Division 01 Section "Substitution Procedures" for procedures governing product substitutions. Request to substitute products will only be accepted from the Contractor and cannot be accepted without a completed Substitution Request Form.

To: **ero architects**
300 S. 8th Street
McAllen, Texas 78501

Substitution Request Number: _____

Date: _____

Project: _____

From: _____

_____

Project No.: _____

Contract For: _____

_____

Specification Section Number: _____ Title: _____

Page: _____ Article/Paragraph: _____ Description: _____

Proposed Substitution: _____

Trade Name: _____ Model No.: _____

Manufacturer: _____ Address: _____ Phone: _____

Installer: _____ Address: _____ Phone: _____

History: New product 2-5 years old 5 – 10 years old More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

Point-by-point comparative data attached – REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: No Yes, explain: _____

_____

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

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

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include Division 01 Section “Substitution Procedures” for administrative procedures for handling requests for substitutions made after the Contract award.

1.02 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 unless otherwise directed by Owner.

1.03 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 unless otherwise directed by Owner.

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 Division 01 Section “Substitution Procedures” if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use forms acceptable to Architect unless otherwise directed by Owner.

1.04 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Division 01 Section “Allowances” for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.05 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 AIA Document G701 unless otherwise directed by Owner.

1.06 UNILATERAL CHANGE ORDER

A. Unilateral Change Order: With the approval of the Owner, Architect may issue a Unilateral Change Order on forms provided by Owner. Unilateral Change Order instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Unilateral Change Order 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 Unilateral Change Order.

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

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

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

B. Related Sections include:

1. Division 01 Section “Allowances” for procedural requirements governing the handling and processing of allowances.
2. Division 01 Section “Contract Modification Procedures” for administrative procedures for handling changes to the Contract.
3. Division 01 Section “Construction Progress Documentation” for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.02 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.

1.03 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 at earliest possible date, but no later than ten 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. Name of Architect.
c. Architect's Project number.
d. Contractor's name and address.
e. 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. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
8. 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.
9. 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.

1.04 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 Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

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. 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.

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. Sustainable design action plans, including preliminary project materials cost data.
8. Schedule of unit prices.
9. Submittal schedule (preliminary if not final).

10. List of Contractor's staff assignments.
11. List of Contractor's principal consultants.
12. Copies of building permits.
13. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
14. Initial progress report.
15. Report of preconstruction conference.
16. Certificates of insurance and insurance policies.
17. Performance and payment bonds.
18. 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.
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 previouslysubmitted and accepted, including, but not limited, to the following:

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 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 including:

    a. Preconstruction conference.
    b. Sustainable design requirements coordination conference.
    c. Progress meetings.
    d. Preinstallation conferences.
    e. Project closeout conference.

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

C. Related Sections include:

1. Division 01 Section “Construction Progress Documentation” for preparing and submitting Contractor's construction schedule.
2. Division 01 Section “Execution” for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section “Closeout Procedures” for coordinating closeout of the Contract.

1.02 DEFINITIONS

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

1.03 INFORMATIONAL SUBMITTALS

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

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

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and 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. Post copies of list in project meeting room, in temporary field office, in web-based Project software directory, and in prominent location inbuilt facility. Keep list current at all times.

1.04 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

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

B. 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 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.

1.05 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to coordination drawingsin a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section “Submittal Procedures.”

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Submittal Format: Submit or post coordination drawing files using PDF format.
3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

    a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    b. Contractor shall execute a data licensing agreement in the form of AIA Document C106.

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

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

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

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 working 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 Architect of 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 10 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. Use software log that is part of web-based Project software.

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.

1.07 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data licensing agreement in the form of AIA Document C106 Digital Data Licensing Agreement.

a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of AIA Document C106

4. The following digital data files will be furnished for each appropriate discipline:

a. Floor plans.
b. Reflected ceiling plans.

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.

1.08 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 10 working 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: Owner 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, Owner's Commissioning Authority, 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. Preparation of Record Documents.
o. Use of the premises.
p. Work restrictions.
q. Working hours.
r. Owner's occupancy requirements.

s. Responsibility for temporary facilities and controls.
t. Procedures for moisture and mold control.
u. Procedures for disruptions and shutdowns.
v. Construction waste management and recycling.
w. Parking availability.
x. Office, work, and storage areas.
y. Equipment deliveries and priorities.
z. First aid.
aa. Security.
bb. Progress cleaning.

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

C. Sustainable Design Requirements Coordination Conference: Owner will schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to Owner, Architect, and Contractor.

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

a. Sustainable design Project checklist.
b. General requirements for sustainable design-related procurement and documentation.
c. Project closeout requirements and sustainable design certification procedures.
d. Role of sustainable design coordinator.
e. Construction waste management.
f. Construction operations and sustainable design requirements and restrictions.

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

D. Progress Meetings: Conduct progress meetings at regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do

so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Status of sustainable design documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of Proposal Requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.

h. Sustainable design requirements.
i. Review of mockups.
j. Possible conflicts.
k. Compatibility requirements.
l. Time schedules.
m. Weather limitations.
n. Manufacturer's written instructions.
o. Warranty requirements.
p. Compatibility of materials.
q. Acceptability of substrates.
r. Temporary facilities and controls.
s. Space and access limitations.
t. Regulations of authorities having jurisdiction.
u. Testing and inspecting requirements.
v. Installation procedures.
w. Coordination with other work.
x. Required performance results.
y. Protection of adjacent work.
z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

F. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of Record Documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Procedures for completing and archiving web-based Project software site data files.
d. Submittal of written warranties.
e. Requirements for completing sustainable design documentation.
f. Requirements for preparing operations and maintenance data.
g. Requirements for delivery of material samples, attic stock, and spare parts.
h. Requirements for demonstration and training.
i. Preparation of Contractor's punch list.

j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
k. Submittal procedures.
l. Coordination of separate contracts.
m. Owner's partial occupancy requirements.
n. Installation of Owner's furniture, fixtures, and equipment.
o. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

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

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

1.02 DEFINITIONS

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

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

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

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

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

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

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

1.03 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in PDF file format.

B. Startup construction schedule.

C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource

loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

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

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

E. Daily Construction Reports: Submit at monthly intervals.

F. Material Location Reports: Submit at monthly intervals.

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

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

1.04 COORDINATION

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

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

1.05 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

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

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

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

C. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

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

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

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.

2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section “Submittal Procedures” in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

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

1. Work under More Than One Contract: Include a separate activity for each contract.
2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
3. Work Restrictions: Show the effect of the following items on the schedule:

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

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

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

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

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

1. See Division 01 Section “Payment Procedures” for cost reporting and payment procedures.

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

1. Unresolved issues.

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

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

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

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

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

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

1.06 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.07 CPM SCHEDULE REQUIREMENTS

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

B. CPM Schedule: Prepare Contractor's Construction Schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 45 days after date established for the Notice to Proceed.

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

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.

3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use “one workday” as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

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

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

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing and inspection.
    j. Punch list and final completion.
    k. Activities occurring following final completion.

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

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

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

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

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

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

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

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

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

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

1.08 REPORTS

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

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

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

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

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

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

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.
4. Preconstruction video recordings.
5. Periodic construction video recordings.
6. Web-based construction photographic documentation.

B. Related Sections include:

1. Section 013300 “Submittal Procedures” for submitting photographic documentation.
2. Section 017700 “Closeout Procedures” for submitting photographic documentation as project record documents at Project closeout.
3. Section 017900 “Demonstration and Training” for submitting video recordings of demonstration of equipment and training of Owner's personnel.
4. Section 311000 “Site Clearing” for photographic documentation before site clearing operations commence.

1.02 INFORMATIONAL SUBMITTALS

A. Qualification Data: For photographer.

B. FAA Requirements:

1. Current FAA Certified Drone Pilot License according to 14 CFR 107, Subpart C – Remote Pilot Certification.
2. Current FAA Registration if drone weighs more than 0.55 pounds.

C. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

D. Digital Photographs: Submit image files within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 10 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date photograph was taken.

f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
g. Unique sequential identifier keyed to accompanying key plan.

E. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.

1. Format: 8-by-10-inch smooth-surface matte prints on single-weight, commercial-grade photographic paper; mounted on linen or card stock to allow a 1-inch-wide margin and enclosed back to back in clear plastic sleeves that are punched for standard three-ring binder.
2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date photograph was taken if not date stamped by camera.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
g. Unique sequential identifier keyed to accompanying key plan.

F. Video Recordings: Submit video recordings within seven days of recording.

1. Submit video recordings in digital video disc format acceptable to Architect.
2. Identification: With each submittal, provide the following information:

a. Name of Project.
b. Name and address of photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date video recording was recorded.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
g. Weather conditions at time of recording.

3. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty,three-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as corresponding video recording. Include name of Project and date of video recording on each page.

1.03 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.04 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 10 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

B. Digital Video Recordings: Provide high-resolution, digital video disc in format acceptable to Architect.

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

D. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

E. Periodic Construction Photographs: Take 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Monthly UAV Drone Progressions:

1. Comply with the safety requirements of 14 CFR 107. Include both panoramic and aerial video of the entire project captured monthly.
2. Do not fly the drone higher than 400 feet.
3. Photograph the 8 cardinal directions around the site perimeter and one top down, edited for proper exposure for allowing view of the entire site.
4. Use the following personnel for all drone progressions:

a. Remote Pilot in Command: Responsible for the operation of the small unmanned aircraft system.

b. Visual Observer: Maintain unaided sight and position of small unmanned aircraft during flight.

G. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

H. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.

1. Do not include date stamp.

I. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special event planned at Project site.
b. Immediate follow-up when on-site events result in construction damage or losses.
c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
d. Substantial Completion of a major phase or component of the Work.
e. Extra record photographs at time of final acceptance.
f. Owner's request for special publicity photographs.

3.02 CONSTRUCTION VIDEO RECORDSINGS

A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.

B. Recording: Mount camera on tripod before starting recording unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.

C. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.
2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.

D. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.

E. Preconstruction Video Recording: Before starting construction, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect.

1. Flag construction limits before recording construction video recordings.
2. Show existing conditions adjacent to Project site before starting the Work.

3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of construction.
4. Show protection efforts by Contractor.

F. Periodic Construction Video Recordings: Record video recording monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 30 minutes(s), unless otherwise directed by Architect.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

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

B. Related Sections include:

1. Division 01 Section “Payment Procedures” for submitting Applications for Payment and the schedule of values.
2. Division 01 Section “Project Management and Coordination” for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Division 01 Section “Construction Progress Documentation” for submitting schedules and reports, including Contractor's construction schedule.
4. Division 01 Section “Quality Requirements” for submitting test and inspection reports, and schedule of tests and inspections.
5. Division 01 Section “Closeout Procedures” for submitting closeout submittals and maintenance material submittals.
6. Division 01 Section “Operation and Maintenance Data” for submitting operation and maintenance manuals.
7. Division 01 Section “Project Record Documents” for submitting record Drawings, record Specifications, and record Product Data.
8. Division 01 Section “Demonstration and Training” for submitting video recordings of demonstration of equipment and training of Owner's personnel.
9. Division 01 Section “Sustainable Construction Requirements” for sustainable design submittals.

1.02 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.”

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

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

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

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

1.04 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. Paper Submittals:

1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Action Submittals: Submit four paper copies of each submittal unless otherwise indicated. Architect will return three copies.
4. Informational Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will not return copies.
5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using AIA Document G810 transmittal form.

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

1.05 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.

2. Paper: Prepare submittals in paper form, and deliver to Architect.

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

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

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.

1.06 SUBMITTAL REQUIREMENTS

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

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

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

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

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.

d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

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

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.

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

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

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

a. Four opaque copies of each submittal. Architect will retain three copies; remainder will be returned.

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

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

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

3. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

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

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit four sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.

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

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

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

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

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

G. Certificates:

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

3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

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

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

1.07 DELEGATED-DESIGN SERVICES

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

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

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate,

signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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

C. BIM Incorporation: Incorporate delegated-design drawing and data files into BIM established for Project according to requirements of Division 01 Section “Facilities Management Data Requirements.”.

1.08 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 indication in web-based Project software. 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.

1.09 ARCHITECT'S REVIEW

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

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

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

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

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Commissioning Authority, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

4. Specific test and inspection requirements are not specified in this Section.

1.02 DEFINITIONS

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

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

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

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

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

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

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

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

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

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

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

1.03 DELEGATED-DESIGN SERVICES

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

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

1.04 CONFLICTING REQUIREMENTS

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

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.05 ACTION SUBMITTALS

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

1.06 INFORMATIONAL SUBMITTALS

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

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

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

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

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

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

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

1.07 CONTRACTOR'S QUALITY-CONTROL PLAN

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

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

1. Project quality-control manager may also serve as Project superintendent.

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

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

1. Contractor-performed tests and inspections including Subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.

2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.

3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.

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

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

1.08 REPORTS AND DOCUMENTS

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

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

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

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.

6. Statement whether conditions, products, and installation will affect warranty.

7. Other required items indicated in individual Specification Sections.

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

1. Name, address, telephone number, and email address of factory-authorized service representative making report.

2. Statement that equipment complies with requirements.

3. Results of operational and other tests and a statement of whether observed performance complies with requirements.

4. Statement whether conditions, products, and installation will affect warranty.

5. Other required items indicated in individual Specification Sections.

1.09 QUALITY ASSURANCE

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

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Texas and who is experienced in providing engineering services of the

kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

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

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

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

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

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.

2. Build mockups in location indicated or, if not indicated, as directed by Architect.

3. Notify Architect seven days in advance of dates and times when mockups will be constructed.

4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.

5. Demonstrate the proposed range of aesthetic effects and workmanship.

6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.

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

7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

8. Demolish and remove mockups when directed unless otherwise indicated.

1.10 QUALITY CONTROL

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

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.

2. Payment for these services will be made from testing and inspection allowances, as authorized by Change Orders.

3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

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

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

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

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

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.

4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

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

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

1. Notify Architect, Commissioning Authority and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 “Submittal Procedures.”

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

G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

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

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

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's

quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.

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

1.11 SPECIAL TESTS AND INSPECTIONS

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

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TEST AND INSPECTION LOG

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

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

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

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

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 42 00
REFERENCES

PART 1 - GENERAL

1.01 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions or the Contract.

B. “Approved”: When used to convey Architect's action on Contractor's submittals, applications, and requests, “approved” is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. “Directed”: A command or instruction by Architect. Other terms including “requested,” “authorized,” “selected,” “required,” and “permitted” have the same meaning as “directed.”

D. “Indicated”: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including “shown,” “noted,” “scheduled,” and “specified” have the same meaning as “indicated.”

E. “Regulations”: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. “Furnish”: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. “Install”: Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. “Provide”: Furnish and install, complete and ready for the intended use.

I. “Project Site”: Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.02 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

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

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

1.03 ABBREVIATIONS AND ACRONYMS

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

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the

entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

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

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and

regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdss.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
6. MILSPEC - Military Specification and Standards; (See DOD).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
2. TAS, Texas Accessibility Standards; http://www.tdlr.texas.gov/ab/abtas.htm.
3. TDLR, Texas Department of Licensing and Regulation; **Error! Hyperlink reference not valid.**.
4. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

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

B. Related Sections include Division 01 Section “Summary” for work restrictions and limitations on utility interruptions.

1.02 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Water Service: Pay water-service use charges for water used by all entities for construction operations.

C. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.03 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.

E. Covid-19 Protocols: Describe procedures and controls for protecting personnel from contracting and spreading COVID-19 at the Project site.

1.04 QUALITY ASSURANCE

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

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the TDLR "2012 Texas Accessibility Standards" (TAS).

PART 2 - PRODUCTS

2.01 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.

2.02 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

1. Owner will designate a location to conduct project meetings.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel office activities. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.

2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.

3. Drinking water and private toilet.

4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.

5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.03 EQUIPMENT

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

B. Permanent HVAC System: Owner will authorize use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section “Closeout Procedures.”

PART 3 - EXECUTION

3.01 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.02 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.03 TEMPORARY UTILITY INSTALLATION

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

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

E. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line(s) for each field office.

1. Post a list of important telephone numbers.

    a. Police and fire departments.

    b. Ambulance service.

    c. Contractor's home office.

    d. Contractor's emergency after-hours telephone number.

    e. Architect's office.

    f. Engineers' offices.

    g. Owner's office.

    h. Principal subcontractors' field and home offices.

H. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Owner, Architect, and other consultants as requested.

1. Band Width: 500 Mb.

3.04 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.

2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section “Earth Moving.”
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

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

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

    a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs so they are legible at all times.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section “Execution.”

G. Temporary Elevator Use: Use of elevators is not permitted.

H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered “tools and equipment” and not temporary facilities.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION

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

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section “Summary.”

C. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

F. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

G. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.06 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

3. Indicate methods to be used to avoid trapping water in finished work.

B. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.

2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.

3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.

    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

    c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.07 COVID-19 PROTOCOLS

A. Develop protocols for controlling the spread of COVID-19 coronavirus at the Project site.

1. Protocols shall be consistent with requirements and recommendations of authorities having jurisdictions and with those established by the Owner.

2. Distribute copies of the protocols to those entities who will be working or do business at the Project site.

3. Enforce protocols at the Project site.

3.08 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section “Closeout Procedures.”

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

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

B. Related Sections include:

1. Division 01 Section “Allowances” for products selected under an allowance.
2. Division 01 Section “Substitution Procedures” for requests for substitutions.
3. Division 01 Section “References” for applicable industry standards for products specified.

1.02 DEFINITIONS

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

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

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words “basis-of-design product,” including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.03 ACTION SUBMITTALS

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

1. Include data to indicate compliance with the requirements specified in “Comparable Products” Article.

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

    a. Form of Approval: As specified in Division 01 Section “Submittal Procedures.”

    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section “Submittal Procedures.” Show compliance with requirements.

1.04 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.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

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

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

6. Protect stored products from damage and liquids from freezing.

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

1.06 PRODUCT WARRANTIES

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

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

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

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.

3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section “Closeout Procedures.”

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term “as selected,” Architect will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

6. Or Equal: For products specified by name and accompanied by the term “or equal,” or “or approved equal,” or “or approved,” comply with requirements in “Comparable Products” Article to obtain approval for use of an unnamed product.

B. Product Selection and Sustainable Requirements:

1. Make product selections within the limits established by Contract Requirements. Where Sustainable requirements are specified, select products complying with indicated requirements.

2. Achieve sustainability goals established by the Owner and the Architect as defined by Sustainable requirements. Where Sustainable requirements are not specified, give preference to product that add value to the Project by:

a. Not having a significant impact on Project cost or schedule.

b. Contributing to obtaining certification under sustainability program specified in Division 01 Section “Sustainable Construction Requirements.”

C. Product Selection Procedures:

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

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with

requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

3. Products:

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

   b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in “Comparable Products” Article for consideration of an unnamed product.

4. Manufacturers:

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

   b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in “Comparable Products” Article for consideration of an unnamed manufacturer's product.

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

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

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section “Substitution Procedures” for proposal of product.

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

2.02 COMPARABLE PRODUCTS

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

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 73 00
EXECUTION

PART 1 - GENERAL

1.01 SUMMARY

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

1. Installation of the Work.
2. Cutting and patching.
3. Progress cleaning.
4. Starting and adjusting.
5. Protection of installed construction.

B. Related Sections include Division 01 Section “Summary” for limits on use of Project site.

1.02 DEFINITIONS

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

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

1.03 PREINSTALLATION MEETINGS

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

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

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

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

1.04 INFORMATIONAL SUBMITTALS

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

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.

5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

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

1.05 QUALITY ASSURANCE

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

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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

PART 2 - PRODUCTS

2.01 MATERIALS

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

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

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

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

PART 3 - EXECUTION

3.01 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate

and verify the existence and location of underground utilities, and other construction affecting the Work.

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

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

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

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

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

3.02 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section “Project Management and Coordination.”

3.03 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

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

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

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

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

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

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

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

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

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

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

1. Comply with Division 01 Section “Closeout Procedures” for repairing or removing and replacing defective Work.

3.04 CUTTING AND PATCHING

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

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

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

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

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

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section “Summary.”

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

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

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

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

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

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

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

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

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

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

3.05 PROGRESS CLEANING

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

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

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

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

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

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

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

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section “Temporary Facilities and Controls.”

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

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

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

3.06 STARTING AND ADJUSTING

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

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

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

D. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section “Quality Requirements.”

3.07 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

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

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

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

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

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

B. Related Sections include:

1. Division 01 Section “Operation and Maintenance Data” for additional operation and maintenance manual requirements.
2. Division 01 Section “Project Record Documents” for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Division 01 Section “Demonstration and Training” for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.02 ACTION SUBMITTALS

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

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

1.03 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.04 MAINTENANCE MATERIAL SUBMITTALS

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

1.05 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. Format:

a. One hard copy.
b. Electronic Copies: Two USB flash drive with PDF format files.

2. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
3. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
4. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
5. Submit asbestos-free certificate.
6. 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.

7. Submit testing, adjusting, and balancing records.
8. Submit sustainable design submittals not previously submitted.
9. 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 Division 01 Section “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.

1.06 FINAL COMPLETION PROCEDURES

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

1. Submit a final Application for Payment according to Division 01 Section “Payment Procedures.”
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit lien releases from subcontractor.

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.

1.07 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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

1. Organize list of spaces in sequential order, proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

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

4. Submit list of incomplete items in PDF electronic file format. Architect will return annotated file.

1.08 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. Warranties in Paper Form:

1. Submit notarized certificate of warranties.
2. 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.
3. 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.
4. Identify each binder on the front and spine with the typed or printed title “WARRANTIES,” Project name, and name of Contractor.

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

PART 2 - PRODUCTS

2.01 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

3.01 FINAL CLEANING

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

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.

h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
p. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section “Temporary Facilities and Controls.” Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section “Temporary Facilities and Controls.”

3.02 REPAIR OF THE WORK

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

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

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

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

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out lamps, lamps noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 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 Sections include Division 01 Section “Submittal Procedures” for submitting copies of submittals for operation and maintenance manuals.

1.02 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.

1.03 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 and Commissioning Authority 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. One hard copy.
2. Electronic Copies: Two USB flash drive drives with PDF format files.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

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

E. Comply with Division 01 Section “Closeout Procedures” for schedule for submitting operation and maintenance documentation.

1.04 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.

1.05 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 Architect.
7. Name and contact information for Commissioning Authority.
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. 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.”

1.06 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.

1.07 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.

1.08 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.

1.09 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.

1.10 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

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

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

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

B. Related Sections include:

1. Division 01 Section “Closeout Procedures” for general closeout procedures.
2. Division 01 Section “Operation and Maintenance Data” for operation and maintenance manual requirements.

1.02 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal: Submit one paper-copy set of marked-up record prints.
b. Final Submittal:

1) Submit PDF electronic files of scanned record prints and two sets of prints.
2) Print each drawing, whether or not changes and additional information were recorded.

c. Final Submittal:

1) Submit record digital data files and three sets of record digital data file plots.
2) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

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

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

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

1.03 RECORD DRAWINGS

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

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

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

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

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

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

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

1. Format: Annotated PDF electronic file with comment function enabled.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

    a. See Division 01 Section “Project Management and Coordination” for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

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

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

    a. Project name.
    b. Date.
    c. Designation “PROJECT RECORD DRAWINGS.”
    d. Name of Architect.
    e. Name of Contractor.

1.04 RECORD PRODUCT DATA

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

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

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

C. Format: Submit record Product Data as annotated PDF electronic file.

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

1.05 MISCELLANEOUS RECORD SUBMITTALS

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

B. Format: Submit miscellaneous record submittals as PDF electronic file.

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

1.06 MAINTENANCE OF RECORD DOCUMENTS

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

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

1.02 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.03 CLOSEOUT SUBMITTALS

A. Manufacturer-Produced Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name of Architect.
c. Name of Contractor.

B. Training Manuals: At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Division 01 Section “Operation and Maintenance Data.”

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section “Quality Requirements,” experienced in operation and maintenance procedures and training.

B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Management and Coordination.” Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.

3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.05 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.06 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.

f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

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

5. Adjustments: Include the following:

   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:

   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning.
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:

   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

1.07 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section “Operation and Maintenance Data.”

B. Set up instructional equipment at instruction location.

1.08 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

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

1.09 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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SECTION 02 40 00
MINOR DEMOLITION AND RENOVATION WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Removing existing roofing and insulation in designated “wet” areas denoted on roof plan at Garza Middle School.

B. Modifying existing roof penetrations, equipment supports, curbs, and piping to provide proper flashing height and flashing details.

C. Installing new nailers, blocking, and sheathing at designated locations.

D. Providing new supports for roof-top equipment and utility piping.

E. Replacing corroded metal roof panels on Transportation Shop.

F. Replacing corrugated fiberglass skylights on Transportation Shop.

G. Performing other miscellaneous and incidental work required.

1.02 RELATED SECTIONS:

A. 07 22 00 - Roof Board Insulation.

B. 07 52 00 - Modified Bitumen Membrane Roofing.

C. 07 53 50 - Metal Retrofit Single-ply Roof System.

D. 07 54 10 - Elastomeric Roof Coating.

E. 07 57 13 - Spray-applied Polyurethane Foam.

F. 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM).

B. Corps of Engineers (CRD).

C. FMG Property Loss Prevention Data Sheet 1-49 “Perimeter Flashing”.

1.04 PROJECT CONDITIONS:

A. Environmental Requirements:
   1. Do not remove existing roofing and flashing in inclement weather or when rain is predicted with 30 percent possibility or greater.
   2. When ambient temperature is below 60 degrees Fahrenheit (15 degrees Celsius), expose only enough temperature sensitive materials required within four hour period.
   3. Do not expose materials to constant temperature in excess of 180 degrees Fahrenheit (82 degrees Celsius).

B. Emergency Equipment: Maintain on-site adequate materials necessary to apply emergency temporary weather protection of incomplete work area in event of sudden storms or inclement weather.

C. Smoking is prohibited on roof areas, in existing building, and Owner's property except at designated locations.

1.05 SEQUENCING AND SCHEDULING:

A. Sequence demolition and renovation with sequence of new work to maintain facility in dry, watertight condition on daily basis.

B. Coordinate roof work so that no more existing items are removed in one day than can be replaced with new materials in same day.

C. Coordinate work with Owner's operational requirements.

D. Coordinate demolition work and removal with roofing work to maintain facility in dry, watertight condition on a daily basis.

1.06 WARRANTY:

A. Provide Contractor's warranty covering defects in installed materials and workmanship for period of two years from date of final acceptance.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Wood Members, Nailers, and Blocking Lumber: Noncombustible Standard Grade Fir or No. 2 Southern Yellow Pine bearing UL label, Kiln-dried after treatment (KDAT), complying with American Lumber Standards of manufacturer’s association under whose rules lumber is produced, minimum size 2-inches (50mm) by 6-inches (150mm), nominal.

B. Treatment for Wood Members: Pressure-preservative treated in accordance with AWPA C2, C9 standards, Above Ground Contact Alkaline Copper Quat Type C (ACQ-C) or Copper Azole Type A (CBA-A) at 0.20 pcf.

C. Plywood: Exterior-grade sheathing; Grade: CDX; 1/2-inch thickness.

D. Gypsum Sheathing/Roof Board: 1/2-inch (13mm) thick moisture resistant gypsum core roof board such as "Dens-Deck Prime" by Georgia Pacific or “SecuRock” by U.S. Gypsum.

E. Fasteners:
   1. Wood Substrate:
      a. Securement of metal flanged items such as flashing pans, metal edge/fascia, cleats, etc., shall be nails, No. 11 gauge, double hot-dipped galvanized, ASTM A153, steel or stainless steel wire with 3/8-inch (9mm) diameter head and ring shank fasteners for anchoring flanges of sheet metal fabrications shall be of sufficient length to achieve a minimum 1-1/4-inch embedment into solid wood substrate such as "R-103-A Stormguard Asphalt and Fiberglass Shingle Nail" by Maze Nails (800/435-5949).
      b. Securement of wood to wood shall be nails, No. 11 gauge, double hot-dipped galvanized steel or stainless steel wire nail with ring shank and 9/32-inch (7mm) diameter head such as "Stormguard PTL Anchor-Down Nail" by Maze Nails (800/435-5949); 10d or length required to provide 1-inch (25mm) penetration minimum into substrate.
      c. Securement of exposed items to wood substrate shall be No. 14 stainless steel screw with stainless steel washer and integral rubber seal; length required to provide 1-inch (25mm) penetration minimum into substrate.
      d. Fasteners for securing roofing materials to wood substrate shall be a hardened stainless steel nail with a 1-inch (25mm) diameter round head and ring shank; length to provide 1-inch (25mm) penetration into substrate, as manufactured by Simplex Nail Co.
      e. Fasteners for securing steel to wood substrate shall be No. 10 stainless steel wood screw with stainless steel washer and integral rubber seal, length to achieve 1-inch embedment into wood.

f. Fasteners for securing wood nailer to wood nailer in vertical position shall be 20 gauge galvanized steel plate, 2-inches wide by 4-inches long such as “MP 24 Mending Plate” by Simpson Strong-Tie Co., Inc. and “A34 Framing Anchor” by Simpson Strong-Tie Co., Inc. for corner connections.

2. Concrete Substrate:
   a. Fasteners for securing sheet metal items such as surface-mounted counterflashings, termination/compression bars, etc., to concrete substrate shall be a pre-assembled drive anchor with a coated steel or steel alloy drive screw, a lead/zinc alloy expansion anchor body (1/4-inch (6mm) diameter, 1-1/2-inch [38mm] length) and a stainless steel washer with integral rubber seal (1-1/8-inch diameter) such as "Zamac Hammer-Screw" as manufactured by Powers Fasteners, Inc., or “Coated Drive Pin Fastener” by Firestone Specialty Products.
   b. Fasteners for securing wood blocking to concrete substrate at roof perimeters shall be stainless steel sleeved stud expansion bolt, 1/2-inch (13mm) diameter (minimum), with 3/4-inch diameter stainless steel washer such as "Kwik Bolt II" by Hilti, "Tru Bolt Wedge" by ITW Ramset, or "Lok/Bolt" by Powers Fasteners, Inc. Fasteners for securing wood blocking to concrete substrate for miscellaneous applications shall be 1/4-inch diameter, 2-3/4-inch long coated screw with hex head such as "Tapcon" by ITW Buildex.
3. Masonry Substrate:
   a. Fasteners for securing wood to solid masonry at roof perimeters shall be stainless steel expansion anchor, 3/8-inch (9mm) diameter (minimum), with 3/4-inch diameter stainless steel washer such as "Countersunk Kwik Bolt II" by Hilti. Fasteners for securing wood to solid masonry for miscellaneous applications shall be 1/4-inch diameter, 2-3/4-inch long coated screw with hex head such as "Tapcon" by ITW Buildex.
   b. Fasteners for securing wood to hollow base masonry shall be 3/8-inch (9mm) diameter (minimum), stainless steel threaded rod, with 3/4-inch diameter stainless steel washer, nut, and screen tube such as "HIT C-20 Adhesive Anchor" by Hilti.
   c. Fasteners for securing sheet metal items to concrete substrate shall be a pre-assembled drive anchor with a coated steel or steel alloy drive screw, a lead/zinc alloy expansion anchor body (1/4-inch (6mm) diameter, 1-1/2-inch [38mm] length) and a stainless steel washer with integral rubber seal (1-1/8-inch diameter) such as "Zamac Hammer-Screw" as manufactured by Powers Fasteners, Inc., or “Coated Drive Pin Fastener” by Firestone Specialty Products.
4. Steel Substrate:
   a. Fasteners for securing plywood to steel substrate shall be self-drilling, 1-1/2-inch long coated No. 10 screw with wafer head such as "Traxx Wood to Metal Fastener" by ITW Buildex. Fasteners for securing wood nailers/blocking to steel substrate shall be self-drilling coated heavy duty screw, 1/4-inch (6mm) diameter (minimum), with 5/8-inch (16mm) diameter washer such as "No. 14 Heavy Duty Screw" by OMG Roof Products.
   b. Fasteners for securing steel to steel substrate shall be self-tapping No. 14, 1-1/2-inch long stainless steel screw with stainless steel washer and bonded integral rubber seal.
5. Plywood Clip: 20 gauge galvanized steel H-clip such as "PSCL Panel Sheathing Clip" by Simpson Strong-Tie Co., Inc. (800/999-5099).
6. Receiver in Reglet: Soft, malleable lead sheet, size and shape to fit in joint and maintain compression against receiver.

F. Rust Inhibitive Primer: 100 percent acrylic resin primer such as “Metalclad Interior-Exterior Acrylic Latex Flat Primer & Finish #41702”, Devoe & Raynolds Co.

G. Piping/Conduit Supports: Pre-manufactured assembly with molded plastic/rubber base, 10-inches by 16-inches (250mm by 400mm); 1/2-inch (13mm) threaded rods and accessory bar, "Type PP-10 with Strut" for conduit/condensate or "Type PP-10 with Roller" with securement strap for steel/gas piping as manufactured by PHP System/Design, Houston, Texas (800/797-6585) or Models 48-R-AH and 24-R-AH by Miro Industries, Inc. (800/768-9678).

H. Pre-manufactured Equipment Curb Supports: Pre-engineered and shop fabricated 18 gauge galvanized steel shell with integral base plate, cap flashing, and nailer, 16-inches high such as "TEMS-3" by Thycurb.

I. Corrugated Fiberglass Skylight: Corrugated reinforced fiberglass/acrylic skylight to match profile of existing roof panels such as "AcrylitGC Light Transmitting Panel" by Resolite; "PBR Light Transmitting Panel" by MBCI; or approved equal.

J. Metal Roof Panel: Corrugated galvanized metal R-panel, 3-feet in width, corrugation profile to match existing, such as "PBR Panel" by MBCI, Mueller, or approved equal.

K. Skylight: Standard bronze colored acrylic double-dome rectangular curb mounted assembly with pre-finished aluminum frame, weeps, and sealing, size to suit application, such as manufactured by Plasteco.

L. Skylight Fall Protection Screen: Hot-dipped galvanized, 3-inch (75mm) by 4-inch (100mm) welded wire mesh, 0.195 diameter wire with extruded aluminum rails. The aluminum rails shall be secured to the skylight frame with self-tapping screws. The entire assembly shall withstand a minimum of 300 feet per pound such as "FallGuard Skylight Screen - Model 101" by Plasteco, Inc.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine existing building and existing roofing to determine existing physical conditions that affect removal of existing roofing and installation of new roofing.

B. Verify that required barricades and other protective measures are in place.

3.02 PREPARATION:

A. Take measures to maintain watertight conditions during term of Contract.

B. Install interior protection and dust partitions where deck penetrations shall be removed or replaced.

C. Protect adjacent surfaces.

D. Roof Drains:
1. Examine existing drain lines for debris or blockage.
2. Clean drains and drain lines, removing debris, excessive bitumen, or aggregate. Flush with water to ensure that drains flow freely.
3. Cap drains with drain plugs during daily operations.
4. Remove plugs after daily clean-up and prior to onset of rainfall.

3.03 MINOR DEMOLITION OPERATIONS:

A. Execute demolition in careful and orderly manner with least possible disturbance or damage to adjoining surfaces and structure.

B. Avoid excessive vibrations in demolition procedures that would be transmitted through existing structure and finish materials.

C. Roof Removal:
   1. Remove existing roofing and insulation in designated wet areas. Remove insulation in each direction until “dry” insulation is encountered. Include an allowance for removal of 1,000 square feet of existing roof membrane and insulation.
   2. Trim existing counter flashing as required for installation of new materials.
   3. Do not stockpile debris on roof surface. Promptly dispose of obsolete equipment and debris at authorized disposal site each day. Use chutes to transfer debris from roof surface to dumpsters.
   4. Provide protective method, such as plywood set on minimum 1-inch (25mm) EPS insulation, when hauling debris over existing roof membrane.

3.04 MINOR RENOVATION WORK:

A. Prepare substrates in accordance with roofing manufacturer's recommendations.

B. Decking:
   1. Steel Decking:
      a. Cover holes or openings 12-inches (300mm) in diameter or smaller with a plate of 18 gauge sheet metal. Extend plate minimum 4-inches (100mm) beyond edge of hole and onto adjacent unaffected rib. Mechanically fasten new decking or plate with screws spaced 6-inches (150mm) on-center.
      b. Repair holes or openings greater than 12-inches (300mm) in diameter with new deck material. Extend new decking 18-inches (300mm) minimum past nearest bar joist or support member. Mechanically fasten new decking or plate with screws spaced 6-inches (150mm) on-center.
      c. Remove loose rust, bitumen, or other foreign material from existing deck that would prohibit proper installation of new materials.
      d. Remove rust by wire brushing or other appropriate method. Apply rust inhibitor over prepared areas of metal deck.

C. Metal Roof Panels (Transportation Shop):
   1. Metal Roof Panel Replacement/Repair:
      a. Replace corroded and/or damaged metal roof panels not suitable to receive new coating.
      b. Extend replacement panels a minimum 4-inches (100mm) onto/under adjacent panels to remain.
      c. Mechanically fasten new panels to supports or adjacent panels with grommetted screws spaced 6-inches (150mm) on-center.
      d. Replace corroded screws on metal roof panels to remain with new grommetted screws.

D. Nailers:
   1. Install wood nailers/blocking in general accordance with FMG DS 1-49 and as supplemented herein with these specifications.
   2. Replace wood nailers and curbs with new nailers and curbs as required.
   3. Install wood nailers to match height of new insulation board.
   4. Secure 2X base nailer into structure and/or substrate for anchorage of cleats and/or fascias of sheet metal fabrications, width as necessary to extend beyond horizontal flange of sheet metal fabrication.
   5. Clean and prepare existing surfaces to receive wood nailers and curbs.
   6. Install 2 X 6 wood nailer, minimum, as base nailer at perimeters or tops of parapet walls. Nailers shall match width of wall and provide minimum 1-inch per foot slope toward roof.
   7. Install wood nailers and curbs continuously with 1/4-inch (6mm) gap between each section. Set level and true. Pre-drill nailers prior to attachment. Countersink fastener in base nailer so that washer and head of fastener or nut are recessed below top of nailer.

8. Securely fasten to structure with appropriate fasteners to resist minimum 175 pounds per linear foot (780N per 300mm) force in any direction and spaced 12-inches on-center. Use of powder-actuated fasteners is prohibited. Place a fastener within 3-inches (75mm) of each end of each section of wood blocking.
9. Secure nailers to concrete substrate with appropriate fasteners spaced 24-inches (600mm) on-center. Secure nailer with a minimum of two fasteners per nailer.
10. Stagger joints in subsequent layers of nailers from joints in underlying layer of nailers a minimum of 12-inches (300mm).
11. Install nailers so that ends and sides of adjoining nailers are aligned to form right angles (nominal) at corners.
12. Weave ends of subsequent layers of nailers at corners so that ends of nailers do not align.
13. Secure nailers to wood substrate using nails 24-inches (600mm) on-center, staggered. Install nails on an angle.
14. Secure nailers with self-tapping steel fastener to structural steel with self-drilling screw or through-bolt spaced 12-inches on-center.
15. If attaching wood nailer to concrete masonry block, install stainless steel threaded rod spaced 12-inches (300mm) on-center in fully grouted cell/core of CMU.
16. Reduce fastener spacing 50 percent at a distance of 10 feet (3m) from each corner.
17. Secure new nailer to existing nailer or curb when increasing curb height utilizing appropriate fasteners, gusset plates positioned 12-inches on-center, and framing anchors positioned at corners.

E. Plywood/Gypsum Sheathing:
1. Install new sheathing at walls, curbs, and over unsuitable substrates to receive new roofing. Replace damaged, deteriorated, or non-salvageable existing sheathing.
2. Secure sheathing to substrate with flat head fasteners (type appropriate for substrate) spaced 12-inches (300mm) on-center.
3. Secure sheathing to wood substrate with nails spaced 6-inches (150mm) on-center.
4. Install new sheathing at roof hatches and metal curbs. Secure sheathing to substrate with flat head fasteners (type appropriate for substrate) spaced 12-inches (300mm) on-center. Trim exposed ends of screws on inside of hatch/curb.

F. Abandoned Equipment/Curb and Deck Opening Infill:
1. Remove and disconnect abandoned existing equipment, curb, and/or penetrating element as necessary and required to expose opening in deck and facilitate new repair.
2. Secure 3-inch X 3-inch X ¼-inch galvanized steel angles around perimeter of opening to provide new supports for new decking with 3/8-inch diameter stainless steel bolts with stainless steel nuts and washers spaced 12-inches on-center.
3. Secure new fluted steel decking to steel angles with #12 self-drilling/tapping screws with ¾-inch diameter washer spaced 6-inches on-center.
4. Install new insulation to match height of existing lightweight insulating concrete decking to serve as substrate for new roof system.

G. Rooftop Equipment:
1. Move and elevate air conditioning units and other rooftop equipment as required to install roofing materials complete and in accordance with plans and specifications.
2. When units or equipment are to be moved, disconnect and move to protected area to prevent damage to parts or components. Reset and reconnect at Contractor's expense.
3. Contractor shall employ mechanics trained, proficient, and certified in the trade involved. The Contractor shall disconnect equipment only as scheduled in the approved construction schedule and when performing roofing work in the immediate area of the equipment. Each piece of equipment shall be fully operational immediately after reinstallation. Shut-down time for each piece of equipment shall be limited to timeframe designated by Owner. Prior to commencing any disconnections, the Owner shall be given forty-eight hours notice.

4. Prior to commencing roofing work, the Contractor shall test equipment in the presence of Owner's Representative. All deficiencies in operation including unusual noises will be noted in writing and shall become a matter of records. Any deficiencies which were not noted in the initial testing shall be corrected by the Contractor at his expense.
5. Install equipment on top of curb or pre-manufactured support. Secure equipment hoods/covers to curb with grommetted fasteners spaced 12-inches (300mm) on-center, minimum two fasteners per side.
6. Set equipment on top of pre-manufactured support and secure to support. Install support on a layer of heavy-duty protection pad on top of a cut section of modified bitumen protection pad.
7. After installation of equipment support (if required), the unit shall be reset on the support. Reconnecting of pipe, conduit, wiring, and reactivation of the unit to its original condition shall be provided by Contractor. All conduit modifications, extension of ductwork, etc., shall be provided by Contractor at no additional cost to Owner. Equipment shall be installed level, plumb, and free of vibration and in accordance with manufacturer's installation practices.
8. Install set of braided stainless steel cables/wire ropes in opposing directions over top of equipment housings/hoods and secure through sides of curb cap flashing and into curb with appropriate fasteners.
9. Attach respective roof-top equipment in general accordance with the following table:

Curb Size and Equipment Type	Equipment Attachment	Number of No.14 Screws Each Side of Curb or Flange
12-inch X 12-inch curb with relief air hood	Hood attached to curb	2
12-inch X 12-inch relief air hood with flange	Flange attached to 22 gauge steel deck	3
24-inch X 24-inch curb with relief air hood	Hood attached to curb	5
24-inch X 24-inch relief air hood with flange	Flange attached to 22 gauge steel deck	8
24-inch X 24-inch curb with exhaust fan	Fan/hood attached to curb	3
36-inch X 36-inch curb with exhaust fan	Fan/hood attached to curb	3
5'-9" X 3'-8" curb with 2'-8" high HVAC unit	HVAC unit attached to curb	5

H. Curbs and Ducts:
1. Secure and modify curbs, ducts, and other work which pass through roof as required to receive new roofing system.
2. Seal joints in sheet metal ducts and vent hoods with reinforcing fabric and elastomeric coating. Apply elastomeric coating to exposed surfaces of ducts and vent hoods.

I. Condensate Lines: Raise and reroute existing condensate lines and supports as required. Provide positive drainage of piping. Reinstall existing and install new condensate lines at existing or new units where discharge is directed onto roof. Route lines to discharge into nearest drainage medium (i.e. drain, gutter, etc.).

J. Piping and Conduit Modifications:
1. Schedule piping and unit downtime for equipment modifications to coordinate with Owner's operations. Switchover time shall be limited to meet Owner's requirements.
2. Replace existing supports for units and associated piping with new supports.
3. Provide temporary supports to maintain unit and piping in operational condition except during switchover.

4. Furnish new fittings, piping, and accessories to match existing to replace deteriorated, damaged, or non-functional components or to accommodate new unit elevation, where necessary.
5. Provide auxiliary make-up air units to supply HVAC needs during equipment downtime, when required.
6. Upon completion of roof installation, paint steel piping and replace or clean aluminum jacketing of insulated pipe.

K. Piping Supports:
1. Furnish and install new supports for piping (conduit, gas, water, condensate, etc.).
2. Install supports at maximum spacing of 10 feet (3m) on-center and within 2 feet (600mm) of changes in plane or direction. Space supports for piping 10-inches (250mm) in diameter or larger and multiple pipes 8 feet (2.4m) on-center.
3. Install over a layer of heavy-duty protection pad set on top of a layer of modified bitumen protection pad adhered to roof surface.

L. Existing Roof Drains:
1. Secure and modify drains to receive new roofing system.
2. Verify drain bowls and pipes are properly secured and sealed.
3. Remove, replace, lower, or raise drain bowl as required to accommodate new roofing system, including insulation and deck conditions.
4. Replace damaged, missing, or otherwise non-salvageable piping and drain components with new components. Replace plastic strainers with cast iron units.
5. Drill and tap existing drain bowls as required for complete assembly of drain. Secure clamp rings with stainless steel bolts and washers. Clamp rings to be secured throughout project. Wire brush, clean, and paint existing cast iron clamp rings and strainers to be reinstalled.
6. Paint new strainers and clamp rings prior to installation.
7. Water test each roof drain with inflatable plug. Position plug in leader so test will cover connection of pipe to bowl. Extend “test” water on top of roof membrane beyond clamping ring. Maintain “test” water for one hour while performing interior observations for water leakage. Replace drain bowl assemblies and associated piping that cannot be made watertight during leak test.

M. Plumbing Vents:
1. Extend plumbing vents or modify as necessary to accommodate new roof installation.
2. Provide pipe extensions and no-hub couplings where necessary to achieve minimum 8-inch (200mm) height above top of newly finished roof surface.
3. Utilize same material type and size as existing for new extension.

N. Sheet Metal Fabrications:
1. Remove and replace ferrous rooftop sheet metal fabrications to match existing.
2. Modify existing sleeves and umbrellas on existing equipment as scheduled.
3. Repair and renovate non-ferrous rooftop sheet metal fabrications as required for permanent watertight installation.
4. Paint sheet metal with metal primer.

O. Skylights: Remove existing skylight assemblies. Install new curb mounted units upon completion of curbs and roof installation. Secure skylight to curb with appropriate fastener spaced 6-inches (150mm) on-center. Paint inside of new curb to match existing interior finish.

P. Skylight Fall Protection:
1. Model A:
   a. Clean surfaces of dome retaining frame that are to receive aluminum rails with isopropyl alcohol.
   b. Secure rail to skylight frame with self-tapping screws spaced 6-inches on-center. Firmly apply pressure to the rail with roller.
   c. Insert screen into opening in rails and install stainless steel retaining clips.

3.05 CLEANING:

A. Materials, equipment, and debris resulting from demolition operations shall become property of Contractor. Remove and dispose of demolition debris in accordance with applicable city, state, and federal laws at authorized disposal site.

B. Leave substrate clean and dry, ready to receive roofing system.

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SECTION 07 22 00
ROOF BOARD INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Replacement of “wet” insulation in designated areas on Garza Middle School .

B. Installation of polyisocyanurate base insulation, tapered insulation sumps and crickets, and secondary/cover board insulation (Alternate Bid – Garza Middle School).

C. Installation of fill insulation between ribs of roof panels and polyisocyanurate insulation board on metal roof panels (Alternate Bid – Transportation Shop).

1.02 RELATED SECTIONS:

A. 02 40 00 - Minor Demolition and Renovation.

B. 07 52 00 - Modified Bitumen Membrane Roofing.

C. 07 53 50 - Metal Retrofit Single Ply Roof System.

D. 07 57 13 - Sprayed Polyurethane Foam Roofing.

E. 07 62 00 - Sheet Metal Flashing & Trim.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM).

B. FM Global Approval Guide.

C. Underwriters Laboratories (UL): Building Materials Directory.

D. National Roofing Contractors Association (NRCA): The NRCA Roofing and Waterproofing Manual.

E. ASCE 7-16: "Minimum Design Loads for Buildings and Other Structures."

F. Polyisocyanurate Insulation Manufacturer’s Association: Technical Bulletin 109 – “Storage and Handling Recommendations for Polyisocyanurate”.

1.04 QUALITY ASSURANCE:

A. Regulatory Requirements:
   1. Classified by Underwriters Laboratories Inc. as Class A rated material.
   2. Follow local, state, and federal regulations, safety standards, and codes. When conflict exists, the more restrictive document shall govern.

B. Installation:
   1. Install in accordance with manufacturer's current published application procedures, general requirements of NRCA, and as supplemented by these documents.
   2. Consider roof system manufacturer's technical specifications part of this Specification and use as reference for specific application procedures.
   3. Install new modified bitumen roof system in manner to resist minimum wind uplift pressures of 45 psf in Zone 1’; 75 psf in Zone 1; 105 psf in Zone 2; and 135 psf in Zone 3. Pressures are based on ASCE 7-16 and following criteria: 143 mph wind speed; Exposure C; Risk Category III; and Safety Factor of 2.0.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Store materials in accordance with manufacturer's recommendations.

B. Outdoor Storage:
   1. Tarp and shield insulation from moisture and exposure to sun.
   2. Elevate insulation above substrate 4-inches minimum.
   3. Secure insulation to resist high winds.
   4. Do not use insulation which has been determined "wet" or which has been wet and has dried.
   5. Distribute insulation stored on roof deck to prevent concentrated loads that would impose excessive stress or strain on deck or structural members, or impede drainage.
   6. Remove manufacturer plastic shrink wrapping from materials prior to covering with protective tarps/canvas.

1.06 SUBMITTALS:

A. Product Data: Submit manufacturer’s product data sheets, providing descriptive data, dimensions, LTTR values, and other pertinent criteria for each material proposed for use in construction of roof assembly.

B. Samples: Provide physical examples of materials/components proposed for use to comprise the specified roof system.

1.07 SEQUENCING AND SCHEDULING:

A. Plan roof layout with respect to roof deck slope to prevent rainwater drainage into completed roofing.

B. Do not install more insulation than can be made watertight in same day.

1.08 PROJECT CONDITIONS:

A. Environmental Recommendations:
   1. Apply roofing and insulation in dry weather.
   2. Do not proceed with roof construction during inclement weather or when precipitation is predicted with 30 percent or more possibility.
   3. Do not apply insulation over wet or moist deck or in foggy conditions.
   4. Consider days when wind speeds are 30 mph or greater as "inclement weather" days.

B. Maintain on site equipment and material necessary to apply emergency temporary weather protection to incomplete work in event of sudden precipitation.

PART 2 - PRODUCTS

2.01 ROOF INSULATION:

A. Flat Stock Base Layer Insulation: Rigid, closed cell polyisocyanurate rigid board insulation utilizing non-chlorine/non-ozone depleting blowing agent, bonded to non-asphaltic coated fiberglass facers meeting ASTM C 1289, Type II, Class 2, Grade 2; maximum board size is 4-feet by 8-feet; two layers of 2.2-inch thickness (Alternate Bid – Garza MS); 1.5-inch thickness (Alternate Bid – Transportation Shop); or thickness to match existing for replacement such as "ACFoam-III" by Atlas Roofing Corp, “Paratherm CG” by Siplast, “FlintBoard ISO Cold" by Certainteed, "Resista" by Elevate, "ENRGY3 CGF" by Johns Manville, or approved equal.

B. Tapered Insulation (Alternate Bid – Garza MS): Rigid, closed cell tapered polyisocyanurate rigid board insulation utilizing non-chlorine/non-ozone depleting blowing agent, bonded to non-asphaltic coated fiberglass facers meeting ASTM C 1289, Type II, Class 2, Grade 2; to form crickets between roof drains; maximum board size is 4 feet by 4 feet; tapered to provide 1/4-inch per foot resulting slope, such as "Tapered AC Foam III" by Atlas, "Tapered Paratherm CG" by Siplast, "Tapered FlintBoard ISO Cold" by Certainteed, "Tapered Resista" by Elevate, "Tapered ENRGY 3 CGF" by Johns Manville, or approved equal.

C. Cover Board (Alternate Bid – Garza MS): Moisture-resistant, 1/2-inch thick gypsum core roof board such as "SecuRock" by US Gypsum, "DensDeck Prime" by Georgia-Pacific, or approved equal.

D. Tapered Edge Strip: Tapered perlite complying with ASTM C-728, to be used for tapered edge strips, size 1/2-inch (13mm) to 1-1/2-inch (37.5mm) thick by 6-inches (150mm) to 24-inches (600mm) wide such as "Tapered Fesco Edge Strip" by Johns Manville or approved equal.

E. Fill Board Insulation (Alternate Bid – Transportation Shop): Custom-cut expanded polystyrene (EPS) insulation board conforming to ASTM C 578, minimum density of 1.0 pcf; thickness to match height at top of rib of metal panel; custom-cut to fill panel configuration between high ribs of metal panels.

2.02 RELATED MATERIALS:

A. Heat Resistant Insulation: Molded hydrous calcium silicate-based or mineral wool-based heat resistant rigid pipe insulation, 2-inches in thickness and sized for installation around circular/tubular element such as "Sproule WR-1200" by Johns Manville; "Thermafiber Pro Section WR" by Owens Corning; or approved equal.

B. Compressible Fill Insulation: Foil or paper faced compressible fiberglass batten roll insulation of proper size and thickness to insert at openings at penetrations, perimeters, and curbs such as manufactured by Owens Corning, or approved equal.

C. Low-Rise Foam Insulation Adhesive:
1. Single-component Moisture-cured Adhesive: ASTM D-2126, dispensed from portable pressurized containers, such as "Insta-Stik Professional Roofing Adhesive" by Dow Chemical Co., "Para-Stick" by Siplast, or approved equal
2. Dual-component Reaction-cure Adhesive: Two-part spray-applied low-rise urethane foam adhesive such as "OlyBond 500" by OMG, "JM Two-Part Urethane Adhesive" by Johns Manville, "Twin Jet" by Firestone, or approved equal.

D. Insulation Fasteners:

1. Steel Deck/Metal Roof Panels: CR-10 fluorocarbon coated, self-tapping screws of sufficient length to penetrate the deck a minimum of 1-inch (25mm) with minimum 3-inch (75mm) diameter steel plates with recessed screw head such as "#14 Heavy Duty Roofing Fastener", or "#15 Extra Heavy Duty Roofing Fastener" as manufactured by OMG, as determined by results of pull-tests and as approved by material manufacturer.

2. Purlins: CR-10 fluorocarbon coated, self-drilling screw with 3/4-inch drill-point, 0.17-inch shank diameter and 0.21-inch thread diameter and 0.485-inch hex-head, of sufficient length to penetrate the steel supports a minimum of 3/4-inch (19mm), minimum 3-inch (75mm) diameter steel plates with recessed screw head for attachment of roof membrane to steel purlins, such as "Purlin Fastener" as manufactured by OMG.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Roof system manufacturer's representative shall inspect roof deck and associated substrates and provide written acceptance of conditions.

B. Manufacturer's approved roofing contractor shall inspect and approve deck and substrates.

C. Roofing contractor shall examine roof deck and related substrates and verify that there are no conditions that would prevent roof system manufacturer's approved application of roof system. These conditions include, but are not limited to, the following:
   1. Inadequate support or anchorage of decking or substrates to structure.
   2. Accumulations of moisture.
   3. Tears, holes, cracks, or punctures.
   4. Ridges, uneven conditions, or gaps.
   5. Rust or other forms of deterioration.
   6. Presence of foreign materials.

D. Start of work constitutes acceptance of substrate and site conditions.

3.02 PROTECTION:

A. Provide special protection from traffic on yet to be removed roofing and newly installed roof materials.

3.03 PREPARATION:

A. Do not install insulation until defects in roof deck and substrates are corrected in order to meet roof system manufacturer's requirements and to ensure that deck conditions will not restrict roof drainage.

B. Perform pull-out resistance tests in general accordance with ANSI/SPRI FX-1-2016 with each of the specified base sheet fasteners and screw fasteners on the existing steel deck. Provide results of the tests to Consultant/Engineer and manufacturer for determination of method of attachment.

3.04 INSTALLATION:

A. Insulation - General:
   1. Install specified insulation continuous across the roof deck in general accordance with manufacturer’s guidelines.
   2. Stagger end joints of insulation boards 1/2 of overall length of board.
   3. Butt joints tightly allowing no more than 1/4-inch (6mm) wide gaps between units. Fill joints between adjacent boards with like insulation or foam adhesive.
   4. Do not use warped, bent, or otherwise damaged insulation boards.
   5. Field cut and fit insulation at penetrations, curbs, and walls.
   6. After installation of initial layer of insulation, install subsequent layers of insulation directly over preceding layer.
   7. Stagger all joints (side and end) between layers of insulation.
   8. Field cut tapered insulation boards to create crickets at upslope sides of curbs and between drains to direct water to drainage medium.
   9. Install tapered edge strips at changes in elevations, edges of crickets, and other locations to create monolithic and uniform substrate for installation of roof membrane.

B. Loose Laid Fill Insulation Over Metal Roof Panels:
   1. Loose lay fill insulation over metal roof panels and between ribs.
   2. Butt joints tight, allowing no more than 1/4-inch wide gaps between units.
   3. Do not use warped or bent insulation boards.
   4. Field cut and fit boards at penetrations, curbs, and eaves.

C. Mechanically Attached Insulation Layer:
   1. Mechanically attach insulation layers to deck.
   2. Install specified base insulation layers on top of deck with end joints and side joints staggered from previous layer installed.
   3. Mechanically fasten insulation layers to roof deck in strict accordance with manufacturer's criteria to achieve specified wind uplift resistance.
   4. Fully engage and seat fasteners. Do not overtighten or strip threads. Bent, deformed, or unseated fasteners or plates are unacceptable.
   5. Fasteners must penetrate through the deck. Do not overdrive fasteners. Remove and replace overdriven, stripped, or non-engaged fasteners.
   6. Properly seat mechanical fasteners and keep heads flush with plates. Cupped plates or unseated screw heads are not acceptable.
   7. Do not rupture or deform surface of the insulation by mechanical fastening.

D. Adhered Layers of Insulation:
   1. Adhere subsequent layers of insulation to mechanically-attached roof insulation layers.
   2. Stagger end joints of insulation boards 1/2 of overall length of board. Stagger joints of subsequent insulation layers from underlying insulation layer.
   3. Butt joints of insulation layers tightly allowing no more than 1/4-inch (6mm) wide gaps between units. Fill joints or gaps greater than 1/8-inch between adjacent boards with low-rise foam adhesive.
   4. Do not use warped, bent, or otherwise damaged insulation boards. Discard damaged boards.
   5. Field cut and fit insulation boards at penetrations, curbs, and walls. Field cut tapered insulation boards to create crickets at upslope sides of curbs and to form crickets between drains.
   6. Install and adhere cover board over base and tapered insulation layers to serve as substrate to receive roof membrane in accordance with manufacturer's guidelines and as specified herein.
   7. Ribbon Application of Low-rise Foam Adhesive: Dispense 3/4-inch to 1-inch (19mm to 25mm) diameter continuous ribbon of adhesive placed 3-inches (75mm) inside each edge/side of the insulation board in picture-frame fashion. Dispense remaining ribbons of adhesive between “picture-frame” placed adhesive ribbons spaced 12-inches (300mm) on-center in the field of the roof, spaced 6-inches (150mm) on-center within an 8-feet wide area along the roof perimeters, and spaced 3-inches on-center within an 8-feet by 8-feet area at corners of roof.
   8. Firmly set insulation boards in the ribbons of foam adhesive following application of the adhesive when adhesive has risen to proper height and walk-in the insulation to spread the adhesive ribbons, ensuring maximum contact. Do not push or slide insulation into position. Set weighted objects on sides, ends, and corners of boards until insulation is firmly attached (approximately 20 to 45 minutes).
   9. On additional insulation layers, dispense ribbons of adhesive in direction perpendicular to the direction of the beads that were dispensed on the underlying layer.
   10. Fill voids or open joints in top layer of insulation and cover board with spray-foam adhesive to provide monolithic surface to receive new membrane.
   11. Adhere partial boards and tapered edge strips with adhesive ribbon positioned in picture-frame fashion along perimeter of board and remaining adhesive ribbons spaced in accordance with location on roof (field, perimeter, or corner).

E. Heat Exhaust Vents:
   1. Install heat resistant insulation around existing heat exhaust flue, vent pipes, or other penetrations that experience elevated operation temperature.
   2. Install new sheet metal base around insulation and strip flange into new roof.

F. Insulation Filler: Install compressible fiberglass insulation at openings in deck at penetrations, perimeters, expansion joints, and/or curbs.

3.05 CLEANING:

A. Remove debris and material wrappers from roof to dumpster daily. Leave insulation clean, dry, and ready to receive new roofing.

3.06 ADJUSTING:

A. Remove damaged insulation and install acceptable new units before installation of roof system.

3.07 PROTECTION:

A. Provide special protection from traffic on completed work.

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SECTION 07 52 00
MODIFIED BITUMEN MEMBRANE ROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Installation of two-ply modified bitumen roof membrane and related flashings (Alternate Bid).

1.02 RELATED SECTIONS:

A. 02 40 00 - Minor Demolition and Renovation Work.

B. 07 22 00 - Roof Board Insulation.

C. 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM).

B. FM Global Approval Guide.

C. Underwriters Laboratories (UL): Building Materials Directory.

D. National Roofing Contractors Association (NRCA): The NRCA Roofing and Waterproofing Manual.

E. ASCE 7-16: "Minimum Design Loads for Buildings and Other Structures."

F. Cool Roof Rating Council (CRRC).

G. SPRI: Application Guidelines for Modified Bitumen Roofing Systems.

H. FM Global Property Loss Prevention Data Sheets
   1. DS 1-28 “Wind Design”.
   2. DS 1-29 “Roof Deck Securement and Above-deck Roof Components”.
   3. DS 1-33 “Safeguarding Torch-applied Roof Installations”
   4. DS 1-49 “Perimeter Flashing”.

1.04 QUALITY ASSURANCE:

A. Application:
   1. Approved by manufacturer of accepted roofing system.
   2. A single applicator with a minimum of five years previous successful experience in installations of similar systems.
   3. Demonstrated successful installation in three other comparable buildings will be preferred. Submit subcontractor qualification statement.

B. Manufacturer Requirements:
   1. Roof Membrane Assembly: Classified by Underwriters' Laboratories, Inc. as a Class A roof covering with no slope limitations.
   2. Roof Membrane Assembly: Classified by FM Global as a Class 1, approved assembly and Class 1-SH (Severe Hail) exposure.
   3. Manufacturer to have direct actual in-house experience in the manufacturing of the specified or similar products for a period of a minimum of twenty years.
   4. Manufacturer to have documented project history of installation of the specified or similar products in the United States for a period of a minimum of twenty years.
   5. Manufacturer to provide authorized documentation of the physical/ mechanical properties from the testing laboratory of Manufacturer of the actual materials utilized for the project indicating compliance with applicable ASTM standards D 5147 and D 6298.
   6. Manufacturer's top membrane ply product shall be tested by CRRC and meet the following requirements: Initial Solar Reflectance of 0.70 (minimum) and Thermal Emittance of 0.75 (minimum).

7. Manufacturer's products shall comply with the following standards:
   a. Polyester/Fiberglass composite reinforcement SBS modified bitumen sheet, ASTM D 6162, Grade S or G, Type 1 – 3.
   b. Fiberglass-reinforced SBS modified bitumen sheet, ASTM D 6163, Type 1 – 3, Grade S or G.
   c. Polyester-reinforced SBS modified bitumen sheet, ASTM D 6164, Type 1 – 3, Grade S or G.
   d. Polyester-reinforced APP modified bitumen sheet, ASTM D 6222, Type 1 or 2, Grade S or G.

C. Regulatory Requirements:
   1. Classified by Underwriters' Laboratories, Inc. as a Class A roof covering.
   2. Classified by FM Global as a Class 1A assembly.
   3. Follow local, state, and federal regulations, safety standards and codes.
   4. Install roof system in manner to resist minimum wind uplift pressures of 45 psf for Zone 1'; 75 psf for Zone 1; 105 psf for Zone 2; and 135 psf for Zone 3. Pressures are based on ASCE 7-16 and following criteria: 143 mph wind speed; Exposure C; Risk Category III; and Safety Factor of 2.0.
   5. Refer to applicable building codes for roofing system installation requirements and limitations. When a conflict exists, the more restrictive document will govern.
   6. Provide tested, engineered, and/or approved system to meet or exceed the specified wind uplift pressures.

D. Laboratory Testing and Samples:
   1. At Owner's request, obtain field samples of the completed roof membrane, laps, and/or assembly.
   2. Take samples at locations designated by Owner's Representative and test for compliance with the requirements of the Contract Documents and with manufacturer's published performance criteria.
   3. Assume all costs for extraction and patching of all samples. Owner shall assume all costs for testing of field samples.
   4. Correct all deficiencies in accordance with the manufacturer's recommended procedures at no cost to Owner.
   5. If for any reason, areas that are tested by Owner fail to meet manufacturer's requirements, then all subsequent expense for retesting of those areas will be borne by Contractor.

E. Installation:
   1. Install in accordance with the manufacturer's current published application procedures, the general recommendations of the National Roofing Contractor's Association, and as supplemented by these documents.
   2. Follow Underwriters Laboratories requirements acceptable for use with specified products or systems.
   3. During installation and upon completion of installation, an inspection shall be conducted by a technical representative of the manufacturer to certify that roofing system has been installed according to manufacturer's most current published specifications and details.
   4. All roofing shall be as described in this Section and shall be provided and/or approved by roof system manufacturer.
   5. Obtain written approval from the manufacturer for any materials not manufactured or provided by manufacturer stating that materials are acceptable and are compatible with other materials and systems required.
   6. Personnel designated to utilized propane torching equipment to install roofing materials must have current CERTA safety certification issued by MRCA.

F. Make no deviations from this Specification or the approved shop drawings without the prior written approval of the Architect, Owner's Representative, and roof membrane manufacturer.

G. Perform entire work of this Section in accordance with the best standards of practice relating to the trades involved.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Store materials in accordance with manufacturer's recommendations. Store rolled goods on end on clean raised platforms. Store other materials in dry area, protected from water and direct sunlight, and maintain at a temperature of 60 to 80 degrees Fahrenheit (16 to 27 degrees Celsius).

C. Provide continuous protection of materials against deterioration.

D. Materials Stored on Roof Levels:
   1. Distribute materials stored on roof to prevent concentrated loads that would impose excessive strain on deck or structural members or impede drainage. Position materials stored on roof over structural support beams and/or columns.
   2. Positively secure materials and protective covers to prevent displacement by wind.
   3. Tarp for protection from exposure.
   4. Cut and remove manufacturer's plastic "shrink wrapping" from materials during storage.

1.06 SUBMITTAL:

A. General:
   1. Material manufacturer's roof system/assembly letter indicating the following: proposed roof system components; general installation requirements (adhesive coverage rate, fastener pattern layout, etc.); roof system uplift pressure resistance; supporting independent laboratory test report indicating respective test pressures; and warranty coverage to be provided.
   2. Material manufacturer's written approval/acceptance of specified roof system and issuance of specified warranty for project.
   3. Shop drawings of details.
   4. Manufacturer's product data sheets with Safety Data Sheets (SDS) on each material proposed for usage.
   5. Sample of warranty that is to be issued upon project completion.
   6. Samples of products proposed for use.

B. Shop Drawings:
   1. Shop drawings which illustrate the Work, showing fabrication, layout, setting, or installation details.
   2. Prepare shop drawings for details that are proposed for the project. Indicate on a roof plan, the proposed location of detail presented on shop drawing.
   3. Indicate joints, types, and locations of fasteners, shapes, sizes, expansion joints, special conditions, and installation procedures for each flashing condition. Note critical dimensions, gauge, and finish of sheet metal for each flashing condition.
   4. Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work.
   5. Provide drawings depicting insulation board attachment for field, perimeter, and corner zones.

C. Product Data: Submit manufacturer's catalog sheets, providing descriptive data for each material proposed for use in construction of roof assembly and related flashings and components.

D. Samples: Provide physical examples of materials/components proposed for use to comprise the specified roof system.

1.07 PROJECT CONDITIONS:

A. Existing Conditions: Examine existing building and existing roofing and decking to determine physical conditions that affect removal of existing roofing and installation of new roofing and decking.

B. Environmental Requirements:
   1. Apply roofing in dry weather.
   2. Do not remove existing roofing and flashing in inclement weather or when rain is predicted (30% or more possibility).
   3. Do not apply materials when ambient temperature is below 40 degrees Fahrenheit (5 degrees Celsius).
   4. Do not expose material to a constant temperature in excess of 180 degrees Fahrenheit (82 degrees Celsius).

C. Protection:
   1. Provide special protection or avoid heavy traffic on completed work when ambient temperature is above 80 degrees Fahrenheit (27 degrees Celsius).
   2. Restore to original condition or replace work or materials damaged during handling or roofing materials.

D. Emergency Equipment: Maintain on-site equipment necessary to apply emergency temporary edge seal in the event of sudden storms or inclement weather.

1.08 SEQUENCING AND SCHEDULING:

A. Do not remove more existing roofing in one day than can be replaced with new roofing and flashing in same day.

1.09 WARRANTY:

A. Contractor shall submit to Owner prior to final payment, two copies of the following warranties:
   1. Roofing Material Manufacturer's Warranty: Project shall be installed in such a manner that the roof system manufacturer will furnish a written full-system (including, but not limited to, insulation layers, fasteners, adhesives, flashing sheets, etc.), no dollar limitation, labor and material warranty agreeing to replace/repair defective materials and workmanship, including leakage of water, abnormal aging or deterioration of materials, and other failures of the materials to perform for a warranty period of twenty years after date of written final acceptance by Owner.
   2. Contractor's Warranty: In addition, Contractor shall furnish a written warranty agreeing to repair/replace defective installation and workmanship causing leakage of water, deterioration of materials, and other failures of the installed system, sealants, painting coatings and related work on this project, to perform for a warranty period of two-years after date of written final acceptance by Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURER:

A. Acceptable SBS Modified Bitumen Roofing Manufacturers:
   1. Siplast.
   2. Elevate.
   3. Soprema.
   4. Johns Manville.
   5. Or approved equal.

2.02 SHEET MATERIALS:

A. SBS Membrane System:
   1. Membrane Base Ply: ASTM D 6164, Type I, Grade S; smooth-surfaced, polyester-reinforced, SBS modified bitumen sheet, suitable for application with cold-adhesive and/or heat-welding/torching methods such as "Paradiene 20 PR TG" or "Paradiene 20 PR" by Siplast, "SBS Poly Torch Base" or "SBS Poly Base" by Elevate, or "DynaWeld 180S" or "DynaBase PR" by Johns Manville, or approved equal.
   2. Membrane Top Ply: White-colored granule-surfaced, fiberglass/polyester reinforced, SBS modified bitumen sheet suitable for application with torch-application/heat welding such as "Parafor 30 FR TG BW" by Siplast, "SBS FR Torch UltraWhite" by Elevate, "DynaWeld Cap 180 CR FR G" by Johns Manville, or approved equal.
   3. Base Flashing System: One-ply of specified membrane base ply and one ply of specified top ply or other granule-surfaced (color to match cap sheet) polyester-reinforced SBS modified bitumen flashing sheet.

2.03 RELATED MATERIALS:

A. Asphalt Primer: ASTM D 41.

B. Edge Sealant: Rubberized asphaltic plastic roof cement that is gun-grade version for sealing terminations of cap sheet such as "Elastomastic 209" by Henry Co, or "#19 Ultra Rubberized Flashing Cement" by Karnak, or approved equal.

C. Elastomeric Plastic Roof Cement: Rubberized plastic roof cement such as "MB Flashing Cement" by Johns Manville, or approved equal to be used for temporary seals of flashings, embedding flanged sheet metal flashings, and three coursing of seams, termination bars, and cuts in modified bitumen sheets.

D. Cold Process Adhesive: Low VOC or solvent free asphaltic or polymeric based adhesive suitable for use with modified bitumen sheets such as “SFT Adhesive” by Siplast, “ColPly EF” by Soprema, "MBR Bonding Adhesive" by Johns Manville, or approved equal.

E. Cant Strip: 3-5/8-inches (92mm) by 1-1/2-inches (38mm) composite cant strips of perlite such as "FesCant Plus" by Johns Manville or "Energy Guard Perlite Cant Strip" by GAF with field-cut strips of cover board with chamfered ends.

F. Walk Pads/Protection Pads: Pre-manufactured sheet or cut sections of granule surfaced polyester-reinforced modified bitumen sheet, extending minimum 2-inches (50mm) beyond edge of overlying element, with rounded corners and to have contrasting granule color from top ply such as “ParaTred” by Siplast, “DynaTred” by Johns Manville, or approved equal.

G. Heavy-duty Protection Pad: Asphaltic composite board with mineral surfacing, 3/4-inch thick, (3’ X 3’) (3’ X 5’) size to suit application, such as “Whitewalk” by W.R. Meadows (2555 N.E. 33rd Street, Fort Worth, Texas 76111, 817/834-1969) or panel composed of recycled rubber particles such as “Roof-Gard Pads” by Humane Manufacturing, LLC (805 Moore Street, Baraboo, Wisconsin 53913, 800/369-6263), “Duo-Pad” by W.R. Meadows (1/2-inch by 30-inch by 4 foot) (3/4-inch by 33-inch by 4-foot), or “Walkway Roof Pads” by RB Rubber Products, Inc. (904 N.E. 10th Avenue, Portland, Oregon 97128, 503/472-4691).

H. Liquid Flashing System: Fluid-applied reinforced flashing system to apply around roof penetrations, low-profile flashing substrates, at roof drains, or other suitable locations that would be included in the warranty coverage for the roof membrane system and match color of finish ply such as "JM PMMA" by Johns Manville, "Parapro" by Siplast, “Alsan” by Soprema, or approved equal.

2.04 MISCELLANEOUS MATERIALS:

A. Best grade or quality approved by the manufacturer for the specific application.

PART 3 - EXECUTION

3.01 EXAMINATION OF SURFACES

A. Examine substrate, roof deck, and related surfaces, and verify that there are no conditions such as inadequate anchorage, foreign materials, moisture, ridges, or other conditions that would prevent satisfactory installation of the roofing system.

B. Correct or complete any condition requiring correction or completion prior to installation of the roofing system. Notify Owner's Representative in writing of unacceptable conditions.

C. Verify the location of all interior ducts, electrical lines, piping, conduit, and/or similar obstructions. Perform all work in such a manner as to avoid contact with the above-mentioned items.

D. Verify insulation is installed correctly.

E. Start of work under this Part Three constitutes acceptance of deck substrate and site conditions.

3.02 PREPARATION:

A. Do not stockpile debris on roof surface.

B. Promptly remove debris each day. Use chutes, hoists, or other equipment to transfer debris from roof surface to disposal container.

C. Cleaning:
   1. Verify that debris has been completely removed.
   2. Clean roof insulation/substrate with stiff bristle broom and forced-air blower immediately prior to base ply application.

3.03 APPLICATION

A. Prior to roof membrane installation, seal all openings, projections, and penetrations in the substrate to prevent material or debris entry into the building. Correct damage to the building or interior components caused by work at Contractor’s sole expense.

B. Membrane Installation - General:
   1. Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Apply roofing immediately following application of insulation as a continuous operation.
   2. The overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply specified materials, and exercise care to ensure finished application is acceptable to Consultant and Owner.
   3. When applicable, install sheet materials using adhesives applied to substrate for adhering the field of the sheet. Side laps and end laps shall be fused together using electric-operated hot-air welding equipment suitable for use with modified bitumen materials such as provided by Cadillac Products, Leister, or other suitable equipment.

4. Prime top and bottom of metal surfaces, concrete surfaces, and masonry surfaces to receive roofing with a uniform coating of asphalt primer, at a nominal rate of one-gallon (3.8 liters) per 100 square feet (9.29 square meters).
5. Place cant strips on top of substrate to form continuous monolithic substrate at walls and curbs. Nail wood cants to nailer and to wall or vertical nailer, where possible. Secure fibrous cants by embedding in ribbons of low-rise foam adhesive. Miter cut cant strips to form continuous substrate at corners. Adhere cut piece of roof cover board in low-rise foam adhesive over top of fibrous cant.
6. Lay all layers of roofing free of wrinkles, creases, or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets.
7. Lay layers of roofing perpendicular or parallel to the slope of the deck as recommended by manufacturer.
8. Install roof system configuration and components as required to meet the requirements of the testing assembly for the respective proposed roof material manufacturer.

C. Membrane Application - Base Ply:
1. Cold Adhesive Application Option: Apply one ply of modified bitumen base ply over substrate in uniform continuous application of cold process adhesive. Apply adhesive at a nominal rate of 1-1/2 gallons to 2-1/2 gallons (5.71 liters to 9.5 liters) per 100 square feet (9.29 square meters), depending on the substrate (base sheet or insulation). Keep the adhesive applicator in close proximity to the material roll, maximum 2 feet (.7m). Exert sufficient pressure on roll during application. Roll field of sheet after initial installation of base ply with weighted lawn/linoleum roller. Heat-fuse the side and end lap seams of base ply with controlled hot-air equipment.
2. Heat-Fusing Application Option: Apply one ply of modified bitumen base ply over substrate using heat-fusing methods with hot-air gun equipment suitable for modified bitumen sheets. Apply heat evenly across the front face and full width of the roll while pulling roll forward and unrolling roll uniformly with an even downward pressure. Apply heat to roll until the bitumen back coating reaches the desired application temperature, resulting in complete melting of the burn-off film, a glossy appearance of the back coating, and an approximate 1/4-inch (6mm) to 1/2-inch (13mm) bitumen flow from edge of sheet. Exert sufficient pressure on roll during application. Do not stand on the subject sheet during the installation process.
3. Fully adhere membrane base ply to base sheet or insulation and have a minimum of 3-inch (75mm) side laps and 6-inch (150mm) end laps. Stagger end laps of adjacent sheets of membrane base ply a minimum of 3 feet. Extend field sheet of membrane base ply to top edge of cant.
4. Complete membrane base ply application over respective roof area prior to application of membrane top ply. Apply additional ply of membrane base ply in low areas or areas that may be subjected to ponding water or to promote positive drainage.
5. Apply a patch over areas of base ply with areas of physical damage or other defects. Patch to be the full width of membrane base ply and extend a minimum of 2-inches (50mm) beyond the defect in each direction.
6. Check lap seams and seal unbonded or discontinuous seams using a heated steel trowel.

D. Base Flashing Application - Base Ply:
1. Install and complete application of base ply of flashing each day base ply of membrane is installed. Install base ply flashings at curbs and parapet walls.
2. Install first ply of base flashing extending horizontally 4-inches (100mm) beyond edge of cant or sheet metal flashing flange and vertically to top edge of curb, wall, or minimum 4-inches (100mm) above the top of the cant.
3. Length of base flashings shall be maximum 6-feet (2m). Lap ends of base flashings 4-inches (100mm), minimum. Seal top edge of base flashing on a daily basis with a continuous troweling of elastomeric roof cement.

4. Check lap seams and seal unbonded or discontinuous seams using a heated steel trowel.
5. For wood substrate, mechanically attach a base sheet 8-inches (200mm) on-center in all directions and along lap seams, overlapping adjacent sheets 4-inches (100mm), minimum. Adhere modified bitumen base ply flashing to base sheet.
6. Where existing substrate is deemed unacceptable to install new materials, attached plywood or acceptable gypsum sheathing to serve as new substrate for flashing membrane.

E. Strip-in Flashing:
1. Prime top and bottom of metal flanges and other sheet metal components completely and allow to dry prior to installation.
2. After membrane base ply has been applied, install metal flange flashings according to Section 07 62 00 - Sheet Metal Flashing and Trim. Strip-in flange/metal with strips of base flashing (base ply) concealing entire flange or horizontal surface of metal flashing and extending a minimum of 4-inches (100mm) beyond edge of flange/metal and heat-fusing strip-in to base ply.

F. Membrane Application - Top Ply:
1. Unroll top ply and cut roll length in half approximately 15-foot lengths. Lay cut sections of top ply with underside exposed to allow the sheet to relax prior to application. Prior to application, re-roll "relaxed" sheet using insert provided with roll.
2. Beginning at the low point on the roof, fully adhere membrane top ply to membrane base ply with minimum of 3-inch (100mm) side laps or width of selvage edge and 6-inch (150mm) end laps. Extend membrane top ply to top edge of cant. Apply each sheet directly behind applicator. Stagger side laps of top ply a minimum of 12-inches (300mm) from side laps of base ply.
3. Cold Adhesive Application: Apply modified bitumen top ply in uniform continuous application of cold process adhesive. Apply adhesive at a nominal rate of 1-1/2 gallons to 2-1/2 gallons (5.71 liters to 9.5 liters) per 100 square feet (9.29 square meters. Keep the adhesive applicator in close proximity to the material roll, maximum 2 feet (.7m). Exert sufficient pressure on roll during application. Roll field of sheet after initial installation of top ply. Heat-fuse the side and end lap seams of the cap sheet with hot-air gun equipment.
4. Heat-Welding/Fusing Application: Apply heat evenly across the face and full width of the roll while unrolling roll uniformly with an even downward pressure. Apply heat to roll using hot-air equipment until the bitumen back coating reaches the design application temperature, resulting in complete melting of the burn-off film, a glossy appearance of the back coating, and an approximate 1/4-inch (6mm) to 1/2-inch (13mm) bitumen flow from edge of sheet. Roll lap seams with steel roller immediately upon fusing/ mating of the sheets.
5. While installing membrane top ply, provide proper protection or method during application to prevent contamination, soiling, charring, or marring the finish surfacing of previously installed sheet. Exert sufficient downward pressure on roll during application.
6. During end lap application, trim the inside corner along the selvage edge of the underlying sheet at the end of the roll. The trimmed area shall be the width of the selvage edge and extend downward from the end of the roll to the outer side of the roll in a linear direction approximately 5-1/2-inches (138mm) from end of roll. Trim outside corner of membrane top ply at end laps to provide rounded finished corner. Remove surfacing or de-granulate areas of underlying top ply to receive overlapped portion of adjacent sheet. Pre-heat the subject area of the underlying sheet so that surfacing material can be removed or that granules can be "depressed" or sunk into the compound and the bitumen compound exudes up through the granules to result in a bituminous material-to-bituminous material contact.

7. Embed white-colored granules into bituminous bleed-out along edges of cap sheet to provide monolithic surface color.
8. Install membrane top ply so that end laps of every other sheet are aligned.
9. Apply a patch over areas of membrane with displaced/dislodged granules/ surfacing or other surface discoloration or defects. Patch shall be the full width of membrane top ply and extend a minimum of 2-inches (50mm) beyond the defect in each direction. Round corners of membrane patches.
10. Apply additional finish material, color to match top ply, over stains, soiling, and other areas of the top ply with displaced or discolored surfacing.
11. Check lap seams and seal unbonded or discontinuous seams using a heated steel trowel.
12. Apply membrane top ply and terminate at the rise in the metal component. Apply a continuous bead of edge sealant along edge terminations of modified bitumen sheet (i.e. flashing flanges, exhaust vents, metal edge, etc.). Bead of edge sealant shall match height of top sheet surfacing and shall be "canted" to shed water. Embed loose granules or coat with elastomeric coating, color to match top ply, into newly installed edge sealant.

G. Base Flashing Application - Top Ply:
1. Apply top ply of flashings only after membrane top ply is in place at curbs and parapet walls.
2. Remove surfacing or de-granulate granulated surfaces on top ply sheet of membrane and flashings to receive flashing top ply. Pre-heat the subject area of the underlying surfaced sheet so that surfacing can be removed or so that granules can be "depressed" or sunk into the compound and the bitumen compound exudes up through the granules to result in a bituminous material-to-bituminous material contact.
3. Cut modified bitumen flashing membrane to extend a minimum of 4-inches (100mm) above the top of the membrane top ply covering the cant. The overall minimum height of the top of the flashing membrane above the top of the roof surface is 8-inches (200mm). Extend flashings to full height of vertical substrate.
4. Extend the flashing membrane horizontally 4-inches (100mm) onto the field of the roof surface beyond the bottom edge of the cant strip.
5. Cut flashing from roll using selvage edge as lap seam for adjacent sheets, resulting in sheet lengths of nominal 3 feet (1m). Lap ends a minimum of 4-inches (100mm) and stagger laps from laps of underlying plies.
6. Fully adhere and conform top ply of flashing to substrate. Extend bleed-out of applied base flashing a minimum of 1/2-inch (13mm) beyond the side or end lap. "Broom-in" foil-faced flashing ply immediately upon installation using a damp sponge mop. Embed granules or coat bleed-out with aluminum dust/elastomeric coating, to match finish surfacing.
7. Walls: Mechanically attach top edge of modified bitumen membrane flashing with termination bar and appropriate fasteners spaced 6-inches (150mm) on-center. Apply three-coursing consisting of an initial continuous troweling of elastomeric plastic roof cement, embedded reinforcing fabric, and a secondary application of elastomeric plastic roof cement along and concealing the top edge of base flashing and termination bar. Utilize duct/masking tape, or similar tape, to provide line of demarcation for three-coursing located parallel and 2-inches below termination bar.
8. For wall substrates greater than 12-inches (300mm) in height, install base flashing to a height of 12-inches (300mm) as specified. For remaining wall height, Adhere modified bitumen flashing to substrate and overlap wall flashing on top edge of base flashing a minimum of 4-inches (100mm). Install appropriate fasteners in vertical lap seams spaced 6-inches (150mm) on-center. Apply three-coursing over completed lap seams.
9. Apply cut section of modified bitumen over corners of curb flashings to conceal cuts in flashing material at corner laps.

10. Install flashing sheets on adjoining perpendicular sides (outside corners) of curbs or walls so that outside corners of flashing sheet align and are rounded.
11. Curbs: For curbs with non-removable hoods/covers/units, extend flashing to full height of curb, secure with termination bar and appropriate fastener, and apply three-coursing of plastic cement and reinforcing fabric over top edge of sheet. Utilize duct/masking tape, or similar tape, to provide line of demarcation for three-coursing located parallel and 2-inches below termination bar. For curbs with removable hoods/covers/units, wrap flashing sheet over top of curb and secure to top or inside of curb with angle termination bar and appropriate fasteners spaced 6-inches (150mm) on-center.

H. Metal Flanged Flashings:
1. Apply membrane top ply and terminate at the rise in the metal component.
2. Apply a target around penetrations or utilize flashing method to conceal cuts in the membrane top ply.
3. Apply a continuous bead of edge sealant along edge terminations of modified bitumen sheet (i.e. flashing flanges, exhaust vents, metal edge, etc.). “Cant” bead of edge sealant to shed water. Embed loose granules in newly installed edge sealant and apply coating to match finish of top ply, where applicable.

I. Liquid-Flashings
1. Apply liquid flashing systems in accordance with the manufacturer’s application guidelines at select and designated locations where conventional flashings cannot be installed to meet manufacturer's warranty requirements and around roof drain sump areas.
2. Clean penetrating element or approved substrate to receive liquid flashing system.
3. Apply masking tape on substrate to create straight-edge terminations of the liquid flashing system.
4. Embed reinforcing fabric in the liquid flashing system to form monolithic flashing with the finished roofing membrane. Apply finish surfacing on the liquid flashing system to match the color of the finished top ply of the roof membrane or substrate to which the coating is applied as approved by Architect.
5. Apply reinforced liquid flashing system on top of cap sheet in area 3-feet X 3-feet around each primary roof drain. Embed granules, color to match cap sheet, in surface of liquid flashing.
6. Apply reinforced liquid flashing/roofing system on top of cap sheet in area 3-feet x 3-feet located around goose-neck exhaust vents and/or pipes that discharge material onto roof surface. Finish surface of liquid flashing/roofing to match color of cap sheet.

J. Daily Seal:
1. Install temporary seal at completion of each day's work.
2. Ensure that water does not flow beneath any completed sections of the membrane system. This will include completion of all flashings, terminations, and daily seals. When possible, install starting at the highest point of the project area, working to the lowest point.
3. Temporarily seal membrane edge with plastic roof cement. Exercise caution to ensure that membrane is not temporarily sealed near drains in such a way to promote water migration below the membrane or impede drainage.
4. Install primary night seal beneath daily night seal in such a manner to seal both new and existing roof system to roof deck to prevent moisture migration from or into either old roof or new roof.
5. Install daily night seals by extending the new roof membrane beyond the insulation and sealing to the existing roof surface using plastic roof cement, sealant, self-adhering membrane or other material/method to achieve watertight seal.
6. When work is resumed, remove and dispose of portion of membrane where materials were applied to achieve night seal.

K. Daily Fire Watch: Contractor personnel to perform daily “Fire Watch” a minimum of two-hours upon completion of heat-fusing installation methods. Contractor to utilize an infrared-sensing thermometer or similar equipment that can provide instant detection of elevated and/or different temperatures of roofing materials. If elevated or suspect temperatures or underlying conditions are detected, contractor to remove necessary materials and perform necessary actions to alleviate the noted condition. Maintain appropriate number of fire extinguishers on roof during installation of roofing, minimum one per application location.

3.04 PROTECTION PADS:

A. Install layer of heavy-duty protection pad loose laid on top of cut section of modified bitumen protection pad adhered to roof surface for large-sized (greater than 4-inch diameter) or heavy roof-top piping. . Install and adhere a layer of modified bitumen protection pad under each support for typical roof-top piping including condensate piping, conduit (2-inch dimeter and smaller), coolant, gas, and other similar piping. Size of protection layers shall be minimum 2-inches longer in each direction through base of support with rounded corners

B. Install protection pads, adhered to capsheet, in locations where items are to be installed on roof surface including, but not limited to, lightning protection system components

3.05 WALK PADS:

A. Install walkpads around serviced equipment, at roof access points, in areas where water is discharged onto roof surface from adjacent/higher roof area, highly trafficked areas, and as required by Owner. Install adjacent walkpads with approximate 4-inch space between ends and/or sides. Apply walkpads on top of membrane top ply.

3.06 FIELD QUALITY CONTROL:

A. Inspections:
   1. During installation on individual roof areas, provide for one on-site inspection by a technical representative of roof membrane manufacturer.
   2. Upon completion of installation, provide a final inspection and written report by a technical representative of roof membrane manufacturer to confirm that roofing system has been installed in accordance with manufacturer's requirements.

3.07 CLEANING:

A. Remove debris, adhesives, and sealants from surfaces.

B. Remove debris and material waste from project site.

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SECTION 07 53 50
METAL RETROFIT SINGLE-PLY ROOF SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Installation of reinforced thermoplastic (TPO) single-ply membrane roofing system, related membrane flashings, insulation board, and other accessories over existing metal panel roof system.

1.02 RELATED SECTIONS:

A. 07 22 00 - Roof Board Insulation.

B. 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM).

1.04 QUALITY ASSURANCE:

A. Applicator:
   1. Approved by manufacturer of accepted roofing system.
   2. A single applicator with a minimum of five years previous successful experience in installations of similar systems.
   3. Minimum five years experience in single-ply roofing with two years experience seaming system same as one currently being proposed.
   4. Be present at job site at all times when work is being performed. Supervise workers as required to ascertain workmanship, progress, and adherence to details.
   5. Report to Owner's Representative.
   6. Be responsible for schedule and coordination.
   7. Have authority to make binding commitments upon Contractor in the field.

B. Regulatory Requirements: Classified by Underwriters' Laboratories, Inc. as a UL 790 Class A roof covering.

C. Notify Owner's Representative a minimum of forty-eight hours in advance of start of field work. In event that Owner provides a full-time Owner's Representative, do not perform work until Owner's Representative is present except as authorized in writing by Owner.

D. Schedule manufacturer's technical representative to be on site during initial of membrane installation and periodically during project duration. Manufacturers shall provide a written report to Owner’s Representative after each inspection outlining observations and any corrective procedures.

E. Install roofing system materials including roof fasteners type and spacing and roofing membrane sheet size and layout in accordance with ASCE 7 to resist wind uplift loads of 60 psf in field, 90 psf along perimeters, and 120 psf in corners.

1.05 SUBMITTAL:

A. General:
   1. Applicator’s License Certificate: Copy of the roofing material manufacturer’s agreement/ contract indicating date application was approved.
   2. Material manufacturer’s written approval/acceptance of specified roof system and issuance of specified warranty for project.
   3. Shop drawings of details, if proposed different from project drawings.
   4. Manufacturer’s product data sheets with Material Safety Data Sheets (MSDS) on each material proposed for usage.
   5. Sample of warranty that is to be issued upon project completion.
   6. Samples of products proposed for use.

B. Shop Drawings:
   1. Original drawings, prepared by Contractor, subcontractor, supplier, or distributor, which illustrate some portion of the Work, showing fabrication, layout, setting, or erection details, prepared by a qualified detailer.
   2. Prepare shop drawings for those details that are proposed different than the project drawings. Indicate on a roof plan, the proposed location of detail presented on shop drawing.
   3. Indicate joints, types, and locations of fasteners, shapes, sizes, expansion joints, special conditions, and installation procedures for each flashing condition. Note critical dimensions, gauge, and finish of sheet metal for each flashing condition.
   4. Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counterflashings, trim, and fascia units, gutters, downspouts, scuppers, and expansion joint systems.

C. Product Data: Submit manufacturer's catalog sheets, providing descriptive data for each material proposed for use in construction of roof assembly and related flashings and components.

D. Samples: Provide physical examples of materials/components proposed for use to comprise the specified roof system.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.

B. Store materials in accordance with manufacturer's recommendations. Store rolled goods on clean raised platforms. Store other materials in dry area, protected from water and direct sunlight, and maintain at a temperature of 50 to 90 degrees Fahrenheit (10 to 32 degrees Celsius).

C. Deliver materials in sufficient quantities to allow continuity of work without delay.

D. Store materials in weather protected environment, clear of ground, and free from moisture. Protect materials against damage. Keep all materials used in construction of the roofing free from moisture prior to and during application. Do not store in plastic bags or other protective coating which may create condensation within bags.

E. Store roof insulation and membrane on pallets or dunnage at least 4-inches (100mm) above the ground, roof, or deck and protect as necessary to keep dry.

F. Handle all materials so as to prevent damage to roofing system components and completed roof system.

G. Proper storage of materials is the sole responsibility of Contractor. Protect all materials susceptible to moisture including, but not limited to, all roll goods, insulation, cant strip, wood, and plywood in dry, above ground, watertight storage. Keep labels intact and legible, clearly showing the product, manufacturer, and other pertinent information.

H. Any materials becoming wet or damaged will be rejected and shall be removed from job site immediately. Any materials found to be improperly stored at jobsite shall be considered wet at the discretion of Owner's Representative and removed from jobsite.

I. Store products in temperature-controlled environment to prevent detrimental affects from low or elevated temperatures.

1.07 PROJECT CONDITIONS:

A. Environmental Requirements:
   1. Apply roofing in dry weather.
   2. Do not remove existing roofing and flashing in inclement weather or when rain is predicted (30 percent or more possibility).
   3. When ambient temperature is below 60 degrees Fahrenheit (16 degrees Celsius), expose only enough sensitive cements, sealants, and adhesives as required within a four hour period.
   4. Do not expose membrane and accessories to a constant temperature in excess of 180 degrees Fahrenheit (82 degrees Celsius).

B. Protection:
   1. Provide special protection and avoid traffic on completed areas of membrane installation.
   2. Restore to original condition or replace work or materials damaged during handling of roof materials.
   3. Take precautions as required to protect adjacent work and structures.

C. Emergency Equipment: Maintain on site equipment necessary to apply emergency temporary edge seal in event of sudden storms or inclement weather.

D. Restrictions:
   1. Smoking is prohibited on roof areas.
   2. Maintain facility and all utility services in a functional condition for Owner's utilization.

1.08 SEQUENCING/SCHEDULING:

A. Install new roof membrane system immediately after completion of insulation installation.

B. Schedule work as required to prevent traffic and material handling over completed work.

C. Do not expose new material to water or sun damage in quantities greater than can be weatherproofed during same day. See additional roof protection provisions herein.

1.09 WARRANTY:

A. Contractor: Provide Owner a written warranty for a period of two years after Owner's final acceptance covering all repairs required to correct all defects due to faulty materials or workmanship and to otherwise maintain the roof in a watertight condition and to correct all other defects without regard to watertightness. Make repairs promptly on notification and at no expense to Owner.

B. Roof System Manufacturer: Manufacturer of the single-ply membrane roof system shall furnish a written guarantee that warrants and guarantees Owner with a watertight condition of roof system and all components thereof for a period of fifteen years from date of Owner's final acceptance. Warranty and guarantee shall cover all labor and materials required to maintain a watertight condition and a roof system free of defects.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Acceptable Manufacturers for Mechanically Attached System:
   1. Carlisle.
   2. Johns Manville.
   3. GAF.
   4. Or approved equal.

B. Products furnished for roofing system shall be products of a single manufacturer.

2.02 SINGLE-PLY ROOFING MEMBRANE:

A. Polyester reinforced thermoplastic polyolefin (TPO) single ply membrane, complying with ASTM D 6878, 0.060-inch (60-mils) thickness, white in color, complying with minimum solar reflectance of 0.78 and thermal emittance of 0.75.

B. Mechanically-Attached System:
   1. Acceptable TPO Product:
      a. “EverGuard TPO” by GAF.
      b. “SureWeld TPO” by Carlisle.
      c. “JM TPO Membrane” by Johns Manville.
      d. Or approved equal.

2.03 RELATED MATERIAL:

A. Membrane Fasteners and Plates:
   1. Purlins: CR-10 fluorocarbon coated, self-drilling screw with 3/4-inch drill-point, 0.17-inch shank diameter and 0.21-inch thread diameter and 0.485-inch hex-head, of sufficient length to penetrate the steel supports a minimum of 3/4-inch (19mm), minimum 3-inch (75mm) diameter steel plates with recessed screw head for attachment of roof membrane to steel purlins, such as “Purlin Fastener” as manufactured by OMG.
   2. Metal Roof Panels: CR-10 fluorocarbon coated, self-drilling screw with 3/4-inch drill-point, 0.17-inch shank diameter, 0.21-inch thread diameter, and 0.485-inch hex-head, of sufficient length to penetrate the metal roof panels a minimum of 3/4-inch (19mm), such as "#15 Extra Heavy-duty Roofing Fastener" as manufactured by OMG, "Drill-Tec Extra Heavy Duty #15" and "XHD Barbed Scam Plate” as manufactured by GAF, Inc., with 3-inch diameter corrosion-resistant steel plate with a high-solids coating on top surface such as “Rhino Bond” plate for attachment of insulation and induction weld attachment of membrane.

B. Flashing: Minimum 60-mil, reinforced or unreinforced, flashing membrane as required and furnished by membrane manufacturer, color to match membrane.

C. Bonding Adhesive: Low-solvent or water-based VOC compliant bonding adhesive furnished by membrane manufacturer for adhering flashing membrane or roof membrane to substrates such as “Sure-Weld/Sure-Flex Low VOC Bonding Adhesive” by Carlisle. Bonding Adhesive; "JM TPO/PVC Membrane Adhesive (Low VOC)" by Johns Manville, "EverGuard H20 Bonding Adhesive" by GAF, or other manufacturer’s approved adhesive for membrane and substrate.

D. Sealants: Membrane manufacturer's approved sealant to seal penetrations through the membrane system or miscellaneous caulking applications that come in contact with roof system components.

E. Lap/Seam Sealant: Liquid formulation sealant. As furnished by membrane manufacturer for sealing cut edges of reinforced membrane and flashing sheets.

F. Water Cut-off Mastic: As furnished by membrane manufacturer for this system.

G. Inside Corners and Outside Corners and Molded Pipe Flashings: White molded pipe flashings as furnished by membrane manufacturer for this system.

H. Walkway Pads: TPO based, reinforced walkpads, as approved by membrane manufacturer.

I. Sponge Tubing: 2-inch diameter compressible foam rubber tubing for use at expansion joints.

J. Protection Sheet: Cut sections of membrane with rounded corners, extending a minimum of 2-inches beyond edges of overlying item.

K. Other miscellaneous materials shall be of the best grade available and approved in writing by roof system manufacturer for the specific application.

PART 3 - EXECUTION

3.01 GENERAL:

A. Perform entire work of this Section in accordance with the best standards of practice relating to trades involved.

B. Follow local, state, and federal regulations, safety standards, and codes. When conflict exists, the more restrictive document shall govern.

C. Follow insurance underwriter's requirements acceptable for use with specified products or systems.

D. Consider roof system manufacturer's current technical specifications a part of this Specification and use as a reference for specific application procedures and recommendations.

E. Mechanically fasten both the reinforced membrane and insulation to metal roof panels.

F. Refer to manufacturer's technical specifications for proper fastener selection and spacing in accordance with specific deck types and appropriate roll width for field of roof and perimeters.

3.02 EXAMINATION OF SURFACES:

A. Verify that preparatory work has been completed.

B. Examine roof areas for conditions that would prevent proper application of new roofing.

C. Verify that new wood nailers are properly installed to receive roofing system.

D. Examine substrate, roof deck, and related surfaces, and verify that there are no conditions such as inadequate anchorage, foreign materials, moisture, ridges, or other conditions that would prevent the satisfactory installation of the roofing system.

E. Correct or complete any conditions requiring correction or completion prior to installation of roofing system. Notify Owner's Representative in writing of unacceptable conditions.

F. Start of work under this Section constitutes acceptance of substrate and site conditions.

G. Verify:
1. Substrates are clean, smooth, and free from depressions, waves, projections, defects, and damage.
2. Surfaces in contact with any single-ply material are free from grease, oil, or other foreign material.
3. Surfaces in contact with roofing membrane are free from sharp edges, fins, or projections.
4. Materials are completely dry and free from ice and snow, including substrate, deck, insulation, and roofing membrane as applicable. Confirm dryness by moisture meter and demonstrate to Owner's Representative.
5. Roof equipment, openings, curbs, pipes, sleeves, ducts, vents, cant strips, and blocking members are solidly and properly set.
6. Mechanical/electrical work to be covered has been installed, tested, and approved.
7. Work has been completed where possible for all other trades that require work or traffic on the roofing area.

3.03 PREPARATION:

A. Verify that debris has been completely removed.

B. Broom clean roof insulation immediately prior to roofing application. Debris under roof membrane is unacceptable.

3.04 APPLICATION:

A. Roofing Membrane - General:
1. Install roof membrane in accordance with roofing manufacturer's specification and installation instructions. Cut sheets to maximum size possible in order to minimize seams.
2. Position membrane over substrate without stretching membrane. Allow membrane to relax for one-half hour before bonding, fastening, welding, and flashing.
3. Begin installation of new roofing system at the lowest point of the project area and work to the highest point to prevent backwater laps. This will include completion of all flashings, terminations, and seals on a daily basis.
4. Execute work so membrane can be temporarily sealed on a down slope surface at the end of each day with nite-seal in accordance with the detail drawings.
5. Portions of the roof membrane that have permanent creases and/or wrinkles prior to installation shall be removed and discarded.

B. Mechanically-fastened System:
1. Install mechanically fastened roofing system over the field of the roof with the length of the sheets parallel to the long dimension of the roof.
2. Position the roof membrane perimeter sheet along the perimeter of the roof over the acceptable substrate.
3. Option 1: Secure the membrane with appropriate fasteners installed into the structural steel supports spaced 6-inches on-center. Install fasteners positioned in membrane pre-formed tabs or in field of sheet. Apply strip of flashing membrane over fasteners installed in field of sheet.
4. Option 2: Heat-weld membrane to coated plates used to secure the insulation board via induction weld process in accordance with manufacturer’s recommendations.
5. Work shall progress across the roof deck with manufacturer's recommended minimum overlap provided at the previously secured sheet edge. Secure opposite length of the sheet with fasteners and plates, and overlap accordingly.

C. Membrane Splicing:
1. Install membrane to achieve a minimum distance between the edge of the fastening plate and edge of the membrane of 1-1/2-inches (38mm). Splices at end roll overlaps (width of the membrane) shall be 6-inches (150mm) wide, minimum. Plan sheet layout so that end roll overlaps can be stripped in with a continuous membrane head lap (minimum 18-inches [450mm] wide).
2. Allow top sheet to fall freely into place over bottom ply without wrinkling or stretching.
3. Surfaces to be welded must be cleaned, primed and dirt-free. Remove excessive dirt by washing with a detergent. Rinse thoroughly, allow to dry, and then wipe surface with manufacturer's solvent/cleaner.
4. Use automatic hot-air welding equipment approved by roof system manufacturer for all field seams. Perform small work and repairs using hand welders. Roof system manufacturer's representative shall be on site at start of project to supervise welding operations and to inspect and approve welded seams.
5. Probe all laps each day to verify that welder set-up is effective. Allow membrane to cool. In addition, perform random lap test sample checks (including checks at start of each day) to verify peel strength. Perform lap seam test sample checks in presence of Engineer/Consultant. Engineer/Consultant will retain test samples for project file.
6. Apply lap seam sealant along cut edges of the membrane and reinforced flashing material, around membrane patches, and along terminations in strip-in membrane.
7. Apply a membrane patch over all T-joints of overlapping flashing and membrane lap seams.

D. Flashing:
   1. General:
      a. Install flashing at all roof penetrations, interruptions, and any roof intersection including roof edges with vertical or sloped surfaces in accordance with manufacturer's recommended procedures and the detail drawings.
      b. Raise/modify all curbs, projections, and risewall conditions as required to accommodate new roofing.
      c. Apply manufacturer's bonding adhesive to both underside of flashing and surface to which it is to be bonded, at a rate of approximately one gallon (3.8 liter) per 50 square feet (4.6m^2) of surface coverage.
      d. Do not apply bonding adhesive to that portion of flashing that overlaps onto itself. Use hot-air welding throughout the system where membrane overlaps itself.
      e. Allow bonding adhesive to dry to finger touch until it does not string or stick to a dry finger. Roll the flashing into dry adhesive. Take care to assure that flashing does not bridge where there is any change of direction.
      f. Mechanically fasten top edge of membrane flashing through appropriate termination bar with approved fasteners spaced 6-inches on-center. Install waterblock behind top edge of membrane flashing and seal top edge of flashing with sealant.
      g. Install flashings for vents, pipes, soil vents, and other round projections using pre-manufactured and/or field-fabricated boot flashings and accordance with manufacturer's recommendations and the detail drawings.
      h. Install preformed flashing membrane as required to form a continuous membrane seal in each corner or change in plane.
      i. Install pre-molded outside and inside corner pieces at appropriate locations along walls and around curbs.
   2. Penetrations:
      a. Flash penetrations with pre-formed or field-formed flashings or polymer-coated metal pan as indicated on drawings.
      b. Apply sealant or water cut-off mastic at top of flashing between flashing and penetration.
      c. After flashing is installed, secure with steel draw band and seal top edge with sealant.
      d. Install grout and pourable sealer in pan. Install sheet metal bonnet or hood/cover at penetrations.
   3. Curbs:
      a. Extend flashing membrane to designated height on curbs.
      b. At curbs with removable cover/hood, wrap flashing over top of curb and secure with angle termination bar.
      c. At curbs with non-removable cover/hood, extend flashing to maximum height and secure with termination bar with fasteners at 6-inches on-center. Apply water block behind top edge of flashing and apply sealant along top edge of termination bar.
      d. Extend flashings at curbs to form rounded outer corners on horizontal tie-ins. Apply pre-molded outside corner pieces at corners.
   4. Polymer-coated Metal:
      a. Install polymer-coated metal flashings at curbs, penetrations, and perimeters as designated.
      b. Hot-air weld flashing membrane to coated metal and field membrane to provide monolithic seal, extending a minimum of 4-inches (100mm) beyond end of flange.
      c. Apply sealant/water-block at fastening points under flanges.
      d. Rise Walls: Extend flashing up walls to terminate under through-wall flashing, or minimum 8-inches above finished new roof surface and secure with termination bar with fasteners spaced at 6-inches on-center. Apply water block behind top edge of flashing and apply sealant along top edge of termination bar.
      e. Parapet Walls: Install flashing membrane up and over top of wall extending 1-inch below top of exterior wall finish. Trim leading edge of flashing to form continuous straight line and adhere/secure in place to prevent displacement.

E. Walk Pads/Protection Pads:
   1. Install walk pads at roof access points and around rooftop equipment in accordance with manufacturer's installation guidelines.
   2. Install protection pads under equipment and piping supports and other items installed on top of the roof surface.

F. Daily Seal:
   1. Ensure that water does not flow beneath any completed sections of membrane system. This will include completion of all flashings, terminations, and daily seals.
   2. Seal new membrane at the deck/substrate level.
   3. Temporarily seal any loose membrane edge with manufacturer's water cut-off sealant. Exercise caution to ensure that membrane is not temporarily sealed in such a manner as to promote water migration below the membrane or impede drainage.
   4. Install daily night seals by extending the roof membrane beyond the insulation and sealing to existing roof surface.
   5. When work is resumed, remove and dispose of membrane where asphalt or other sealants were previously applied before resuming installation.
   6. Install insulation at end of work day to allow proper staggering of insulation joints and layers.
   7. Install loose insulation at daily seal to prevent ponding and/or collection of water on temporary membrane seal.

3.05 CLEANING:

A. Upon completion of installation of roof system, flashings, and sheet metal, clean surfaces of roof membrane and membrane flashings by power washing methods. Remove debris, dirt, adhesives, sealants, surface contaminants, or materials that cause surface discoloration from surfaces.

B. Remove all work related dirt, debris, drippage, spills, etc. from finishes of roof surface, building, or building grounds.

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SECTION 07 54 10
ELASTOMERIC ROOF COATING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Application of elastomeric coating to existing metal roof panels.

1.02 RELATED SECTIONS:

A. 02 40 00 - Minor Demolition and Renovation Work.

B. 07 62 00 - Sheet Metal Flashing and Trim.

1.03 DEFINITIONS:

A. "Coating" as used in this Section means coating system materials including primers, sealers, caulks, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.04 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Provide primary products of single manufacturer with not less than five years of successful experience in producing elastomeric coating materials of type required for Project applications equivalent to requirements for this Project. Provide secondary materials only as recommended by manufacturer of primary roofing materials.

B. Installer Qualifications: Manufacturer licensed or approved applicator as certified in writing by primary materials manufacturer.

C. Provide on-site mock-ups, 2 feet by 2 feet, of two colors selected by Owner’s Representative for review and determination of final product.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to jobsite in manufacturer's unopened, labeled containers and comply with manufacturer's instructions for storage and handling. Containers shall bear UL label or FM approval marking.

1.06 PROJECT CONDITIONS:

A. Apply coatings only when temperature of surfaces and surrounding air temperatures and humidity levels are within limits specified by coating manufacturer during application and drying periods.

B. Do not apply coating in snow, rain, fog, mist, or when relative humidity exceeds 85 percent, or to damp or wet surfaces unless otherwise permitted by coating manufacturer's printed instructions.

C. Allow sufficient daylight hours necessary for elastomeric coating system to cure if ultraviolet light is required for curing process.

1.07 WARRANTY:

A. Contractor's Warranty: Provide Contractor's warranty covering defects in installed materials and workmanship for period of two years from date of final acceptance by Owner.

B. Manufacturer's Warranty: Provide manufacturer's ten year written warranty, signed by authorized representative of manufacturer, warranting applied roofing materials and labor from leakage, delamination, deterioration, blistering, or other coating failures resulting from installation and/or material failure.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Acceptable Manufacturers:
   1. GAF.
   2. Gaco.
   3. Or approved equal.

2.02 MATERIALS:

A. Rust Inhibitor: Water-based rust inhibitor to be applied over rusted areas after surface preparation such as "Metal Roof Primer" by GAF, or approved equal.

B. Base Coat: Single-component acrylic elastomer, gray in color such as “Premium Acrylic HydroStop Base Coat” by GAF, or approved equal.

C. Top Coat: Single-component elastomer with fungus resistant protection, white in color, such as "Premium Acrylic HydroStop TopCoat" by GAF, or approved equal.

D. Reinforcing Fabric: Flexible polyester mat of weight and type or composition recommended by coating manufacturer for embedment in coating such as “GAF Premium Fabric” by GAF, or approved equal.

E. Flashing Compound: Trowel grade acrylic elastomer such as "Premium Brush-Grade Acrylic Flashing" by GAF, or approved equal.

F. Self-Adhering Tape: A 6-inch (150mm) wide self-adhering tape composed of butyl-based rubber bonded to a woven polymer backing such as "WebSeal" by EternaBond.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Comply with manufacturer's instructions for preparation of substrate to receive coating.

B. Clean and power wash substrate free of dust, debris, and other substances detrimental to coating.

C. Repair flashings and metal prior to applying coating in accordance with coating manufacturer's recommendations.

D. Install new flashing sheets and accessory items as required to provide suitable substrate for coating.

E. Fill voids, including non-moving joints and rough areas of substrate, with flashing compound in manner recommended by coating manufacturer. Fill voids larger than 1/4-inch (6mm) with materials recommended by coating manufacturer's recommendations. Form coves at penetrations and corners in substrate.

F. Remove corrosion on metal substrate by power washing or power abrading methods down to bare metal. Apply rust inhibitor as recommended by coating system manufacturer. Replace corroded metal panels that cannot be properly prepared to receive coating.

G. Mask off, neat and square, adjoining areas and, as needed, areas not to receive coating.

H. Remove and replace corrode fasteners with new grommeted fasteners. Completely encapsulate fasteners with flashing compound.

I. Perform adhesion tests of proposed coating on existing substrate at 1 test per 5,000 square feet or minimum 4 tests.

3.02 APPLICATION:

A. Comply with instructions of roofing materials manufacturer for application of elastomeric coating, including integral flashings, reinforcing fabric, or surfacing. Apply total thickness of roofing membrane in number of coats required by the manufacturer to obtain a ten year materials and labor warranty.

B. Lap Joints and Flashing Detail Areas: Flash fasteners, laps, and seams, including horizontal seams, with self-adhering tape or reinforcing fabric and flashing compound as recommended by coating manufacturer.
   1. Apply a continuous troweling of flashing compound along the exposed edges of panel end laps and flashings.
   2. Apply an initial minimum 8-inch (200mm) wide strip of coating of the flashing compound, at rate recommended by manufacturer, over all panel end laps and flashing transitions.
   3. Adhere self-adhering tape or embed reinforcing fabric into flashing compound minimum 6-inches (150mm) wide, centered over laps.

C. Eave/Rake/Ridge Flashing:
   1. Replace corroded fasteners and fasteners with damaged washers and resecure/retighten loose fasteners. Replace foam closures with new foam closures and set in continuous tape sealant on top and bottom of closure.
   2. Apply flashing compound into joint between metal flashing and metal panels along roof edges feathered and extending 4-inches (100mm) onto metal panel and extending 4-inches (100mm) on top of metal and 4-inches (100mm) each side of end laps in metal.
   3. Adhere self-adhering tape or embed reinforcing fabric, 6-inches wide, into flashing compound and centered over horizontal seam and lap seams in metal.
   4. Remove existing fasteners and dismantle existing metal flashings as necessary to remove and install closures at panel terminations. Clean mating surfaces to receive new sealant tape. Install sealant tape between closure and metal flashing and metal panels. Secure metal panels with new fasteners

D. Metal Roof Panels:
   1. Prepare metal panels and apply new elastomeric coating to metal panels.
   2. Elastomeric Roof Coating Membrane: Apply membrane coating in manner to provide uniform thickness and minimum dry-film thickness to achieve specified warranty as required by material manufacturer.
      a. Base Coat: Apply coating perpendicular to metal roofing ribs at material manufacturer's recommendations. Cure in accordance with material manufacturer's recommendations. Correct defect, flaws, or holidays before applying second coat.
      b. Top Coat: Apply coating parallel to metal roofing ribs at 1-1/2 to 2 gallons per 100 square feet. Cure in accordance with material manufacturer's recommendations. Correct defect, flaws, or holidays.

3.03 FIELD QUALITY CONTROL:

A. Start installation of elastomeric coating only in presence of manufacturer's technical representative. Installation of elastomeric coating prior to presence of manufacturer's technical representative is subject to rejection. Submit written approval/acceptance of substrate conditions.

3.04 ADJUSTING:

A. Remove overspray, drips, runs, and spills and restore affected areas to pre-project condition prior to final acceptance of Project by Owner.

B. Repair or replace, as required, deteriorated or defective work found at time of final inspection. No seams should be visible on roof. Repair damages to roofing which occurred subsequent to roofing installation and prior to final inspection. Ensure that roof is in optimum condition at time of Substantial Completion and final inspection.

3.05 CLEANING:

A. Remove trash and debris from jobsite daily. Remove remaining materials furnished by Contractor or subcontractors from jobsite and dispose of after completion of roofing system.

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SECTION 07 57 13
SPRAYED POLYURETHANE FOAM ROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Furnish labor, materials, tools and equipment necessary for the application of spray applied polyurethane foam insulation, elastomeric roof coating, mineral granules and walkpads, including accessory items, subject to the general provisions of the contract.

B. The Manufacturer's application instructions for each product used are considered part of this specification and should be followed at all times.

C. Existing HVAC and other equipment shall be protected from any damage that could be caused by roofing demolition, foam over spray, coating and mishandling.

D. Raising, re-setting and protection of existing air conditioning equipment, ventilators, utility piping and exhaust fans as required to install new roofing.

1.02 RELATED SECTIONS:

A. 02 40 00 - Minor Demolition and Renovation Work.

B. 06 10 00 - Rough Carpentry.

C. 07 22 00 - Roof Board Insulation.

D. 07 52 00 - Modified Bitumen Membrane Roofing.

E. 07 62 00 - Sheet Metal Flashing and Trim.

1.03 PERFORMANCE REQUIREMENTS:

A. Watertightness: Provide spray applied polyurethane foam (with coating) roofing that is watertight and will not permit the passage of water.

B. Material Compatibility: Provide polyurethane foam, elastomeric coatings, and miscellaneous roofing materials that are compatible with one another and -able to bond to substrate under conditions of service and application required, as demonstrated by spray applied polyurethane foam (with coating) Roofing Manufacturer based on testing and field experience.

C. Energy Performance: Provide roofing system that meet or exceed any of the following options for Reflectance and Emittance:
   1. Three-year aged solar reflectance of 0.55 and three-year aged thermal emittance of 0.75.
   2. Three-year aged solar reflectance index of 64.

1.04 SUBMITTALS:

A. Submit reference list of 10 similar projects independently verified by and approved third party. Include project name, location, scope and current contact information. A minimum of 5 of these projects must include the application of Coating Manufacturers polyurethane products and a minimum of 5 of these projects must include the application of the SPF Manufacturers spray polyurethane foam products approved for use on this project.

B. Submit product data sheets and Material Safety Data Sheets (MSDS) for primers, polyurethane foam, elastomeric polyurethane coating, granules, other safety and handling instructions and installation instructions. Include Manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties.

C. Submit under provisions of Section 01 33 00 - Submittal Procedures.

D. Samples for Initial Selection: For roof coating colors.

E. Samples for Verification: For spray applied polyurethane foam (with coating) roofing, prepared on Samples of size indicated below:
   1. Samples, 24 by 24 inches, on rigid backing, showing polyurethane foam of thickness required and stepped coatings in colors required to illustrate buildup of spray applied polyurethane foam (with coating) roofing.

F. Qualification Data: For SPFA-qualified Installer and applicators.
   1. Manufacturer's Certification: Provide current letter(s) on foam Manufacturer's letterhead, signed by an authorized employee or corporate officer attesting to all following items:
      a. Qualifications: Certify and document system and items.
      b. Products: Certify that selected products and system meet or exceed specified requirements.
      c. Ensure roofing system components are physically and chemically compatible for installation as designed.
      d. Ensure proposed system meets all criteria for issuance of required Manufacturer's warranty.
      e. Specifically identify and define any deviations.

G. Applicator: Certify that installer is approved by Manufacturer for installation of selected products.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for spray-applied polyurethane foam (with coating) roofing.

I. Research/Evaluation Reports: For coated foamed roofing, from ICC Evaluation Service.

J. Field quality-control reports.

K. Maintenance Data: For spray-applied polyurethane foam (with coating) roofing to include in maintenance manuals.

L. Warranty: Sample of standard warranty.

1.05 QUALITY ASSURANCE:

A. Installer Qualifications: A qualified installer who is approved, authorized, or licensed by roof coating Manufacturer for installation of Manufacturer's product over polyurethane foam.
   1. Engage an installer who participates in and who has fulfilled requirements of the SPFA Accreditation Program for company accreditation and individual applicator accreditation for personnel assigned to work on Project.
   2. Installer shall have been in business a minimum of five (5) years and be able to show proof of successful completion of at least three (3) projects of similar scope and complexity to that being bid.
   3. Installer shall have a competent foreman (full-time, on-site) to maintain the standards required by these specifications. The foreman shall be technically proficient in this trade and be able to provide information to substantiate proficiency.

B. Source Limitations: Obtain polyurethane foam materials and coating products from a single Manufacturer of coated foamed roofing systems which has been successfully producing the specified types of primary products for not less than 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years.

C. Fire Rest Response Characteristics: Provide spray applied polyurethane foam (with coating) roofing systems with the fire-test-response characteristics indicated, as determined by testing identical systems per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes of 75 and 450, respectively; ASTM E 84.
2. Exterior Fire-Test Exposure: ASTM E 108; Class A.
3. Fire-Resistance Ratings: ASTM E 119, determined for coated polyurethane foam roofing as part of a roof assembly.

D. Field Quality Control: Upon completion of the roofing system installation, an inspection by a manufacturer's approved, prequalified third party inspection company is required. Cost of the inspection shall be borne by the installing contractor. The inspection will confirm that the installation meets or exceeds minimum requirements as detailed within this specification.

E. Acceptable Contractor: Contractor shall have a minimum of 4 years' experience under the same company name in installing the same or similar roofing materials and be certified in writing by the roofing materials manufacturer to install the primary roofing products.
1. Contractors and Roofing installers will be required to submit documentation demonstrating experience for a minimum of five completed projects of similar size and type within the last four years.
2. Roofing Contractor to have highest level of certification with roofing manufacturer.
3. Roofing contractor's certification will be reviewed during negotiation process.
4. Owner reserves the right to reject any proposed roofing contractor based on past performance and criteria above.
5. Should owner reject proposed roofing contractor, general contractor will not receive an adjustment in the contract sum.

F. Comply with recommendations in NRCA's "Quality Control Guidelines for the Application of Spray Polyurethane Foam Roofing."

G. Comply with recommendations in SPFA-104, "Spray Polyurethane Foam Systems for New and Remedial Roofing.

H. Pre-Installation Conference: Conduct conference at Project site prior to commencement of construction.
1. Review methods and procedures related to spray applied polyurethane foam (with coating) roofing including, but not limited to, the following:
a. Structural load limitations.
b. Construction Schedule: Verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
c. Certifying procedures.
d. Surface preparation specified in other Sections.
e. Substrate condition and pretreatment.
f. Minimum curing period.
g. Forecasted weather conditions.
h. Special details and sheet flashings.
i. Installation procedures.
j. Testing and inspection procedures.
k. Protection and repairs.

I. Manufacturer Requirements: Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful completion of the project.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to Project site in manufacturer's original containers with seals unbroken, labeled with Manufacturer's name, product identification and type, date of manufacture, shelf life, safety information, batch or lot number, and directions for storing and mixing with other components.

B. Store materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by Manufacturer. Protect stored materials from direct sunlight.

C. Remove and replace material that cannot be applied within its stated shelf life.

D. Materials shall be stored in compliance with local fire and safety requirements.

E. Materials shall be handled in accordance with the Manufacturer's guidelines.

1.07 PROJECT CONDITIONS:

A. Environmental Limitations: Do not deliver or install spray applied polyurethane foam (with coating) roofing until existing roof is properly prepped and cleaned, and all MEP equipment and lines have been properly raised and supported and parapets, expansion joints, wall dividers, gutters and sheet metal foam stops have been installed.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing work to be performed according to spray applied polyurethane foam (with coating) Roofing Manufacturer's written instructions and warranty requirements, subject to the following additional requirements:
   1. Do not install polyurethane foam insulation under the following conditions:
      a. When the surface temperature of the materials to receive spray applied polyurethane foam (with coating) is below 50 degrees Fahrenheit or above 160 degrees Fahrenheit.
      b. When the relative humidity is above 80 percent or the ambient temperature is within 5 degrees Fahrenheit of the dew point.
      c. When the wind velocity exceeds 15 mph (without the use of a wind screen).
   2. Do not apply materials to damp or wet surfaces.
   3. Do not apply primers, polyurethane foam, or coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period.
   4. Do not apply polyurethane foam when wind conditions result in surface finish textures not complying with requirements.
   5. Do not apply coatings when wind conditions prevent uniform coating application.
   6. Do not apply material unless surface to receive sprayed polyurethane foam and / or coating is clean, dry and free of all contaminants.
   7. Wind barriers shall be used if wind conditions could affect the quality of the spray polyurethane foam or coating installation during spraying.

1.08 SEQUENCING AND SCHEDULING:

A. In projects where other trades are also at work, the sprayed polyurethane foam shall be installed when the deck, parapet walls, rough openings, and curbs have been completed. Plumbing vents, drains and electrical penetrations shall be in place. No other trades are permitted on the roof while the sprayed polyurethane foam and coating are being installed.

1.09 WARRANTY:

A. Warranty: Spray applied polyurethane foam (with coating) Roofing Manufacturer's standard form in which Manufacturer agrees to repair or replace spray applied polyurethane foam (with coating) roofing that does not comply with requirements or that does not remain watertight within specified warranty period. Guarantee against leaks, sprayed polyurethane foam or coating membrane failures caused by faulty material or workmanship or by ordinary weathering, bird peck damage, wind forces up to 90 mph, and severe hail (SH) damage as defined by Factory Mutual Research Corporation (FMRC) simulated hail damage tests.
   1. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 POLYURETHANE FOAM:

A. Rigid cellular polyurethane, spray applied, produced by the catalyzed chemical reaction of polyisocyanurates with polyhydroxyls, with stabilizers, fire retardants, and blowing agents added; and complying with ASTM C 1029, Type III, as certified by a qualified independent testing agency.
   1. Subject to compliance with requirements, provide Polyurethane Foam Insulation, Manufactured by one of the following:
      a. Green Shield Products.
      b. Gaco Western.
      c. Neogard.
      d. Or approved equal.
   2. In-Place Density: Nominal 3.0 lb/ cu. ft. ASTM D 1622.
   3. Surface-Burning Characteristic: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.02 SILICONE COATING:

A. Silicone Coatings: Liquid silicone elastomeric coating system, complying with ASTM D 6694 and specifically formulated for coating spray polyurethane roofing.
   1. Subject to compliance with requirements, provide Silicone Coating, Manufactured by one of the following:
      a. Green Shield Products.
      b. Gaco
      c. Neogard.
      d. Or approved equal
   2. Base-Coat and Topcoat Composition: One component silicone.
   3. Topcoat Color at all roof areas: White.

2.03 AUXILIARY MATERIALS:

A. Primer: Polyurethane foam Manufacturer's standard factory-formulated primer.

B. Mineral Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained by No. 40 sieve.
   1. Color:
      a. Roof Field: White.
      b. Walk Pads: Safety Yellow.

C. Reinforcement: Flexible polyester or fiberglass mat of weight, type, and composition recommended by roof coating Manufacturer for embedment in liquid coating.

D. Walkway Pads: 4 Gal per 100 sf (64 wet mils) with safety yellow granules into wet coating at a rate of 0.5 lb/ 100 sf.

E. Sealant: ASTM C 920, Class 25, Use NT, Grade NS, Type S, one-component, neutral- or acid-curing silicone, and as recommended by spray applied polyurethane foam (with coating) Roofing Manufacturer for substrate and joint conditions and for compatibility with roofing materials.

F. Sheet Flashing and Accessories: Types recommended by spray applied polyurethane foam (with coating) Roofing Manufacturer, provided at locations indicated and as recommended by spray applied polyurethane foam (with coating) Roofing Manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine substrates, areas, and conditions under which spray applied polyurethane foam (with coating) roofing will be applied, with Installer present, for compliance with requirements. Begin installation only after unsatisfactory conditions have been corrected and substrates are acceptable to the Manufacturer.

B. Existing substrates muse be clean, dry and free of all loose dirt, dust and debris. Oil, grease, release agents or other contaminants shall be removed with proper cleaning solutions..

3.02 SURFACE PREPARATION:

A. Clean and prepare substrate according to spray applied polyurethane foam (with coating) Roofing Manufacturer's written instructions. Provide clean, dust-free, dew-free, and dry substrate for spray applied polyurethane foam (with coating) roofing application.

B. Remove grease, oil, form-release agents, curing compounds, and other contaminants from substrate..
   1. Prepare substrate for recovering according to spray applied polyurethane foam (with coating) Roofing Manufacturer's written instructions
   2. Existing Granule Surfaced BUR Surface Preparation:
      a. Remove loose granules from existing roof system by power vacuum or power sweep.
      b. Remove dirt, dust, debris, oil, grease, rust, loose scale, ice, frost, moisture, and other surface contaminants which could adversely affect application of spray applied polyurethane foam (with coating) roofing system.
      c. Examine roof for areas where cold application asphaltic materials may have been applied. Remove cutback asphalts and plastic cements down to the existing felts.
      d. Remove and replace blisters and delaminated/loose materials and replace to match adjacent material to remain.
      e. Remove designated and encountered “wet” areas and areas of saturation and replace with compatible materials to match existing to remain.
      f. Remove base flashings and counter flashing as required. Install new base flashing, counter flashing, and copings as required to ready the installation for new flashing work.
      g. Power wash existing roof membrane. Thoroughly rinse and allow to completely dry.
      h. Inspect the entire roof surface and flashings for any open seams, tears, cuts, etc. Repair these flaws so water is not blown under membrane during the cleaning and rinsing process. Pressure wash the entire roof with water and allow to dry completely. Clean substrate to remove all oils and surface contaminants.

C. Cover and mask adjoining / adjacent surfaces not receiving spray applied polyurethane foam (with coating) roofing to prevent overspray or spillage affecting other construction. Close off roof drains, removing roof drain plugs when no work is being done or when rain is forecast.
   1. Remove masking after polyurethane foam application and remask adjoining/adjacent substrates before coating.

D. Prime substrate if recommended by spray applied polyurethane foam (with coating) Roofing Manufacturer. Apply primer at coverage rates as recommended by manufacturer and as dictated by existing conditions to provide suitable substrate to receive new sprayed polyurethane foam.

E. Fill, cover, or tape joints and cracks in substrate that exceed a width of 1/4-inch. Remove dust, dirt and loose debris from joints and cracks before applying polyurethane foam.

F. Other Considerations: electrical conduits and other ancillary rooftop projections and/or equipment shall be masked prior to the application of the polyurethane foam. Electrical and mechanical conduits shall be relocated or raised above the roof surface.

3.03 POLYURETHANE FOAM APPLICATION:

A. General: Mix and apply polyurethane foam according to ASTM D 5469 and spray applied polyurethane foam (with coating) Roofing Manufacturer's written instructions.
   1. Fill irregularities and areas of ponding to achieve slopes and drainage patterns indicated on the Drawings.
   2. Apply the required full thickness, 2-inches, of polyurethane foam in any specific area on same day.
   3. Apply only the area of polyurethane foam that can be covered on same day with required-base coating.
   4. Apply polyurethane foam to avoid overspray beyond immediate area of work.
   5. Do Not Foam:
      a. Existing cable or wiring that is presently on the roof surface.
      b. Existing piping or pipe supports of any kind that is on the roof surface. Provide pipe supports as specified.
      c. Any existing weep holes in existing walls.

B. Apply polyurethane foam in lift thicknesses not less than 1/2-inch and not more than 1-1/2-inch.

C. Uniformly apply total thickness of polyurethane foam indicated, but not less than 1-inch, to a surface tolerance of plus 1/4-inch and no minus.

D. Apply polyurethane foam to roof penetrations, terminations, and vertical surfaces as indicated. Unless otherwise indicated, extend polyurethane foam at least 4-inches above elevation of adjacent roof field.
   1. Surface Finish: Provide finished surface of polyurethane foam within the following range of surface textures as defined by ASTM D 5469.
   2. Texture: Smooth to coarse orange peel.

E. Remove and replace polyurethane foam not complying with minimum surface texture limitations. Remove defective thickness and prepare and reapply polyurethane foam with acceptable, uniform results.

3.04 COATING APPLICATION:

A. Allow polyurethane foam substrate to cure for a minimum of two hours. Remove dust, dirt, water, and other contaminants before applying coating.

B. Apply coating system to polyurethane foam, in two or more coats and according to roof coating Manufacturer’s written instructions, by spray, roller, or other suitable application method.

C. Apply base coat and one or more topcoats to obtain a uniform, seamless membrane free of blisters and pinholes. Apply each coat at right angles to preceding coat, using contrasting colors for successive coats.
   1. Apply base coat on same day as polyurethane foam is applied and allow it to cure. Base coat thickness shall be as recommended by the Manufacturer to achieve the specified system warranty.
      a. The base coat must cover all surfaces completely extending at least 2" beyond the polyurethane foam on vertical terminations. An extra pass of base coat material is required at all edges and penetrations if GacoFlex NF-621 Neoprene Sheet Flashing is not used.
   2. Apply topcoat(s) after removing dust, dirt, water and other contaminants from base coat.
   3. Silicone Coating: Apply topcoat to a minimum dry film thickness of 38 mils, as recommend by spray applied polyurethane foam (with coating) Roofing Manufacturer for the specified 20 Year System Warranty.

4. Do Not Coat:
   a. Existing cable or wiring that is presently on the roof surface.
   b. Existing piping or pipe supports of any kind that is on roof surface. Provide pipe supports as specified.

D. Apply coating system at wall terminations and vertical surfaces to extend beyond polyurethane foam by 2-inches, minimum.

E. Mineral Granules: Apply mineral granules over additional wet topcoat at a rate to achieve 8 mils DFT at the rate of 30 lbs per 100 sf. Remove excess granules after topcoat has cured

F. Sealant: Apply sealant to perimeter and other terminations where indicated or required by spray applied polyurethane foam (with coating) Roofing Manufacturer.

G. Walkways: Install roof walkways in size and locations indicated on Drawings. Mask off completed roof coating adjacent to walkways and apply one coat of Silicone Coating at 64 mils WFT. Broadcast safety yellow granules in the wet coating at a rate of 0.5 lb per 100 sf.
   1. Note: No traffic shall be permitted on the coated surface for a minimum of 3 days.

3.05 FIELD QUALITY CONTROL:

A. Continuous Monitoring Equipment:
   1. Installer shall utilize the following equipment to continuously monitor the preparation and installation of the spray applied polyurethane foam insulation and coating system for the duration of the preparation and installation process.
      a. Data Loggers (to measure Temperature and Humidity).
      b. Anemometer (to measure wind speed).
      c. Digital Video Cameras (to time stamp work progression).
   2. The location of work undertaken outside of the specified parameters for temperature, humidity and wind speed will be identified using the data gathered by the instruments listed above. All materials that are installed out of compliance with the specifications will be removed at the expense of the Contractor and reinstalled in a manner compliant with the project specifications.

B. Destructive Testing:
   1. Core Samples and test slits will be taken at each roof area to insure compliance with the project specifications.
      a. Two core samples will be required for roof areas up to 10,000 sq. ft. and one core sample will be required for each additional 10,000 sq. ft. or part thereof.
      b. Two test slits will be made for roof areas up to 10,000 sq. ft. and one core sample will be required for each additional 10,000 sq. ft. or part thereof and will be taken to determine number of coats applied and dry film thickness of coating.

C. Correct deficiencies in, or remove, foam or coatings that do not comply with requirements; fill and repair substrates and reapply materials.

D. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.

E. Refill cores, repair slits and recoat test areas.

3.06 REPAIR AND RECOATING:

A. Repair and recoat spray applied polyurethane foam (with coating) roofing according to ASTM D 6705 and spray applied polyurethane foam (with coating) Roofing Manufacturer’s written instructions.

3.07 CURING, PROTECTING, AND CLEANING:

A. Cure coatings according to spray applied polyurethane foam (with coating) Roofing Manufacturer's written instructions, taking care to prevent contamination and damage during application stages and curing. Do not permit traffic on uncured coatings.

B. Protect spray applied polyurethane foam (with coating) roofing from damage and wear during remainder of construction period.

C. Clean overspray and spillage from adjoining and adjacent construction using cleaning agents and procedures recommended by Manufacturer of affected construction.

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SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Shop or field-formed sheet metal work for moisture protection.

B. Types of work specified in this Section include:
   1. Roof penetration bonnets.
   2. Counter flashings.
   3. Expansion joints.
   4. Coping.
   5. Miscellaneous sheet metal accessories.

1.02 RELATED SECTIONS:

A. 02 40 00 - Minor Demolition and Renovation Work.

B. 07 57 13 – Spray-applied Polyurethane Foam.

C. 07 52 00 - Modified Bitumen Membrane Roofing.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM).

B. Federal Specifications (FS).

C. National Roofing Contractor's Association (NRCA): NRCA Roofing and Waterproofing Manual, latest edition.

D. Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA): Architectural Sheet Metal Manual, latest edition.

E. ANSI/SPRI/FM 4435 ES-1: "Wind Test Standard for Edge Systems Used With Low Slope Roofing Systems."

1.04 WARRANTY:

A. Contractor's Warranty: Provide Owner a written warranty which shall warrant sheet metal work to be free of leaks and defects in materials and workmanship for two years after date of final acceptance by Owner.

B. For pre-finished metal, provide manufacturer's twenty-year guarantee covering deterioration or failure of the fluoropolymer finish.

1.05 PERFORMANCE REQUIREMENTS:

A. Roof edge sheet metal flashing/coping shall be certified by the manufacturer or shop-fabricator to comply with ANSI/SPRI Standard ES-1 for 150 mph wind speed and horizontal design pressure and vertical design pressure applicable for the eave height of the subject building. ANSI/SPRI ES-1 Test Method RE-1 and RE-2 Tests for Edge Metal: The edge metal shall be tested for 150 mph wind speed and horizontal design pressure and vertical design pressure applicable for the eave height of the subject building

B. The sheet metal edge flashing product shall be UL Classified by Underwriters Laboratories, Inc. or other third-party verification of compliance with the ANSI/SPRI ES-1 Wind Design Standard.

C. Provide base sheet metal that is manufactured in the United States and incorporates some percentage of recycled content. Provide documentation from manufacturer/supplier supporting this information.

1.06 MOCK-UPS:

A. Contractor to prepare mock-ups utilizing materials proposed for the finished product and to simulate the desired appearance of the finished product. Mock-ups shall be of appropriate size to depict finishes and connections

B. Schedule of mock-ups shall include the following: Typical wall counter flashing condition(s); typical metal edge/fascia condition(s); typical through-wall flashing; typical expansion joint cover/flashing; size of mock-ups shall be 3 feet minimum.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Acceptable Pre-finished Sheet Metal Manufacturers:
1. Berridge Manufacturing Company.
2. Peterson Aluminum Corporation (PAC CLAD).
3. McElroy Metals, Inc.
4. Metal Building Components, Inc. (MBCI).
5. Or approved equal.

2.02 SHEET METAL MATERIAL:

A. Pre-finished Metal: "Kynar 500" or "Hylar 5000" fluoropolymer pre-finished G90 galvanized/galvalume sheet metal, minimum 24 gauge. "Kynar 500" or "Hylar 5000" finish shall consist of a two coat Polyvinyladine flouride, minimum 70 percent by weight in coatings, dry film thickness 1 mil, factory applied by metal manufacturer or supplier. Color selected by Owner from manufacturer's standard color chart.

B. Zinc-coated (Galvanized) Sheet Metal: Commercial quality with 0.20 percent copper, in accordance with ASTM A 526 except ASTM A 527 for lock forming; coating designation G90 hot-dip galvanized, 24 gauge minimum.

C. Stainless Steel Sheet Metal: ASTM A240, Type 304, ASTM A480, No. 2B/2D Mill Finish, gauge as scheduled.

2.03 FASTENERS:

A. Fasteners shall be same metal as flashing and sheet metal being joined.

B. Exposed fasteners shall be self-sealing or gasketed for watertight installation.

C. Heads of fasteners, including but not limited to, rivets, screws, and bolts, that are exposed or visible shall have same manufactured finishes as item being secured; color to match when applicable.

D. Mechanical Fasteners:
1. Refer to Section 02 40 00 – Minor Demolition and Renovation Work.
2. Washers: Steel washers with bonded rubber sealing gasket.
3. Screws: Self-tapping sheet metal type compatible with material fastened.
4. Rivets: Stainless steel material for the head and stem, closed end, color to match sheet metal items being adjoined.

2.04 RELATED MATERIALS:

A. Solder:
1. ASTM B 32, alloy grade 58, 50 percent tin, 50 percent lead.
2. For Use with Stainless Steel: 60-40 tin/lead solder, ASTM B 32.

B. Flux:
1. Phosphoric acid type, manufacturer's standard.
2. For Use with Steel or Copper: Rosin flux.
3. For Use with Stainless Steel: Acid-chloride type flux, except use rosin flux over tinned surfaces.

C. Flexible Underlayment: Self-adhering rubberized asphalt sheet membrane, 40-mil thick, suitable for high-temperature applications up to 250 degrees Fahrenheit such as "WIP 300 HT" by Carlisle, or approved equal.

D. Adhesives: Type recommended by flashing sheet manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet.

E. Metal Accessories: Sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gauge required for performance.

F. Sealant:
   1. Type A: One component polyurethane sealant color to match finish of metal such as "Sikaflex 1a" by Sika Corp. or “Sonolastic NP1” by BASF, or approved equal.
   2. Type B: Low modulus silicone sealant for sealing metal-to-metal surface (i.e. metal edge, cover plates); color to match finish of metal; such as “Sikasil WS-290” or “Sikasil WS-295” by Sika Corp., “Dowsil 795 Silicone Building Sealant” or “Dowsil 790 Silicone Building Sealant” by Dow Corning, or “GE Silpruf 2000” by Momentive Performance Technologies; or approved equal.
   3. Type C: Self-adhering elastomeric butyl tape, 1/8-inch (3mm) by 3/8-inch (9mm), such as "Extru-Seal" by Pecora Corp, or approved equal.
   4. Type D: Type A: One component moisture cure polyether polymer sealant available in over 175 standard colors color; to match finish/color of adjacent sheet metal such as "Tite Bond Weather Master Sealant" by Franklin International, or approved equal.

G. Termination Bar: 1/8-inch (3mm) thick, 1-inch (25mm) wide extruded aluminum bar with flat profile, factory punched oval holes (1/4-inch by 3/8-inch [6mm by 9mm]) spaced 6-inches (150mm) on-center, such as "TB 125" by The TruFast Corp., “Heavy Flat Bar” by OMG, or approved equal.

H. Stainless Steel Clamp: Stainless steel banding with worm-drive tightening, sized for application such as "Make-A-Clamp Kit" by Dynamic Fastener, 800/821-5448.

2.05 FABRICATION - GENERAL:

A. Fabricate work in accordance with SMACNA Architectural Sheet Metal Manual and other recognized industry practices and approved shop drawings.

B. Comply with material manufacturer's instructions and recommendations for forming material.

C. Shop fabricate work to greatest extent possible. Fabricate inside and outside corners for metal edge flashings and copings from single piece with equal length legs, minimum 3 feet. Notch, lap, and seam inside and outside corners of counter flashings.

D. Fabricate for waterproof and weather resistant performance with expansion provisions for running work sufficient to permanently prevent leakage, damage, or deterioration of work. Form work to fit substrates.

E. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling.

F. Form materials with straight lines, sharp angles, smooth curves, and true levels. Avoid tool marks, buckling, and oil canning.

G. Fold back edges of exposed ends of sheet metal edge to form hem, 1/2-inch minimum.

H. Lap joints 1-inch (25mm) minimum. Rivet and solder joints on parts that are to be permanently and rigidly assembled for copper, stainless, aluminum, and galvanized sheet metal. Install rivets, spaced 1-inch (25mm) on-center and apply solder to secure and seal exposed edge of sheet metal in a uniform continuous bead with smooth top finish. Clean residue upon completion of soldering process. Fabricate sheet metal assemblies so that adjoining sections are nested to achieve continuous metal-to-metal contact.

I. Seams:
   1. Fabricate non-moving seams in sheet metal with flat-lock seams.
   2. Pre-finished Galvanized Sheet Metal: Seal pre-finished metal seams with rivets, spaced 1-inch (25mm) on-center, and silicone sealant, color to match metal finish.
   3. Metal Other than Aluminum: Tin edges to be seamed, form seams, and solder.

J. Expansion Provisions: Where lapped type expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with sealant concealed within joints.

K. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant in compliance with SMACNA standards.

2.06 FABRICATED ITEMS:

A. Counter Flashings: Minimum 24-gauge pre-finished sheet metal formed in maximum 10 foot (3m) lengths; fabricate counter flashing with broken fascia of length to extend over top edge of base flashing a minimum of 4-inches with 1/2-inch hemmed drip edge.

B. Wind Clips: Minimum 24-gauge pre-finished sheet metal, 1-inch (25mm) wide, length to engage counter flashing a minimum of 1/2-inch (13mm).

C. Roof Penetration Flashing Pan and Bonnet: Minimum 24-gauge stainless steel sheet metal. Fabricate pan with 1/4-inch (6mm) hem at top edge, 4-inch (100mm) wide horizontal flanges with rounded corners; to provide installed minimum clear inside perimeter dimension of 2-inches (50mm) on each side of penetrating element and 6-inch height. Fabricate bonnet in two-piece adjustable construction with 1/2-inch caulk trough along top edge and a skirt, with hemmed edge, of length to extend over top edge of pan a minimum of 2-inches (50mm).

D. Angle Termination Bar: 1-inch by 1-inch (25mm by 25mm) 24-gauge galvanized sheet metal.

E. Pipe Box (Base, Hood, and Face Plate): 24-gauge stainless steel sheet metal. Base shall be 8-inches in height, with 4-inch wide flanges with rounded corners and sized to provide minimum 2-inch clearance between pipes and box.

F. Cleats/Clips:
   1. Concealed Cleats/Clips: Continuous strips, 22-gauge sheet metal, same metal type and fascia profile as adjacent metal item, with 3/4-inch drip edge formed at a 30 degree angle with vertical wall.
   2. Exposed Cleats/Clips: 24-gauge pre-finished sheet metal.

G. Heat Exhaust/Gravity Vent/Turbine Vent: 24-gauge stainless steel sheet metal. Base shall be 8-inches in height with 4-inch wide horizontal flanges with rounded corners and hoods to conceal top of base.

H. Curb Cap Flashing: 24-gauge stainless steel sheet metal with 4-inch vertical fascias.

I. Scupper: Stainless steel sheet metal with 4-inch (100mm) wide nailing flanges with rounded corners. Provide prefinished sheet metal face plate with 4-inch wide flanges at overflow scupper locations.

J. Collector Head: Minimum 24 gauge pre-finished sheet metal with tapered bottom and sized 4-inches larger than scupper opening with overflow port on side.

K. Fascia Extender: 24 gauge pre-finished sheet metal with 1/2-inch stiffening rib at mid-span with 3/4-inch drips with 5/8-inch returns at 30-degree angle with vertical wall at bottom end formed in 10-foot lengths.

L. Expansion Joint: 24-gauge stainless steel sheet metal cover and clip with standing seam profile at joints.

M. Coping:
   1. Shop-Fabricated Option: 24-gauge pre-finished sheet metal for 8-inch maximum width and 22-gauge for 8-inch to 12-inch width with 6-inch (150mm) wide back-up plates of same profile. Form 3/4-inch drips with 5/8-inch returns at 30-degree angle with vertical wall at bottom end of both interior and exterior fascias. Fabrication to meet specified ANSI/SPRI ES-1 requirements for 110 mph.
   2. Pre-Manufactured Option: Pre-manufactured prefinished sheet metal coping of designated dimensions and meeting ANSI/SPRI ES-1 requirements for 110 mph with continuous cleat installed over sloped substrate such as “Sloped Formed Coping” by Hickman Engineered Systems, “One Coping” by Metal Era, or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that substrates are smooth and clean to extent needed for sheet metal work.

B. Verify that reglets, nails, cants, and blocking to receive sheet metal are installed and free of concrete and soil.

C. Do not start sheet metal work until conditions are satisfactory.

3.02 INSTALLATION:

A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form 1/4-inch (6mm) hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Install prefabricated corners or transitions at changes in direction, elevation or plane, and at intersections. Locate field joints not less than 12-inches (300mm), nor more than 3 feet (1m) from actual corner. Laps for all metals, except for prefinished metal, shall be 1-inch (25mm) wide, fastened with rivets spaced 1-inch (25mm) on-center and soldered.

B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners where possible; and set units true to line and level as indicated. Install work with laps, joints, and seams permanently watertight and weatherproof.

C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

D. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by coating affected surfaces with zinc chromate or other permanent liquid-applied or sheet product separation at locations of contact.

E. Continuous Cleat: At exposed edges of metal edge flashings, fascias, copings, and where required, attach continuous cleat at 6-inches (150mm) on-center with appropriate fasteners positioned on the vertical face and fastened into 2X blocking, concrete/masonry substrate, metal wall panels, or steel substrate. At a distance of 10 feet (3m) from each direction of corner, install fasteners 3-inches (75mm) on-center. Install cleat so fascia extends a minimum of 1-inch (25mm) below top of exterior wall finish.

F. Counter Flashings:
   1. Install new counter flashings under equipment housing flanges and existing or new receivers along rise or parapet walls to extend a minimum of 4-inches below top edge of base flashing.
   2. Secure counter flashing at 6-inches (150mm) on-center with self-tapping screws.

3. Saw-cut Reglet Mounted Assemblies: Saw cut new joint, 1/2-inch by 1-inch deep, in existing masonry/concrete where required and to install new receiver. Clean and prepare joint surfaces to receive sealant and insert receiver into joint. Secure new receiver in place with lead wedges spaced 12-inches (300mm) on-center wedged into joint. Install backer rod into saw-cut reglet and apply a continuous bead of sealant, Type B, along reglet and top edge of receiver and tool sealant to provide outward sloping finished surface. Secure counter flashing to receiver utilizing self-tapping grommetted screws spaced 6-inches (150mm) on-center.
4. Surface-mounted Assemblies: Secure two-piece surface-mounted receiver and counter flashing assemblies along concrete substrates. Install sealant tape, Type C, between receiver and substrate. Secure receiver to substrate with termination bar and appropriate fasteners spaced 12-inches on-center. Install a continuous bead of sealant, Type B, along caulk trough/top edge of receiver and tool sealant to provide outward sloping finished surface. Secure counter flashing to receiver utilizing grommetted self-tapping screws spaced 6-inches (150mm) on-center.
5. Install new receivers extending behind wall finish and secure vertical flange of receiver 6-inches on-center to back-up wall or metal wall panels. Extend underlayment and/or dampproofing material over vertical flange of receiver, where applicable.
6. Lap adjacent sections of receivers and counter flashings a minimum of 4-inches (100mm). Apply a continuous bead of sealant, Type B in lap.
7. Trim existing counter flashings at curbs and walls that are to remain to receive new flashings. Secure new counter flashing to trimmed existing flashing utilizing self-tapping screws spaced 6-inches (150mm) on-center.
8. Install wind clips to termination bar spaced 24-inches (600mm) on-center and engage drip edge of counter flashing a minimum of 1/2-inch (13mm).
9. Fabricate the counter flashing to form an integral closure at terminations.

G. Scupper:
1. After field membrane is installed, install sheet metal scupper insert into wall opening. Set scupper in sealant and secure flanges of scupper to wall and deck with appropriate fasteners.
2. Strip-in flanges of scupper with appropriate flashing membrane.
3. Install sealant, Type A, around exterior opening of scupper between metal insert and wall.
4. Attach face plate to scupper insert and wall and apply sealant around perimeter of face plate.
5. Attach collector head to scupper and wall and apply sealant around perimeter.
6. Install new downspouts plumb and level, attached to columns or wall with straps located at top and bottom of downspout and 10 feet (3m) on-center, maximum.
7. Install splash block under discharge port of downspouts. Install splash block over a protection pad for downspouts located at roof level.

H. Expansion Joint:
1. Construct new curbs as shown in drawings using materials as specified herein.
2. Secure insulation layers and wood nailer to metal curb.
3. Install new elastic underlayment, form envelope, and secure underlayment to curb. Fill envelope with new compressible insulation.
4. Secure clips to curb with grommetted screws at 6-inches on-center. Securely fasten new expansion joint cover to curb with new grommetted fasteners spaced 6-inches (150mm) on-center and engage clip to allow 1-inch movement.
5. Form 1-inch high hemmed standing seam joint at adjoining sections of the cover.
6. Taper expansion joint down at the metal edge. At roof edge, install two-piece sheet metal cover/closure engaged onto drip edge of metal edge flashing and hemmed into cover.

I. Coping:
   1. Install new 2X wood nailers and/or 2X wood nailers and plywood to provide substrate on top of wall to have a resulting positive slope (minimum 1-inch per foot) toward roof.
   2. Install and adhere underlayment or flashing membrane over the wood substrate extending a minimum of 1-inch below top of wall system. Lap ends minimum of 3-inches (75mm) and secure membrane in place on exterior vertical face.
   3. Install metal coping segments allowing 1/2-inch (13mm) spaces between segments. Lock coping onto cleat and install appropriate fasteners through the interior fascia spaced 24-inches (600mm) on-center in enlarged holes.
   4. Install back-up plates centered under butt joints at adjoining sections of coping and set in continuous beads of sealant, Type B, placed approximately 1-inch (25mm) from cover edges.
      Install appropriate fastener through neoprene washer and back-up plate between coping segments. Apply bead of sealant, color to match sheet metal, in butt joint tooled to match surface of adjacent coping sections.

3.03 CLEANING:

A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean and free of stains, scrap, and debris.

B. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration/damage of finishes. Paint (color to match) areas of prefinished metal where finish is damaged. Replace sheet metal items when damaged finish can not be repaired to an acceptable condition.

C. Prime soldered area of phosphatized metal after cleaning to prevent rusting.

D. Paint with white-colored elastomeric coating, exposed lead flashings that have been soiled by Work and cannot be properly cleaned. Use medium nap roller to apply paint to surfaces to achieve monolithic finished color.

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SECTION 07 62 10
SINGLE PLY SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Shop or field-formed sheet metal work for single ply roof system (Alternate).

B. Types of work specified in this Section include:
   1. Ridge vents
   2. Counter flashings.
   3. Edge flashing.
   4. Fascia.
   5. Penetrations.
   6. Gutters and downspouts.
   7. Miscellaneous sheet metal accessories.

1.02 RELATED SECTIONS:

A. 07 53 50 - Metal Retrofit Single-ply Roof System

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM).

B. Federal Specifications (FS).

C. National Roofing Contractor's Association (NRCA): NRCA Roofing and Waterproofing Manual.

D. Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA): Architectural Sheet Metal Manual.

E. ANSI/SPRI ES-1 "Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems".

1.04 QUALITY ASSURANCE:

A. High performance roof edge shall be certified by the manufacturer to comply with ANSI/SPRI Standard ES-1. Roof edge/gravelstop shall meet performance design criteria according to the following test standards:
   1. ANSI/SPRI ES-1 Test Method RE-1 Test for Roof Edge Termination of Single-ply Roofing Membranes: The fascia system shall be tested to secure the membrane to minimum 100 lbs/ft in accordance with the ANSI/SPRI ES-1 Test Method RE-1
   2. ANSI/SPRI ES-1 Test Method RE-2 Pull-Off Test for Fascia: The fascia system shall be tested in accordance with the ANSI/SPRI ES-1 Test Method RE-2.
   3. The roof edge product shall be UL Classified by Underwriters Laboratories, Inc. or other third-party verification of compliance with the ANSI/SPRI ES-1 Wind Design Standard.

1.05 WARRANTY:

A. Contractor's Warranty: Provide Owner a written warranty which shall warrant sheet metal work to be free of leaks and defects in materials and workmanship for two years after date of final acceptance by Owner.

B. Manufacturer's Standard Warranty: Warranted materials shall be free of defects in material and workmanship for five years after shipment. If, after inspection, the manufacturer agrees that materials are defective, the manufacturer shall at their option repair or replace them. For decorative finish warranty, consult manufacturer.

PART 2 - PRODUCTS

2.01 SHEET METAL MATERIAL:

A. Pre-finished Metal: "Kynar 500" or "Hylar 5000" fluoropolymer pre-finished G90 galvanized/galvalume sheet metal, minimum 24 gauge. "Kynar 500" or "Hylar 5000" finish shall consist of a two coat polyvinyladine fluoride, minimum 70 percent by weight in coatings, dry film thickness 1 mil, factory applied by metal manufacturer or supplier. Color as selected by Owner from manufacturer's standard color chart.

B. Zinc-coated (Galvanized) Steel Sheet: Commercial quality with 0.20 percent copper, in accordance with ASTM A 526; 24 gauge minimum.

C. Polymer-coated Metal: 24 gauge G-90 galvanized steel base metal laminated with polymer coating, 1mm (0.020-inch) thick, compatible with thermoplastic sheet membrane color to match membrane such as “Sure-Weld Coated Metal" by Carlisle, or as approved by membrane material manufacturer.

D. Stainless Steel Sheet Metal: ASTM A240, Type 304, ASTM A480, No. 2B/2D Mill Finish, 24 gauge.

2.02 FASTENERS:

A. Fasteners shall be same metal as flashing and sheet metal being joined.

B. Exposed fasteners shall be self-sealing or gasketed for watertight installation.

C. Heads of fasteners, including but not limited to, rivets, screws, and bolts, that are exposed or visible shall have same manufactured finishes as item being secured; color to match when applicable.

D. Mechanical Fasteners:
   1. Washers: Steel washers with bonded rubber sealing gasket.
   2. Screws: Self-tapping sheet metal type compatible with material fastened.
   3. Rivets: Stainless steel for the head and stem, closed end; type and color to match sheet metal items being adjoined.

2.03 RELATED MATERIALS:

A. Solder: 40-60 tin/lead solder with less than 0.5% weight of antimony, ASTM B 32.

B. Metal Accessories: Sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gauge required for performance.

C. Sealant: In accordance with Section 07920 - Joint Sealants.

D. Stainless Steel Clamp: Stainless steel banding with worm-drive tightening, sized for application such as "Make-A-Clamp Kit" by Dynamic Fastener, 800/821-5448.

E. Termination Bar: 1/8-inch (3mm) thick, 1-inch (25mm) wide extruded aluminum bar with flat profile, factory punched oval holes (1/4-inch by 3/8-inch [6mm by 9mm]) spaced 6-inches (150mm) on-center; "Heavy Flat Bar" by OMG.

2.04 FABRICATION - GENERAL:

A. Fabricate work in accordance with SMACNA Architectural Sheet Metal Manual and other recognized industry practices and reviewed/approved shop drawings.

B. Comply with material manufacturer's instructions and recommendations for forming material.

C. Shop fabricate work to greatest extent possible. Fabricate inside and outside corners for metal edges, counter flashing, and coping caps. Fabricate corners with equal length legs, minimum 2 feet.

D. Fabricate for waterproof and weather resistant performance with expansion provisions for running work sufficient to permanently prevent leakage, damage, or deterioration of work. Form work to fit substrates.

E. Make angle bends and folds for interlocking metal with full regard for expansion and contraction to avoid buckling or fullness in metal after installation.

F. Form materials with straight lines, sharp angles, smooth curves, and true levels. Avoid tool marks, buckling, and oil canning.

G. Fold back edges on concealed side of exposed edge to form hem.

H. Lap joints 1-inch minimum. Rivet and solder joints on parts that are to be permanently and rigidly assembled. Install rivets, spaced 1-inch on-center and apply solder to secure and seal exposed edge of sheet metal in a uniform continuous bead with smooth top finish. Clean residue upon completion of soldering process. Fabricate sheet metal assemblies so that adjoining sections are nested to achieve continuous metal-to-metal contact.

I. Seams: Fabricate non-moving seams in sheet metal with flat-lock and soldered seams. Tin edges to be seamed, form seams, and solder.

J. Expansion Provisions: Where lapped or expansion provisions in work cannot be used or would not be sufficiently waterproof or weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant concealed within joints.

K. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant in compliance with SMACNA standards.

2.05 FABRICATED ITEMS:

A. Receivers and Counter Flashings: Minimum 24-gauge pre-finished sheet metal formed in maximum 10 foot lengths; fabricate “S”-shaped receiver to engage counter flashing a minimum of 1-inch; fabricate counter flashing with broken fascia of length to extend over top edge of base flashing a minimum of 4-inches with 1/2-inch hemmed drip edge.

B. Wind Clips: Minimum 24-gauge pre-finished sheet metal, 1-inch wide, length to engage counter flashing a minimum of 1/2-inch.

C. Miscellaneous Trim Flashing: 24-gauge pre-finished sheet metal.

D. Low-profile Metal Eave Flashing: TPO-clad sheet metal formed in maximum 10-foot lengths, with 4-inch wide horizontal flange and 2-inch fascia with 1/2-inch hemmed kick-out.

E. Fascia Extender: 24-gauge pre-finished sheet metal.

F. Roof Penetration Pan and Bonnet: Polymer-coated metal base with 24-gauge prefinished galvanized sheet metal bonnet.

G. Heat Exhaust Vent: Polymer-coated metal base, 12-inch height with 4-inch (100mm) flanges with rounded corners; base diameter sized to provide minimum 2-inch clearance between pipe and base; and 24-gauge pre-finished, white in color, sheet metal bonnet.

H. Cleats/Clips:
   1. Concealed Cleats/Clips: Continuous strips, 22-gauge galvanized sheet metal, same fascia profile as adjacent metal item with 3/4-inch drip edge formed at a 30 degree angle with vertical wall.
   2. Exposed Cleats/Clips: 24-gauge prefinished sheet metal.

I. Angle Termination Bar: 1-inch by 1-inch (25mm by 25mm) 24-gauge galvanized sheet metal.

J. Rake Edge/Fascia: Polymer-coated metal with 4-inch horizontal flange, 1-inch high vertical hem and fascia, length to extend a minimum of 1-inch below top edge of exterior wall cladding. Form 3/4-inch drip with 5/8-inch return at 30° angle with vertical wall. Provide a 24-gauge pre-finished sheet metal fascia cover with horizontal reinforcing rib at mid-span to attach to drip edge and vertical hem formed in maximum 10-foot (3m) lengths.

K. Ridge Vent: Polymer-coated sheet metal base, 12-inch (300mm) height with 4-inch (100mm) flanges with rounded corners, with prefinished sheet metal hood, clips, straps and stainless steel wire “insect” screen.

L. Gutter and downspout: 24-gauge pre-finished sheet metal gutter 6-inch width and 6-inch depth; downspout shall be 4-inches (100mm) by 6-inches (150mm) with seam located on back of downspout. Downspout and gutter straps shall be 1-inch wide double-hemmed pre-finished sheet metal with rounded corners; brackets to be 1/8-inch galvanized steel wrapped with prefinished sheet metal.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that substrates are smooth and clean to extent needed for sheet metal work.

B. Verify that reglets, nails, cants, and blocking to receive sheet metal are installed and free of concrete and soil.

C. Do not start sheet metal work until conditions are satisfactory.

3.02 INSTALLATION:

A. Install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from objectionable wave, warp, or buckle. Exposed edges of sheet metal shall be folded back to form 1/4-inch hem on concealed side from view. Finished work shall be free from water retention and leakage under all weather conditions. Install prefabricated corners or transitions at changes in direction, elevation or plane, and at intersections. Locate field joints not less than 12-inches, or more than 3 feet from actual corner. Laps for all metals shall be 1-inch wide, fastened with rivets spaced 1-inch on-center and soldered.

B. Anchor units of work securely in place to prevent damage or distortion from wind or buckling. Provide for thermal expansion of metal units; conceal fasteners where possible; and set units true to line and level as indicated. Install work with laps, joints, and seams permanently watertight and weatherproof.

C. Install fabricated sheet metal items in accordance with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.

D. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates by installing self-adhering underlayment sheet or other permanent separation at locations of contact as recommended by manufacturer or fabricator. Do not use materials incompatible with roofing system.

E. Continuous Cleat/Clips: Attach continuous cleats/clips at 6-inches on-center with appropriate fasteners positioned on the vertical face. At a distance of 10 feet from each direction of corner, install fasteners 3-inches on-center. Install cleat so fascia extends a minimum of 2-inches below top of exterior wall finish.

F. Counter Flashings:
1. Install new receivers and counter flashings along rise walls and curbs.
2. Secure counter flashings to receivers or flanges of equipment hoods/covers at 6-inches on-center with self-tapping grommetted screws.

3. Lap adjacent sections of receivers and counter flashings a minimum of 4-inches. Apply a continuous bead of sealant, Type B, in lap.
4. Install wind clips spaced 24-inches on-center and secured to termination bar.

G. Low-profile Metal Eave Flashing:
1. Install metal edge flashing/cleat on top of single ply membrane along eaves.
2. Secure horizontal flange of metal flashing to substrate with appropriate fasteners spaced 3-inches on-center, staggered.
3. Butt adjacent sections of metal flashing and install back-up plate under butt joint with beads of sealant, Type B, in laps.
4. Strip-in flange of metal flashing with single ply membrane concealing flange and extending beyond edge of flange to achieve proper welded lap seam.

H. Roof Penetration Hoods and Bonnet:
1. Install watertight bonnet at penetration locations.
2. Round or Pipe Penetrations:
   a. Set bonnet in sealant, Type A; utilize Type B sealant at heat sensitive areas.
   b. Tighten draw band.
   c. Seal top of bonnet with sealant, Type A; utilize Type B sealant at heat sensitive units.
3. Square Penetration:
   a. Secure bonnet to penetration with self-drilling screw.
   b. Set bonnet in sealant, Type C.
   c. Seal top of bonnet with sealant, Type B.

I. Ridge Vent:
1. Install polymer-coated metal ridge vent bases on roof membrane, secure flanges with appropriate fasteners spaced 6-inches on-center and install membrane flashing over base.
2. Install insect screen over opening in vent.
3. Install straps and hood over vent, securing to each side with self-tapping screws.

J. Heat Exhaust:
1. Install polymer-coated base around heat exhaust vent, secure flange with appropriate fasteners spaced 6-inches on-center, and apply flashing membrane.
2. Install heat-resistant insulation between base and vent.
3. Install and secure bonnet on vent and apply heat-resistant sealant along top edge of bonnet.

K. Gravity Vents:
1. After membrane installation, install sheet metal base at existing vent pipes extending through deck. Hot-air weld membrane flashing to top edge of base, apply sealant, and secure with stainless steel draw band.
2. Secure hood to base with four grommetted screws.

L. Gutter
1. Install brackets attached to substrate with two screws per bracket and brackets spaced 3-feet on-center. Install fascia extender behind brackets to extend a minimum of 1-inch below bottom of gutter and to conceal top edge of exterior wall finish/demarcation.
2. Secure gutter to substrate with appropriate fastener spaced 6-inches on-center.
3. Fabricate gutter spacers spaced 3 feet (1m) on-center attached to front and back of gutter with pop rivets and staggered from brackets.
4. Lap joints in gutters 2-inches (50mm). Apply a continuous bead of sealant, Type A, between lap and install two rows of rivets spaced on 1-inch (25mm) centers, staggered. Lap joints in direction of flow of water within gutter. Apply reinforced coating or liquid flashing over lap joints and downspout connections in gutters.
5. Install expansion joints in gutter in continuous runs exceeding 50-feet. Install end caps secured with pop rivets and sealed. Install snap-on cap/cover over top of end caps.

6. Install downspouts at designated locations to match existing. Install downspouts within 50 linear feet of gutter length, within expansion joints, or within section of gutter installed along each roof edge length of less than 50 feet.
7. Install new downspouts plumb and level and secure to wall with straps located at bottom of downspout and located at joints in downspouts. Install downspouts to conform to wall or substrate configuration. Install downspouts into drainage inlets at ground level or onto splash block.

M. Metal Rake Edge:
1. Install metal edge over membrane and lock to cleat.
2. Along rake edge, lap adjacent sections of metal edge in direction of slope a minimum of 4-inches (100mm). Sandwich a continuous bead of sealant, Type B, in lap joint.
3. Secure horizontal flange of metal edge to wood nailer with appropriate fasteners spaced 3-inches (75mm) on-center, staggered.
4. Hot-air weld strip-in membrane over flange of metal edge.
5. Install pre-finished sheet metal cover/fascia over clad-metal edge; field crimped to drips and hemmed edges.

3.03 CLEANING:

A. Remove flux and residual acid immediately by neutralizing with baking soda and washing with clean water. Leave work clean and free of stains, scrap, and debris.

B. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration/damage of finishes. Replace sheet metal items when damaged finish can not be repaired to an acceptable condition.

C. Prime soldered area of phosphatized metal after cleaning to prevent rusting.

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SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Applying sealant to counter flashings, reglets/receivers, and other roofing related sheet metal.

B. Replacing sealants in control joints in EIFS in rise walls.

1.02 RELATED SECTIONS:

A. 02 40 00 - Minor Demolition and Renovation Work.

B. 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM).

B. Federal Specifications (FS).

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's product data, joint preparation and installation instructions, and color charts for each product required.

B. Submit manufacturer's certification that products meet specified requirements and are appropriate for project applications.

C. Samples for Initial Selection Purposes: Submit manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available for each product exposed to view.

1.05 QUALITY ASSURANCE:

A. Product Labels: Include manufacturer's name, type of sealant, and color on labels of containers.

B. Single Source Responsibility for Joint Sealer Materials:
   1. Obtain joint sealer materials from single manufacturer for each different product required.
   2. Provide primers, joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience as supplied and warranted by one manufacturer.
   3. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

C. Installer Qualifications: Installer having not less than five years successful experience in comparable projects and employing personnel skilled in operations required for project.

D. Field Sample: Upon directions of Owner, prepare 12-inch (300mm) samples in presence of Owner demonstrating removal and cleaning process and application of sealant.

E. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealers to joint substrates under environmental conditions that will exist during actual installation.

F. Installer to perform field adhesion in peel testing using hand pull method. Perform a minimum of one test on every type of substrate and joint condition.
   1. Test Method: Test joint sealers by hand pull method described below:
      a. Install joint sealants in 4 feet joint lengths using same materials and methods for joint preparation and joint sealant installation required for complete work. Allow sealants to cure fully before testing.

b. Make knife cuts as follows: A horizontal cut from one side of joint to the other followed by two vertical cuts approximately 2-inches (50mm) long at side of joint and meeting horizontal cut at top of 2-inch (50mm) cuts. Place a mark 1-inch (25mm) from top of 2-inch (50mm) piece.
c. Use fingers to grasp 2-inch (50mm) piece of sealant just above 1-inch (25mm) mark; pull firmly down at a 90 degree angle or more while holding a ruler along side of sealant. Pull sealant out of joint to the distance recommended by sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension; hold this position for ten seconds.

2. Report whether or not sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
3. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of non-compliance with requirements, will be considered satisfactory. Do not use sealants which fail to adhere to joint substrate during testing.
4. Repair test cut areas immediately after completion of testing work.
5. Notify in advance and conduct adhesion testing in presence of Consultant.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials in original containers with seals unbroken and labels intact.

B. Store materials in a single lockable area of project site.

C. Protect materials from extreme temperatures and exposure. Store in accordance with manufacturer's recommendations.

1.07 PROJECT CONDITIONS:

A. Environment: Comply with sealant manufacturer's recommended minimum and maximum installation temperatures and other weather protection.

1.08 SEQUENCING AND SCHEDULING:

A. Do not remove more sealant than can be replaced in same day.

1.09 WARRANTY:

A. Manufacturer's Warranty: Provide manufacturer's standard warranty for type of sealant specified.

B. Contractor's Warranty: Provide written warranty against leakage and defects in workmanship for a period of two years from date of final acceptance by Owner.

PART 2 - PRODUCTS

2.01 SEALANT:

A. Sealant:
1. Type A: One component polyurethane sealant, color to match finish of metal. such as "Sikaflex 1a" by Sika Corp. or “Sonolastic NP1” by BASF, or approved equal.
2. Type B: Low modulus silicone sealant color to match finish of metal or as selected by Owner; such as “Sikasil WS-290” or “Sikasil WS-295” by Sika Corp., “Dowsil 795 Silicone Building Sealant” or “Dowsil 790 Silicone Building Sealant” by Dow Corning, or “GE Silpruf SCS 2000” by Momentive Performance Technologies; or approved equal.
3. Type C: Self-adhering elastomeric butyl tape, 1/8-inch (3mm) by 3/8-inch (9mm), such as "Extru-Seal" by Pecora Corp. or approved equal.
4. Type D: One component polyether sealant for exterior finishes for color matching finish such as "Tite Bond Weather Master Sealant" by Franklin International, or approved equal.

2.02 RELATED MATERIALS:

A. Cleaner: Noncorrosive, nonstaining type, compatible with joint forming materials as recommended by sealant manufacturer.

B. Joint Backing: Closed cell non-gassing polyethylene foam rod, over-sized 30 to 50 percent for joint size, compatible with sealant, sized and shaped to provide proper compression upon insertion in accordance with manufacturer's recommendations such as “Sonolastic Soft Backer-Rod” by BASF, “SofRod” by Namaco, or approved equal products.

C. Bond Preventive Materials: Pressure sensitive adhesive polyethylene strip recommended by sealant manufacturer to suit application “Pecora 531 Bond Breaker Tape” by Pecora Corp.

D. Primer: Nonstaining type as recommended by sealant manufacturer to suit application.

E. Masking Tape: Nonstaining, nonabsorbent type compatible with sealant and surfaces adjacent to joints.

2.03 MIXING:

A. Mix multi-component products as directed by manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Removing Existing Sealants and Mortar:
1. Cut out and remove existing sealants, backer rods, bond breaker tapes, mortar and other loose materials to depth as required by sealant manufacturer or to 1/2-inch (13mm) minimum. Grind or otherwise abrade masonry and concrete substrates to remove foreign material to clean, sound substrate.
2. Remove foreign matter from joint substrates which could interfere with adhesion of joint sealant. Remove dust, oil, grease, waterproofing, water repellent, surface dirt, and paints, except for permanent protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer.

B. Cleaning:
1. Clean joints receiving sealant and adjacent surfaces in manner not to damage existing materials. Perform cleaning of joints the same day sealant is to be installed in cleaned joint.
2. Remove dust and debris by blowing clean with high pressure air.
3. Wipe nonporous surfaces clean with solvent such as MEK, toluene, xylene, or isopropyl alcohol (IPA) and clean, lint free, and 100 percent cotton cloths.
4. Wipe non-porous surfaces with a second clean, lint free, 100 percent cotton cloth before solvent evaporates.

C. Cleaning Metal Substrates:
1. All corrosion, scale, old sealant, and existing paint coatings must be removed to clean, bright metal.
2. Solvent clean contact surfaces with clean cloth and solvent such as MEK, or as required by sealant manufacturer.
3. Wipe clean with a second clean, lint free cloth before solvent evaporates.
4. Prime substrate if required by the sealant manufacturer.

D. Priming:
1. Apply primer on joint substrates to receive sealant based upon preconstruction sealant adhesion tests.
2. Apply primer to comply with joint sealer manufacturer's recommendations. Apply primer to surfaces the same day sealant is to be installed onto primed surfaces.
3. Confine primers to area of joint sealer bond. Do not allow spillage or migration onto adjoining surfaces.

E. Masking: Mask areas adjacent to joints to prevent sealant contact with surfaces which would be permanently stained or damaged by sealant or by cleaning methods required to remove excess sealant.

3.02 APPLICATION:

A. Joint Backing:
1. To achieve required joint depths, restrict depth of joints by use of joint backer rod.
2. Size backer rod to allow for 30 percent minimum compression of the backer rod when installed.
3. Where joint backing material is not feasible due to insufficient clearance or depth, install bond preventive material in joint.
4. Three-sided adhesion of sealant is not permitted.

B. Sealant:
1. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates.
2. Apply sealant in uniform continuous bead without gaps or air pockets, following manufacturer's instructions for each specific type of sealant.
3. Provide uniform cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
4. Provide 1/4-inch minimum adhesion on all sealant joint and wet seal joint substrates; provide 1/4-inch minimum joint thickness.
5. Provide minimum width-to-thickness ratio of 2:1.
6. Apply cap bead of sealant over exposed fastener heads securing items and lap joints in sheet metal components, completely concealing fastener and exposed edge of lap with sealant.
7. Apply fillet-shaped bead of sealant along surface-mounted counterflashings, caulk troughs, and other similar conditions.

C. Tooling:
1. Tool joints to required configuration in accordance with manufacturer's recommendations.
2. Sealant Tape:
   a. Provide continuous uniform bed of sealant tape on horizontal bearing surfaces. Butt adjacent sections end-to-end.
   b. Prior to mating surfaces, remove backing paper from the installed tape.
   c. Firmly press or clamp assembly upon removal of backing paper.
3. Tooling Non-sag Sealants:
   a. Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration required.
   b. Eliminate air pockets and ensure contact and adhesion of sealant with sides of joint.
   c. Remove excess sealant from surfaces adjacent to joint.
   d. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by manufacturer.
   e. Embed sand and/or masonry fines into the top surface of newly tooled “wet” sealant to match the texture and color of existing adjacent mortar, cast stone, stucco, or adjacent finish.

D. Remove masking immediately after tooling without disturbing joint sealant.

E. Wet Sealing Windows/Clerestories:
1. Tool or strike fillet-shaped joints to a sharp chisel profile with a light pressure to spread the material against each shoulder. Finished appearance should be smooth, straight, and even. Rough, unevenly tooled sealant finishes with non-linear edges will not be acceptable.
2. Mask and tool as noted above.
3. Extend sealant onto each glass and metal surface not less than ¼-inch and not more than 1/2-inch.

4. Complete tooling in one continuous stroke within ten minutes of sealant application and before a surface-skin forms. Do not use soaps, oils and/or alcohol as tooling aids. Such materials should not be allowed on work site.
5. Remove masking immediately after tooling without disturbing joint sealant.

3.03 ADJUSTING:

A. If damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

3.04 CLEANING:

A. Remove excess sealant from adjacent surfaces immediately after contact with xylene or toluene.

B. Remove debris and containers from jobsite.

3.05 PROTECTION:

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes.

3.06 SCHEDULE:

A. Sealant A:
   1. Sealant work in conjunction with roofing.

B. Sealant B:
   1. Metal-to-metal joints in flashings.
   2. Heat sensitive applications.
   3. Counter flashings.
   4. Penetration bonnet caulk troughs.
   5. EIFS control joints.

C. Sealant C:
   1. Between bonnet and penetrating element.
   2. Surface-mounted counter flashings.

D. Sealant D:
   1. Exposed applications to match color of adjacent sheet metal.

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